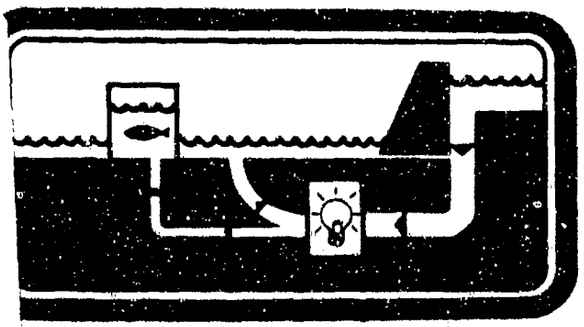
FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

LEVEL II

3

WYNOOCHEE
Hydropower/Fish Hatchery



AD A109140

DTIC
ELECTE
DEC 3 1 1981
S D
H

REVIEW DRAFT

DTIC FILE COPY

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

US Army Corps
of Engineers
Seattle District

8112 31 022

NOVEMBER 1981

THIS DOCUMENT CONTAINS:

Feasibility Report

Environmental Impact Statement

Appendixes

A. Section 404(b) Evaluation

B. Study Coordination and Public Involvement

C. Benefits, Cost Allocation, and Cost-Sharing Coordination

D. U.S. Fish and Wildlife Service Report

E. Design and Cost Estimates

F. Geology, Soils, and Construction Materials

G. Plan Formulation

H. Environmental Analyses

SEND YOUR COMMENTS TO
THE DISTRICT ENGINEER
BY 31 JANUARY 1982.

If you would like further information, please contact Dr. James O. Waller, Study Manager, U.S. Army Corps of Engineers, Seattle District, Post Office Box C-3755, Seattle, Washington 98124, commercial telephone (206) 764-3473, FTS telephone 399-3473.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A109 240
	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Wynoochee Hydropower/Fish Hatchery Study: Draft Feasibility Report and Environmental Impact Statement.	5. TYPE OF REPORT & PERIOD COVERED Review Draft
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineers, Seattle District P.O. Box C-3755/4735 East Marginal Way South Seattle, WA 98124	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE November 1981
	13. NUMBER OF PAGES 342
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

DTIC ELECTE DEC 3 1 1981 S H

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Wynoochee Dam
Feasibility Studies
Environmental Impact Statement
Fish Hatcheries
Hydrolectric Plants
Washington (State)
Grays Harbor Co.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A wide range of planning criteria was used to evaluate the hydropower and fish enhancement alternatives, design options for the alternatives, and alternative plans for Wynoochee Dam. The alternatives included hydropower at Wynoochee Dam, various fish enhancement measures in the vicinity of Wynoochee Dam, and no action. The tentatively selected plan is a 10.2-megawatt (nameplate) hydropower addition to Wynoochee Dam which would produce an

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

average of 37,400 megawatthours energy per year and a 396,000-pound (190 cubic feet per second) hatchery for anadromous fish 3,000 feet downstream of Wynoochee Dam which would add 129,000 adult fish annually to the anadromous fish harvest. Total fish enhancement would be 118,450 fish. Two satellite fish stations for enhancement of fish runs on other Washington coastal rivers are included in the plan. The tentatively selected plan meets the two planning objectives of this study.

Accession For
NTIS GRA&I ☒
DTIC TAB ☐
Unannounced ☐
Justification
By
Distribution/
Availability Codes
Dist | Avail and/or Special
A

WYNOOCHEE HYDROPOWER/FISH HATCHERY STUDY
DRAFT FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT

EXECUTIVE SUMMARY

This report presents the results of a feasibility study undertaken by the Seattle District, Corps of Engineers, on the desirability of developing the hydropower potential and fish enhancement opportunities at Wynoochee Dam, Washington, 35 miles north of the town of Montesano in Grays Harbor County, Washington.

The planning objectives for this study were to:

a. meet a portion of the increasing electrical energy needs in the Pacific Northwest by development of the hydropower potential of Wynoochee Dam, Washington, and

b. meet a portion of the increasing demand for anadromous fish in the Pacific Northwest by development of fish enhancement facilities at Wynoochee Dam, Washington.

A wide range of planning criteria was used to evaluate the hydropower and fish enhancement alternatives, design options for the alternatives, and alternative plans. The alternatives included hydropower at Wynoochee Dam, various fish enhancement measures in the vicinity of Wynoochee Dam, and no action. The tentatively selected plan is a 10.2-megawatt (nameplate) hydropower addition to Wynoochee Dam which would produce an average of 37,400 megawatthours energy per year and a 396,000-pound (190 cubic feet per second) hatchery for anadromous fish 3,000 feet downstream of Wynoochee Dam which would add 129,000 adult fish annually to the anadromous fish harvest. Total fish enhancement would be 118,450 fish. Two satellite fish stations for enhancement of fish runs on other Washington coastal rivers are included in the plan. The tentatively selected plan meets the two planning objectives of this study.

In response to the public's desire, the Corps of Engineers and Grays Harbor Public Utility District (PUD) have formed a hydropower partnership for the hydropower facility. Under the partnership, the Corps would construct the hydropower facility. The PUD, as local sponsor of the hydropower facility, would market the power output and pay 100 percent of the hydropower construction cost and annual hydropower operation, maintenance, and replacement costs. This partnership requires an exemption from the power marketing provisions of section 5 of the 1944 Flood Control Act which requires Bonneville Power Administration to market power produced at Corps of Engineers projects in the Pacific Northwest.

Total investment cost for the tentatively selected plan would be $42.4 million (October 1981 price level), of which $22.6 million is allocated to the hydropower facility and $20.8 million is allocated to the fish hatchery. The plan is economically justified, producing $2.20

in average annual total benefits for every $1 in average annual total costs. The hydropower facility would produce $1.20 in average annual power benefits for every $1 in average annual power costs; the average annual cost of energy produced would be 5.3 cents per kilowatt hour. The fish hatchery would produce $2.90 in average annual fish enhancement benefits for every $1 in average annual fish costs.

A draft environmental impact statement has been prepared for the Wynoochee hydropower/fish hatchery plan and is being circulated for public and agency review and comment.

There is no known opposition to the tentatively selected plan. A Federal fish agency would become the owner and manager of the fish hatchery and be responsible for the Federal share of the operation, maintenance, and replacement costs of the fish hatchery. The State of Washington and Grays Harbor PUD have expressed their intent to act as local sponsor of the fish hatchery and hydropower facility, respectively, and provide their respective share of the project costs.

The District Engineer's preliminary recommendation is that an integrated hydropower/fish hatchery project at Wynoochee Dam, Washington, be authorized for Federal construction. Federal implementation of the tentatively selected plan would insure complete integration of the proposed project with the operation of the existing federally owned Wynoochee Lake project for its authorized project purposes, would insure provision for the water quality and quantity needs of the proposed fish hatchery, and would result in construction efficiencies and cost savings.

WYNOOCHEE HYDROPOWER/FISH HATCHERY

TABLE OF CONTENTS

Paragraph		Page
	EXECUTIVE SUMMARY	i
	TABLE OF CONTENTS	iii
	SECTION 1. BACKGROUND	
1.01	Study Authority	1
1.02	Type of Study	1
1.03	Location of Study Area	1
1.04	Existing Wynoochee Lake Project Purposes and Operation	1
1.06	Existing Wynoochee Lake Project Fish Mitigation	5
	a. General	5
	b. Hatchery Facilities	5
	c. Fish Passage Facilities	5
1.07	Needs	6
	a. Energy	6
	b. Anadromous Fish	6
1.08	Pertinent References	7
	SECTION 2. PLANNING OBJECTIVES AND CRITERIA	
2.01	Planning Objectives	9
2.02	Planning Constraint	9
2.03	Planning Criteria	9
	a. General	9
	b. National Economic Development Criteria	9
	c. Environmental Quality Criteria	10
	d. Regional Economic Development Criteria	11
	e. Other Social Effects Criteria	11
	SECTION 3. FORMULATION AND EVALUATION OF ALTERNATIVES	
3.01	Plan Formulation Approach	12
3.02	Preliminary Analysis and Screening	12
	a. Hydropower at Wynoochee Dam	12
	b. Fish Enhancement at Wynoochee Dam	13
	c. No Action	13
3.03	Detailed Studies	13
	a. Design Options	13
	b. Optimization	16
3.04	Alternative Plan 1: No Action	16
	a. Description	16
	b. Evaluation of Key Criteria	17

TABLE OF CONTENTS (con.)

Paragraph		Page
3.05	Alternative Plan 2: Combined Underground Hydropower and Enhancement Fish Hatchery (National Economic Development Plan/ Environmental Quality Plan/Tentatively Selected Plan)	17
	a. Description	17
	b. Evaluation of Key Criteria	17
3.06	Plans of Others	19
	a. Public Utility District No. 1 of Grays Harbor County, Washington	19
	b. City of Aberdeen, Washington	19
	c. Washington Departments of Fisheries and Game	19
	d. U.S. Forest Service	20
	SECTION 4. TENTATIVELY SELECTED PLAN	
4.01	Plan Description	21
4.03	Hydrology	21
	a. Climatic Conditions	21
	b. Drainage and Streamflow	22
4.04	Existing Wynoochee Lake Project Purposes and Operation	22
4.05	Existing Water Quality	22
4.06	Environmental Setting	22
4.07	Geotechnical Considerations	22
	a. Geologic Setting	22
	b. Exploration and Analyses	23
	c. Material Sources and Waste Area	23
4.08	Design Criteria	24
	a. Intake Structure	24
	b. Powerhouse	24
	c. Fish Hatchery	24
4.09	Structural Features and Hydraulic Design	24
	a. Intake Structure	24
	b. Penstock	25
	c. Powerhouse	25
	d. Switchyard and Transmission Line	26
	e. Draft Tubes and Tailrace Tunnel	26
	f. Hydropower Outlet/Fish Hatchery Intake Structure	27
	g. Fish Hatchery Water Supply Pipeline	28
	h. Fish Hatchery	28
	i. Existing Fish Collection Facility	29
	j. Satellite Fish Stations	29
4.10	Relocations	30
4.11	Real Estate	30
4.12	Environmental Features	31
4.13	Mitigation	31
4.14	Cultural Resources	33

TABLE OF CONTENTS (con.)

Paragraph		Page
4.15	Recreation Facilities	33
4.16	Project Costs	33
4.17	Construction	35
4.19	Operation and Maintenance	36
4.24	Replacement	38
4.25	Economics of Tentatively Selected Plan	39
	a. Power Benefits	39
	b. Fish Benefits	39
	c. Cost Allocation	40
	d. Economic Justification	40
4.26	Effects of Tentatively Selected Plan	42
4.28	Implementation Alternatives	44
4.29	Non-Federal Cost Sharing	44
	a. State of Washington's Previous Mitigation Responsibility	46
	b. Non-Federal Cost Sharing Requirements Under Existing Law	46
	c. Proposed Non-Federal Hydropower Cost Sharing	47
	d. Former President Carter's Proposed Cost-Sharing Policy	48
	e. State of Washington Participation	48
4.30	Federal Sponsorship of Fish Hatchery	50
4.31	Implementation of Tentatively Selected Plan	51

SECTION 5. STUDY COORDINATION AND PUBLIC INVOLVEMENT

5.01	Study Coordination and Public Involvement Framework	52
5.02	Summary of Views	52
5.03	Coordination with Key Agencies	52
	a. State of Washington	52
	b. National Marine Fisheries Service	53
	c. U.S. Fish and Wildlife Service	53
	d. U.S. Forest Service	57
	e. Environmental Protection Agency	57
	f. Bonneville Power Administration	57
	g. Public Utility District No. 1 of Grays Harbor County, Washington	57
	h. City of Aberdeen, Washington	58
5.04	Coordination of Draft Report	58

SECTION 6. PRELIMINARY CONCLUSIONS AND RECOMMENDATION

6.01	Preliminary Conclusions	59
6.02	Preliminary Recommendation	59

TABLE OF CONTENTS (con.)

		Page
	ENVIRONMENTAL IMPACT STATEMENT	
	Cover Sheet - Abstract	EIS-i
	Summary	EIS-ii
	Table of Contents	EIS-iii
	Section 1. Need For and Objectives of Action	EIS-1
	Section 2. Alternative Plans	EIS-2
	Section 3. Affected Environment	EIS-15
	Section 4. Environmental Impacts of Final Alternative Plans	EIS-20
	Section 5. Study Coordination and Public Involvement	FIS-48
Number	**TABLES**	
1	Summary Comparison of Alternative Plans	18
2	Adult Salmon and Steelhead Harvest from Wynoochee Fish Hatchery	32
3	Cost Estimate Summary - Tentatively Selected Plan	34
4	Economics of Tentatively Selected Plan	41
5	Effects of the Tentatively Selected Plan on Resources of Principal National Recognition	43
6	Non-Federal and Federal Cost Sharing	45
	FIGURES	
1	Location of Wynoochee Dam	2
2	Wynoochee Hydropower/Fish Hatchery Plan Area	3
3	Wynoochee Hydropower/Fish Hatchery Design Option Combinations	14
4	Tentatively Selected Plan - Construction Schedule	36
	PHOTOGRAPHS	

TABLE OF CONTENTS (con.)

Number

PLATES

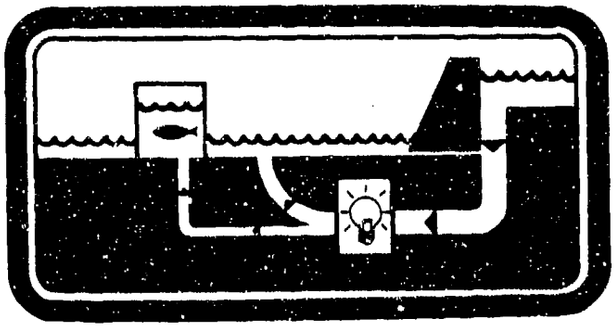
1 Wynoochee Lake Project
2 Wynoochee Hydropower/Fish Hatchery
Recommended Plan - General Design I
3 Wynoochee Hydropower/Fish Hatchery
Recommended Plan - General Design II

APPENDIXES

A Section 404(b) Evaluation
B Study Coordination and Public Involvement
C Benefits, Cost Allocation, and Cost-Sharing
Coordination
D U.S. Fish and Wildlife Service Report
E Design and Cost Estimates
F Geology, Soils, and Construction Materials
G Plan Formulation
H Environmental Analyses

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



FEASIBILITY REPORT

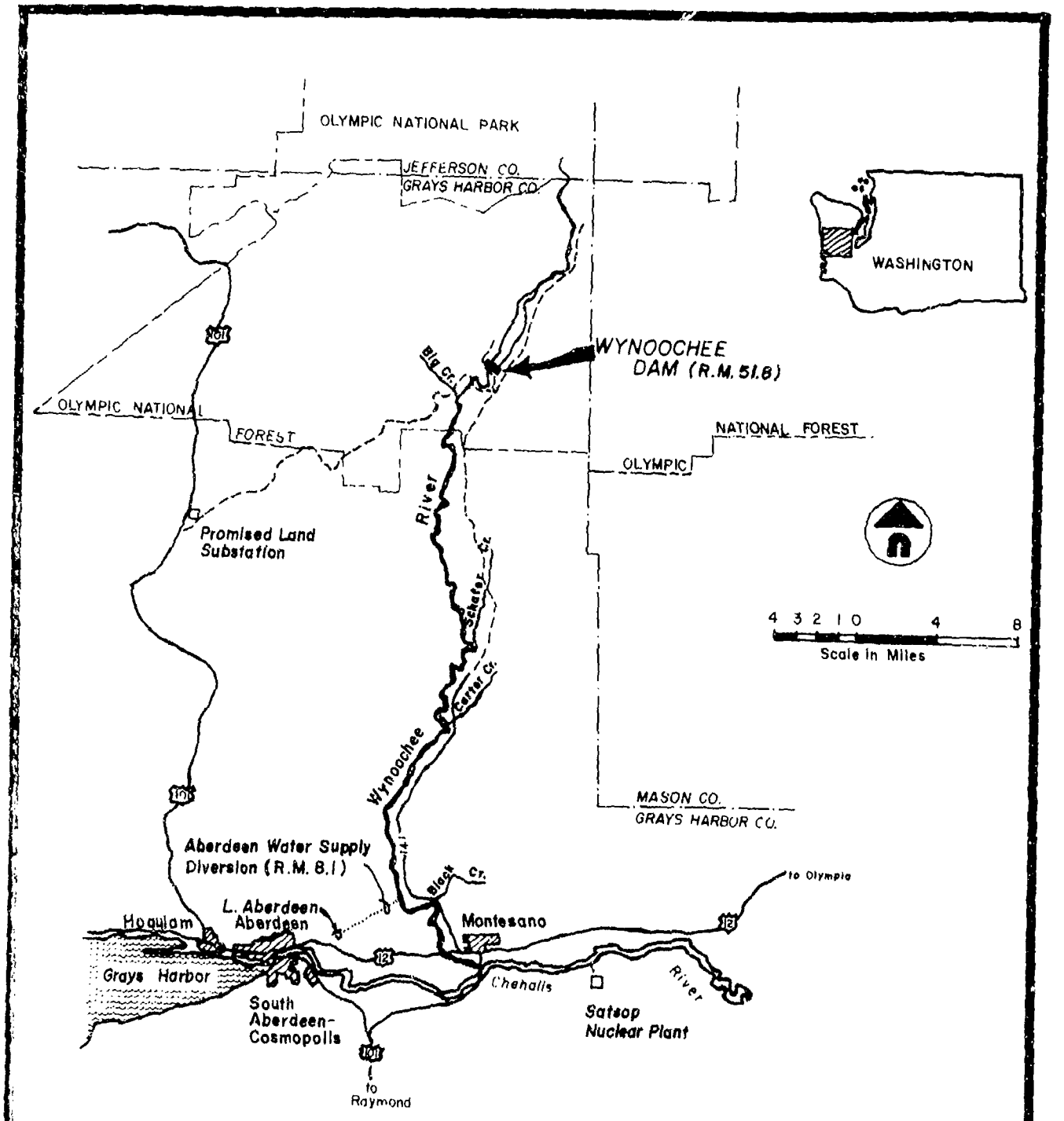
SECTION 1. BACKGROUND

1.01 Study Authority. This study was conducted under the general authority of the Chehalis River Basin study resolution adopted by the House of Representatives Committee on Flood Control on 9 April 1946. Specific authority for the Corps of Engineers to study hydropower development at Wynoochee Dam is provided by Section 203 of the River and Harbor Act of 1962 (Public Law 87-874, 23 October 1962). The referenced section of the act authorized the Wynoochee Lake Project in accordance with the recommendations of the Chief of Engineers in House Document 601, 87th Congress, provided that the installation of a power generating facility not be made until the Chief of Engineers submitted a reexamination report to the Congress for authorization. Specific authority for consideration of fish enhancement facilities at Wynoochee Dam is provided by the Fish and Wildlife Coordination Act of 1958, Public Law 85-624, as amended by Public Law 89-72.

1.02 Type of Study. This report presents the results of a feasibility study undertaken by the Seattle District, Corps of Engineers. The study was conducted in response to the study authorizations for the purpose of reporting to Congress for their action on the desirability of developing the hydropower potential and fish enhancement opportunities at Wynoochee Dam, Washington, and to present a full assessment of the environmental impacts of the alternatives and alternative plans.

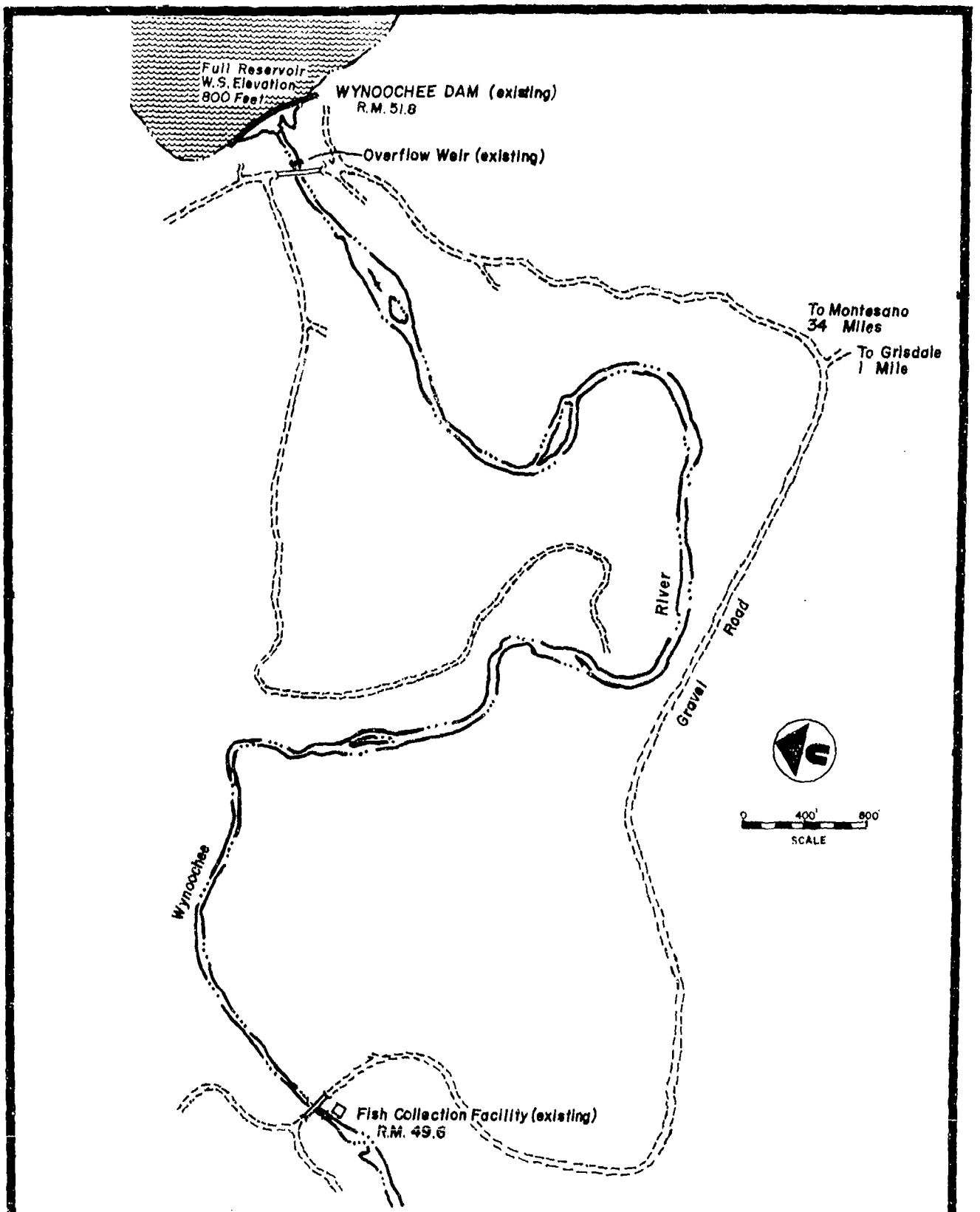
1.03 Location of Study Area. The study area is the Chehalis River Basin and Grays Harbor area in western Washington. This area includes the Wynoochee River Basin and the plan area in the immediate vicinity of the Corps of Engineers' Wynoochee Dam, 35 road miles north of the town of Montesano in Grays Harbor County, Washington (figure 1). The Wynoochee River originates on the southern slopes of the Olympic Mountains in the Olympic National Park and flows into the Chehalis River 13 miles upstream of Aberdeen, Washington. The Chehalis River flows into Grays Harbor at Aberdeen. The plan area extends from Wynoochee Dam at river mile (R.M.) 51.8 on the Wynoochee River downstream to the existing Corps fish collection facility at R.M. 49.6 (figure 2). The outputs of the alternatives considered would be provided to the Pacific Northwest region.

1.04 Existing Wynoochee Lake Project Purposes and Operation. The Wynoochee Lake Project is a 177-foot-high (above streambed) concrete and earthfill dam constructed by the Corps of Engineers from years 1969 to 1972 (plate 1). The project provides 70,000 acre-feet of total storage and is presently operated for city of Aberdeen industrial water supply, winter flood control, and fisheries. Hydropower development was considered originally in the Wynoochee River studies but was not included in the existing project due to the lack of economic feasibility at the time of authorization. Incidental fish enhancement benefits were attributed to the Wynoochee Lake Project for improved streamflows which



Location of Wynoochee Dam

FIGURE 1



Wynoochee Hydropower/Fish Hatchery Plan Area

FIGURE 2

enhance transportation and rearing habitat of anadromous fish. The existing project includes mitigation lands for elk and a fish collection facility and trucking program for anadromous fish. In addition, the Washington Department of Game was paid $696,000 for steelhead spawning habitat losses associated with the project.

1.05 Wynoochee reservoir provides 59,500 acre-feet of usable storage between the minimum pool at elevation 700 feet and the normal maximum pool at elevation 800 feet. The project is drafted to flood control pool elevation 764 feet to provide 35,000 acre-feet of storage for flood control regulation from 1 November to approximately 15 March. The reservoir is generally filled from elevation 764 feet to elevation 800 feet between 15 March and 1 June to provide up to 59,500 acre-feet of conservation water supply. The city of Aberdeen has contracted to repay all costs allocated to water supply or approximately 78 percent of the annual investment, operation, maintenance, and replacement costs of the existing project. Operational outputs and requirements of the existing project are as follows:

a. 125 cubic feet per second (c.f.s) present city of Aberdeen industrial water supply withdrawal at Wynoochee R.M. 8.1; ultimate withdrawal of 300 c.f.s. when Aberdeen requests it sometime in the future. Water supply releases are scheduled according to the industrial water supply needs of the city and are provided in regular segments of increasing flows.

b. Up to 120 c.f.s below R.M. 8.1 for fish passage.

c. 62 c.f.s. release by the city of Aberdeen past R.M. 8.1 to Washington Public Power Supply System starting in approximately 1986 to replace Chehalis River water withdrawn for cooling at the Satsop nuclear plant. The 62 c.f.s. would be provided from the city of Aberdeen's water supply entitlement and would be in addition to the 50 c.f.s. minimum flow requirement below R.M. 8.1 when the city of Aberdeen reaches its ultimate entitlement sometime in the future.

d. 35 c.f.s. for future irrigation downstream of R.M. 27 during June, July, and August. Actual regulation for irrigation will not commence until appropriate irrigation contracts have been signed.

e. Winter flood control storage is designed to regulate the Wynoochee River below Black Creek to 18,000 c.f.s.

f. Minimum allowable releases from Wynoochee Dam are 190 c.f.s., except for 140 c.f.s. from 1 May to 30 June to complete refilling the reservoir.

g. One foot per hour water level fluctuations immediately downstream of Wynoochee Dam when flows are less than 2,500 c.f.s.; no fluctuation restriction when flows are greater than 2,500 c.f.s.

1.06 Existing Wynoochee Lake Project Fish Mitigation.

a. General. Prior to construction of the Wynoochee Lake Project, approximately 1,500 coho salmon, 1,400 steelhead, and 500 searun cutthroat trout spawned in the Wynoochee River above the damsite at river mile (R.M.) 51.8 to Wynoochee Falls at R.M. 61.0. The Wynoochee Dam blocked passage to this area and the reservoir inundated the area from R.M. 51.8 to R.M. 57.2. Mitigation for anadromous fish losses associated with Wynoochee Lake Project construction was provided for two categories of losses: (1) $696,000 was transferred to the Washington Department of Game (WDG) for the construction of hatchery facilities for the mitigation of steelhead and cutthroat trout habitat inundated by the Wynoochee reservoir, and (2) fish passage facilities were constructed to allow continued use of the remaining spawning areas above Wynoochee reservoir by coho salmon, steelhead, and searun cutthroat.

b. Hatchery Facilities. Fish spawning areas in the 5.4 miles of the Wynoochee River immediately above R.M. 51.8 were inundated by formation of the Wynoochee reservoir. Approximately 1,000 steelhead and 330 searun cutthroat trout spawned in this area and were lost due to construction of the Wynoochee Lake Project; there was no appreciable spawning of coho salmon in the reservoir area. Additionally, some steelhead losses were expected downstream of the dam due to the operation of the Wynoochee Lake Project. As a result of coordination among the Federal and state resource agencies, artificial propagation facilities were recommended for mitigation. Accordingly, under a signed Memorandum of Agreement dated 28 July 1977 between the Corps of Engineers and WDG, (Construction of Fish Hatchery Facilities for Prevention of Natural Spawning Areas for Anadromous Trout Occasioned by Construction of Wynoochee Lake Project), $696,000 was provided to the WDG in 1977 for construction of fish hatchery facilities and for operation and maintenance of those facilities for the life of the Wynoochee Lake Project. The transfer of these funds to the State of Washington was authorized by the Water Resources Development Act of 1974 (Public Law 93-251). WDG was to release sufficient steelhead smolts to increase the number of returning adult steelhead by 1,700 fish over the natural run and planned to produce these smolts through expansion of the Aberdeen hatchery. Problems arose which have prevented the intended expansion of the Aberdeen hatchery by WDG, and only interim measures to produce steelhead have been undertaken. To date, th WDG has implemented temporary rearing pens in Lake Aberdeen for rearing a portion of the steelhead necessary to mitigate for the existing dam. All unused funds have been invested by the State of Washington.

c. Fish Passage Facilities. With implementation of the Wynoochee Lake Project, fish spawning and rearing in the Wynoochee River upstream of the reservoir was continued by construction of adult fish collection facilities 2.2 miles downstream of the dam, a release facility above the dam, and multilevel low-flow pipes through the dam for the passage of downstream migrants. These facilities were to provide mitigation for

1,500 coho salmon, 400 steelhead, and 170 cutthroat trout estimated to spawn in the stream habitat upstream of the reservoir. Under the present operation, adult fish are transported from the collection facility by truck to a release station in the river upstream of the reservoir. Progeny of the fish spawning in this reach of the river move through the reservoir on their seaward migration and pass through the dam via six low-flow outlets which provide for downstream temperature control and safe passage for downstream migrants. Since the multilevel low-flow outlets were a prototype design, the efficiency of the structure to safely pass seaward migrants was tested in 1974-1976. The test results indicated that the structure was not operating at its intended efficiency and have led to requests by the WDG and Washington Department of Fisheries (WDF) for additional mitigation. The WDG has requested total mitigaion for 570 steelhead and cutthroat trout that spawned upstream of the reservoir. The WDF has requested mitigation for one-third (i.e., 500 adults) of the coho run annually and continuation of the operation of the fish facilities for the remaining two-thirds (i.e., 1,000 adults) of the annual coho salmon run. The State of Washington and the Corps have deferred further negotiation for additional mitigation pending authorization of the Wynoochee hydropower/fish hatchery plan.

1.07 Needs. Energy and anadromous fishery resource needs in the Pacific Northwest have increased considerably since Wynoochee Dam was authorized for construction.

a. Energy. Average annual energy deficits in the West Group Area (Pacific Northwest) are forecast to range from 10,310,000 megawatt-hours (MWH) (1,177 megawatts (MW)) in 1981-1982 to 23,600,000 MWH (2,694 MW) in 1985-1986 to 13,960,000 MWH (1,594 MW) in 1991-1992, according to the West Group Forecast prepared by the Pacific Northwest Utilities Conference Committee (PNUCC) (Northwest Regional Forecast of Loads and Resources, June 1981). The probability of the region being without sufficient resources to meet electrical needs due to increased loads and delays of thermal development has caused power planners to focus on smaller renewable resource projects and conservation methods. These new plans emphasize the development of small hydropower and other methods to relieve the potential deficits. However, since the PNUCC forecast already includes anticipated conservation and renewable resource development in 1990-1991, the demand for electrical energy will probably exceed generating resources by over 13 million MWH in the next decade and beyond.

b. Anadromous Fish. The natural runs of anadromous fish in the Pacific Northwest are being adversely impacted by logging, pollution, and water resource projects. In particular, the fish runs in the Chehalis River Basin and Grays Harbor area have declined. The demand for anadromous fish by commercial, Indian, and sport fishermen has exceeded the available declining stocks and the remaining natural spawning and rearing areas available for producing anadromous fish have proved to be insufficient to meet the continuing increased demand on the fisheries.

There is, therefore, a need to enhance the salmon and steelhead runs in the Chehalis River Basin and Grays Harbor area over their present levels. In addition, the Judge Boldt decision of 12 February 1974 allocates 50 percent of the state's anadromous fisheries to Indian harvest, limiting the number of fish available to non-Indian sport and commercial fishermen.

To overcome the potential economic loss caused by these impacts on the sport and commercial fisheries, the Federal, state, and local governments are investigating ways of increasing the supply of harvestable anadromous fish. A fishery enhancement bill was passed by Congress in 1980 to provide funds to enhance anadromous fisheries in the Pacific Northwest. Various state agencies and local interests have made considerable progress in improving the general environmental conditions in the Grays Harbor area. In addition, the Washington State Departments of Fisheries and Game have long recognized the potential for a fish hatchery at Wynoochee Dam. In a letter from the Governor of the State of Washington dated 23 April 1980 (see appendix C), the Corps was requested to study the feasibility of a fish hatchery in conjunction with hydropower development at Wynoochee Dam. The Grays Harbor Fisheries Enhancement Task Force, established by the Grays Harbor Regional Planning Commission, was formed in 1980 to discuss plans to enhance the declining anadromous fishery in the Grays Harbor area. The fish enhancement plan, adopted in July 1980 by the Commission, recommended the Wynoochee fish hatchery as one of two long-range plans to enhance the fishery. Special emphasis has been placed by the fishery agencies on enhancing spring chinook salmon, a species facing near extinction in many watersheds of the Northwest.

1.08 Pertinent References.

a. U.S. Army Corps of Engineers, Seattle District, 1961, Report on Survey of Wynoochee River, Washington (published as House Document No. 601, 87th Congress, 2d Session, 1962), recommended a multiple-purpose project at R.M. 42.5 on the Wynoochee River.

b. U.S. Army Corps of Engineers, Seattle District, 1965, Wynoochee Reservoir, Washington, Design Memorandum 1, Site Selection, selected the site for a multiple-purpose project at R.M. 51.8 on the Wynoochee River.

c. U.S. Army Corps of Engineers, Seattle District, 1966, Wynoochee Reservoir, Washington, Design Memorandum 3, General Design, presented design details of the Wynoochee Lake Project.

d. Public Utility District No. 1 of Grays Harbor County, Washington, June 1979, Wynoochee River Project, Appraisal Report, presented results of an appraisal study by R. W. Beck and Associates on hydroelectric power development at existing Wynoochee Dam and the undeveloped Oxbow site at R.M. 42.5.

e. Public Utility District No. 1 of Grays Harbor County, Washington, April 1980, Application before the Federal Energy Regulatory Commission for Preliminary Permit for Wynoochee River Waterpower Project.

f. Grays Harbor Fisheries Enhancement Task Force, July 1980, An Action Plan for Grays Harbor Fishery Enhancement, A Report to the Grays Harbor Regional Planning Commission.

g. City of Aberdeen, Grays Harbor County, Washington, November 1980, Competing Application before the Federal Energy Regulatory Commission for Preliminary Permit for Wynoochee River Water Power Project.

h. Public Utility District No. 1 of Grays Harbor County, Washington, May 1981, Wynoochee Dam Hydroelectric Project Pre-Draft SEPA EIS Consultation Packet of Information.

i. Matthews, Stephen B., September 1981, Biological Report for Wynoochee Hatchery Management Planning, prepared for Seattle District, Corps of Engineers.

Copies of these pertinent references are available for review in the Seattle District office.

SECTION 2. PLANNING OBJECTIVES AND CRITERIA

2.01 Planning Objectives. Planning objectives are statements of the primary water and related land resources management needs of the study area which led to the request for the study. For this study, the planning objectives were to:

a. meet a portion of the increasing electrical energy needs in the Pacific Northwest by development of the hydropower potential of Wynoochee Dam, Washington, and

b. meet a portion of the increasing demand for anadromous fish in the Pacific Northwest by development of fish enhancement facilities at Wynoochee Dam, Washington.

2.02 Planning Constraint. The only planning constraint placed on this feasibility study by the Corps of Engineers was that there would be no change in the outputs of the congressionally authorized project purposes of Wynoochee Lake Project as a result of adding hydropower and fish enhancement facilities.

2.03 Planning Criteria.

a. General. A wide range of planning criteria was used to evaluate the hydropower and fish enhancement alternatives, design options for the alternatives, and alternative plans according to their contribution to the National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE) accounts of the Water Resources Council's Principles and Standards for Water and Related Land Resources. The criteria considered include legal, financial, policy, social, economic, engineering, and environmental factors and conditions which impose constraints and limitations on the planning process or provide rules and guidelines for evaluation. The criteria also include needs, opportunities, and concerns in addition to those which specifically address the planning objectives. All applicable planning criteria for the study are presented in the following paragraphs under the account to which they are primarily related.

b. National Economic Development Criteria. The NED criteria consisted of needs that would result in NED benefits and the constraints and procedures which apply to the calculation of these benefits. The pertinent NED criteria were:

(1) reduce energy deficits in the Pacific Northwest; and

(2) enhance the commercial, Indian, and sport fisheries harvest in the Pacific Northwest.

In addition, the following guidelines were used in the NED analysis:

(1) all costs determined for the October 1981 price level;

(2) interest rate to be used in the evaluation of alternative plans is 7-5/8 percent (Fiscal Year (FY) 1982) in accordance with the formula prescribed by the Water Resources Council;

(3) evaluate all alternatives on a 100-year economic life;

(4) simplified small-scale hydropower evaluation procedures established in response to the Water Resources Council's Procedures for Evaluation of National Economic Development Benefits and Costs in Water Resources Planning (14 December 1979 Federal Register, Section 713.601(b), p. 72938)can be used; and

(5) each project purpose must provide benefits at least equal to its cost in accordance with Corps of Engineers and Water Resources Council policy.

c. Environmental Quality Criteria. The EQ criteria consisted of specific environmental related resource constraints and opportunities to increase environmental quality. These included criteria imposed by Federal, state, and local regulations and those uniquely related to the study area. The pertinent EQ criteria were:

(1) enhance runs of salmon and steelhead in the Chehalis River Basin, Grays Harbor area, and other Washington coastal rivers;

(2) minimize adverse impacts on resident fish and wildlife in plan area;

(3) minimize energy use;

(4) maintain water quality of Wynoochee River within existing state classification;

(5) preserve or salvage significant historic and prehistoric cultural resource sites affected by potential project construction or effects in accordance with authorities contained in the National Historic Preservation Act of 1966, the Reservoir Salvage Act of 1960 as amended by Public Law 93-291, and Executive Order (EO) 11593;

(6) preserve wetlands in conformance with EO 11990;

(7) preserve flood plain in conformance with EO 11988;

(8) protect habitat of any threatened and endangered species;

(9) allow for appropriate instream flows in the Wynoochee River;

(10) be compatible with existing Wynoochee project mitigation facilities;

(11) provide State of Washington opportunity to develop mitigation facilities for previous steelhead losses associated with existing Wynoochee project under 28 July 1977 Memorandum of Agreement;

(12) minimize adverse impacts on existing wild stocks of anadromous fish in the Chehalis River Basin, Grays Harbor area, and other Washington coastal rivers; and

(13) assure that Wynoochee River fluctuations continue to be compatible with the fish resource.

d. Regional Economic Development Criteria. The RED criteria consisted of opportunities to increase economic efficiency within the Chehalis River Basin and Grays Harbor area which may also provide increases in NED. This list also included areas of concern listed in Section 122 of Public Law 91-611. The pertinent RED criteria were:

(1) reduce energy deficits in the Pacific Northwest;

(2) enhance the commercial, Indian, and sport fisheries production in the Pacific Northwest;

(3) increase employment of unemployed or underemployed resources in the Chehalis River Basin and Grays Harbor area;

(4) increase recreational opportunities in Chehalis River Basin and Grays Harbor area.

e. Other Social Effects Criteria. The OSE criteria included those engineering policy standards that were applied to all alternatives to assure the maintenance of public health and safety and those opportunities and constraints related to the well-being of people. This list also included areas of concern listed in Section 122 of Public Law 91-611. The pertinent OSE criteria were:

(1) maintain structural soundness of Wynoochee Dam;

(2) maintain operation of Wynoochee project for its authorized project purposes;

(3) minimize adverse social impacts in plan area;

(4) provide improved Indian fisheries;

(5) assure that river fluctuations continue at existing safe levels; and

(6) provide water quality consistent with existing state classification for Wynoochee River.

SECTION 3. FORMULATION AND EVALUATION OF ALTERNATIVES

3.01 Plan Formulation Approach. The plan formulation process began with the identification of the planning objectives and the planning criteria. A range of hydropower and fish enhancement alternatives was identified to meet the planning objectives while addressing as many of the planning criteria as possible. Alternatives and design options for the alternatives were evaluated, screened, and refined during preliminary and detailed technical studies. As a result of these formulation studies, the selected plan consisted of an underground hydropower facility and a fish hatchery. Hydropower formulation was done in accordance with the Water Resources Council's guidelines for small hydropower projects (see paragraph 4.25a). Hydropower development was optimized with a 1,200 c.f.s. powerhouse based on net power benefits and energy production; the fish hatchery was sized at 190 c.f.s. to provide the maximum opportunity for fish enhancement development. The selected plan and a no-action plan were then evaluated against the planning criteria and the tentatively selected plan was selected. Extensive study coordination and public involvement were conducted throughout the study. Plan formulation details are presented in appendix G.

3.02 Preliminary Analysis and Screening. Alternatives for meeting the two planning objectives were formulated, evaluated, and screened during preliminary engineering, economic, and environmental studies. The alternatives included hydropower at Wynoochee Dam, various fish enhancement measures in the vicinity of Wynoochee Dam, and no action.

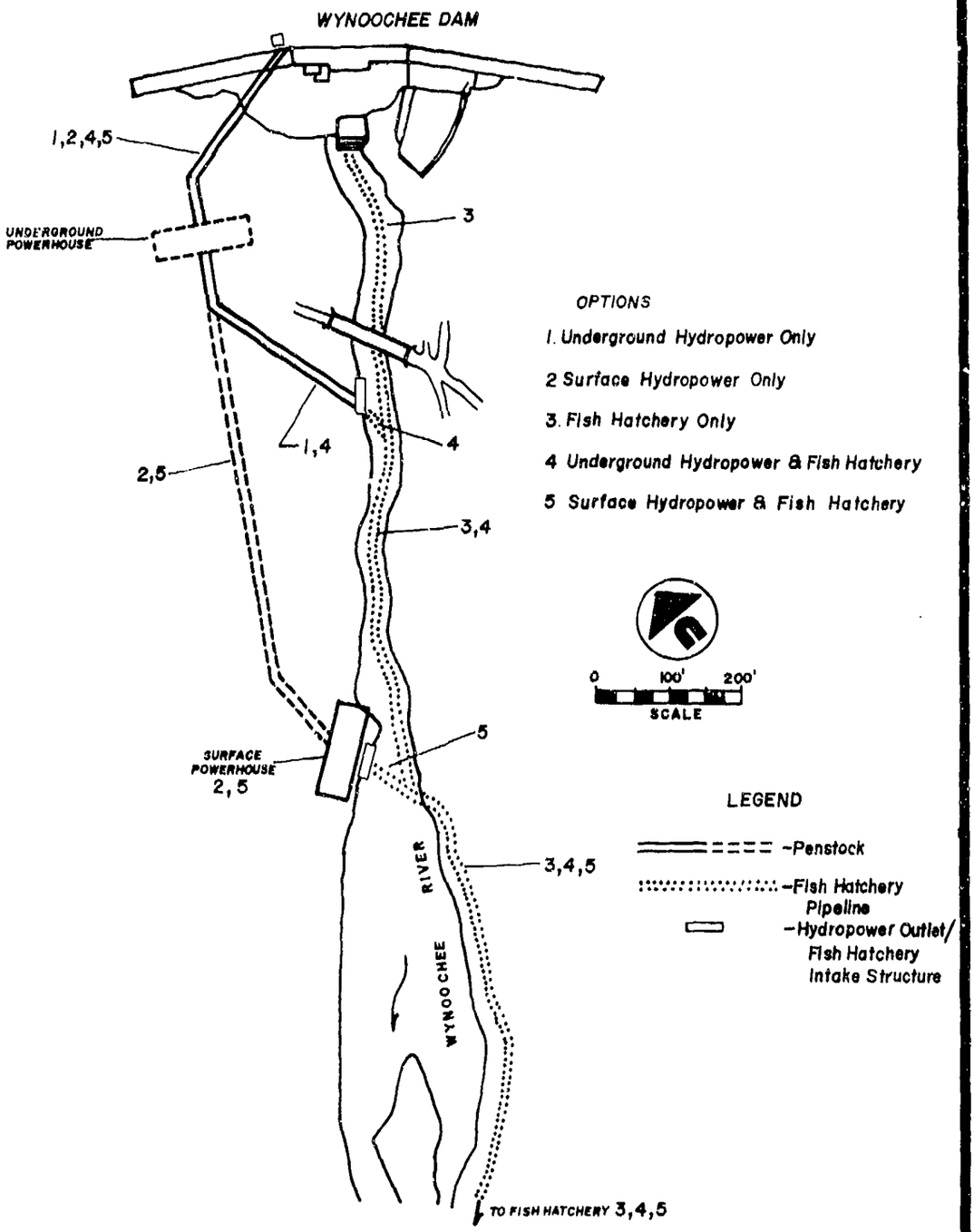
a. Hydropower at Wynoochee Dam. Studies were conducted to determine the powerhouse configuration most appropriate to produce energy from a reasonably high percentage of expected outflows from Wynoochee Dam without modifying existing project operations. A preliminary hydraulic capacity of the powerhouse was selected to be 1,200 c.f.s., the flow equalled or exceeded 20 percent of the time in December, the month with the highest runoff at Wynoochee Dam. As detailed in appendix G, seven powerhouse locations (figure 3) with various penstock configurations were considered during the preliminary studies. As part of the preliminary screening process, hydropower design options were dropped from further study if they (1) presented a potential hydraulic and operational constraint on the operation of the spillway of the Wynoochee Dam, (2) would operate with relatively high loss in net power head when compared to the other alternatives, (3) would result in insufficient room or access for construction of the feature, or (4) were located in the rock canyon bottom below known overburden slide areas. As a result of this preliminary screening, all but two hydropower design options were deleted from further consideration: a right bank underground powerhouse 200 feet downstream of the dam and a right bank surface powerhouse 900 feet downstream of the dam, both of which would have a penstock tunnel under the right bank abutment and through the right bank.

b. Fish Enhancement at Wynoochee Dam. Three alternatives are possible in the vicinity of Wynoochee Dam to enhance the anadromous fish runs: spawning channels, rearing ponds, and a fish hatchery. All three would take advantage of the gravity water supply from Wynoochee Dam. As detailed in appendix G, a fish hatchery was considered to be the most viable fish enhancement alternative in the vicinity of Wynoochee Dam because it would provide optimum use of the opportunity at Wynoochee Dam in terms of production and efficiency. Following selection of the fish hatchery alternative, three alternative fish hatchery sites were evaluated in the vicinity of Wynoochee Dam, one on the left bank and two on the right bank. The left bank site located on a high level bench 2,000 feet downstream of the dam was eliminated from consideration because the site was too small an area for a hatchery to utilize the available water (190/140 c.f.s. minimum flow release) and because the site was too high above the river to be connected with a gravity flow pipeline from a hydropower facility. The right bank sites located approximately 3,000 feet downstream of the dam were similar except that one site was located on a intermediate level bench and the other on a low level bench. Although other fish hatchery sites in the Chehalis River Basin and Grays Harbor area could be developed by state and other Federal agencies, the other sites do not offer the unique combination of factors that make a right bank fish hatchery site below Wynoochee Dam the most desirable hatchery site in the basin (refer to appendix G). Both right bank sites could accommodate a hatchery which could utilize all the available water and could be connected with a gravity flow pipeline from a hydropower facility. However, the lower level site was selected over the intermediate level site because it would cause less hydropower head loss if the fish hatchery had a direct pipeline connection from a hydropower facility. In addition, the lower fish hatchery site would be a source of suitable aggregate materials for construction of the hydropower facility.

c. No Action. Under the no-action alternative, there would be no Federal hydropower or enhancement fish hatchery development at Wynoochee Dam at this time. No action is discussed further in paragraph 3.04.

3.03 Detailed Studies.

a. Design Options. As outlined in appendix G, detailed design and cost estimate studies, geotechnical investigations, and environmental studies were conducted on the five possible hydropower and fish hatchery design options which remained after the preliminary studies. The project outputs and construction costs of the remaining design options (figure 3) were as follows:



Wynoochee Hydropower/Fish Hatchery Design Options

FIGURE 3

Design Option	Description	Powerhouse Nameplate Capacity (MW)	Average Annual Energy (MWH)	Fish Production (Pounds)	October 1981 Construction Costs (Million Dollars)
(1)	Underground hydropower only	10.2	37,400		25.5
(2)	Surface hydropower only	10.2	37,400		23.5
(3)	Fish hatchery only			396,000	21.0
(4)	Underground hydropower plus fish hatchery	10.2	37,400	396,000	42.4
(5)	Surface hydropower plus fish hatchery	10.2	37,400	396,000	39.3

Detailed design and cost studies showed an economic advantage for developing a combined hydropower and fish hatchery project, with the underground hydropower option $3.1 million more expensive than the surface hydropower option. However, detailed geotechnical investigations (refer to appendix F) considered that the risk of potential slide problems associated with the surface powerhouse offset the additional construction cost of the underground powerhouse and determined that the underground powerhouse location is geotechnically sound with no known potential problems. Detailed environmental studies showed that an underground hydropower and fish hatchery option had a net beneficial environmental impact. Therefore, based on present information, the underground hydropower and fish hatchery option was the only design option which remained for consideration as an alternative plan during this feasibility study. Additional consideration will be given to the alternate project locations during advanced engineering and design studies to verify selection of the most advantageous design option. In response to coordination with fish resource agencies and interested parties, the fish hatchery was expanded into a Washington coastal fish enhancement facility by adding two satellite fish stations. Detailed siting and design studies of the stations will be accomplished during advanced engineering and design as the details of the hatchery and its management are formulated.

b. Optimization. The optimum level of hydrpower development was determined by comparing the net power benefits and percent of total potential energy produced of the underground powerhouse with five different hydraulic capacities - 800 c.f.s., 1,000 c.f.s., 1,200 c.f.s., and 1,400 c.f.s. A comparison of the four power plants was as follows:

	Powerhouse Hydraulic Capacity			
	800 cfs	1000 cfs	1200 cfs	1400 cfs
Installed Capacity (MW)	6.8	8.6	10.2	11.8
Dependable Capacity (MW)	5.3	6.4	7.2	7.6
Average Annual Energy (MWH)	33,600	35,400	37,400	38,100
Percentage Total Potential Energy	82%	86%	91%	92%
Annual Power Benefits ($1000)	2,024	2,237	2,419	2,498
Annual Power Costs ($1000)	1,667	1,788	1,987	2,212
Net Power Benefits ($1000)	357	449	432	286

A plot of power benefits versus costs (in appendix G) showed the maximum net power benefits would be $455,000. A plot of net power benefits versus powerhouse hydraulic capacity (in appendix G) showed the maximum net power benefits would occur with a 1,065 c.f.s. hydraulic capacity. However, the increase in energy production between 1,000 c.f.s. and 1,200 c.f.s. is slightly greater than the increase between 800 c.f.s. and 1,000 c.f.s., and the rate of increase in energy production decreases for powerhouses larger than 1,200 c.f.s.. Therefore, the 1,200 c.f.s. powerhouse was selected as the optimum level of hydropower development to capture the extra energy production with only a slight decrease in net power benefits. Details of the hydropower optimization are presented in appendix G.

The fish hatchery was sized to use the minimum allowable releases from Wynoochee Dam, which are 190 c.f.s., but can be reduced to 140 c.f.s. from 1 May to 30 June to complete refilling the reservoir. The 190 c.f.s. flows would provide the maximum opportunity for fish enhancement development at Wynoochee Dam, thereby permitting maximum fishery enhancement in the Chehalis River Basin, Grays Harbor area, and other Washington coastal rivers (see appendix C).

3.04 Alternative Plan 1: No-Action.

a. Description. Under the no-action plan, there would be no Federal hydropower or enhancement fish hatchery development at Wynoochee Dam at this time. Energy conservation programs and renewable resources development by public and private utilities and state and local governments would continue. Fish habitat improvement measures and fishery management by state fisheries agencies would also continue. There is a possibility of non-Federal hydropower development at Wynoochee Dam as discussed in paragraphs 3.06a and 5.03f. Although the enhancement fish

hatchery has been recognized as a quality project by non-Federal entities, there are no proposals for complete non-Federal development of an enhancement fish hatchery at Wynoochee Dam.

b. Evaluation of Key Criteria. Under the no-action plan, a regional energy deficit of at least 13 million MWH would remain and the increasing demand for anadromous fish would continue. Fish runs in the Wynoochee River and other streams would be expected to remain at their present level or continue to decline. A comparison of the no-action plan with the tentatively selected plan is summarized in table 1; a detailed comparison is presented in table EIS-1 and in appendix G.

3.05 Alternative Plan 2: Combined Underground Hydropower and Enhancement Fish Hatchery (National Economic Development Plan/Environmental Quality Plan/Recommended Plan).

a. Description. The combined underground hydropower and enhancement fish hatchery plan is a 10.2-MW and 37,400-MWH per year hydropower addition to Wynoochee Dam and a 396,000-pound fish hatchery downstream of Wynoochee Dam. The plan includes a multilevel intake structure, penstock tunnel, penstocks, underground powerhouse, switchyard, 22-mile buried transmission line constructed by the Grays Harbor PUD, bypass pipe, draft tubes, tailrace tunnel, hydropower outlet/fish hatchery intake structure, hatchery backup water supply pipe, fish hatchery water supply pipeline, fish hatchery, and two satellite fish stations. The underground powerhouse with three turbines (1.8, 4.2, and 4.2 MW nameplate) would be located 200 feet downstream of the dam, 200 feet behind the right canyon wall. The enhancement fish hatchery, with raceways, rearing ponds, and adult holding ponds for salmon and steelhead, would be located on a low meander bench on the right bank 3,000 feet downstream of the dam (plate 2).

b. Evaluation of Key Criteria. The combined underground hydropower and enhancement fish hatchery plan would produce $1.20 in average annual power benefits for every $1 in average annual power costs and produce fish at $2.90 in average annual fish enhancement benefits for every $1 in average annual fish costs. The tentatively selected plan would result in a major increase in the anadromous fishery, while minimizing adverse environmental impacts. It would provide the State of Washington the opportunity to fulfill its mitigation responsibilities under the 28 July 1977 Memorandum of Agreement with the Corps and would not change the operation of the existing Wynoochee Lake Project. A comparison of the tentatively selected plan with the no-action plan is summarized in table 1; a detailed comparison is presented in table EIS-1 and in appendix G. Because the combined underground hydropower and enhancement fish hatchery plan would produce both energy and fish with a net beneficial contribution to the environment, this plan is considered to be both the NED plan, the plan that most contributes to the national economic development, and the EQ plan, the plan that emphasizes environmental quality contributions. This plan is also the tentatively selected plan because it meets the two planning objectives of this study. Section 4 is a detailed description of the tentatively selected plan.

TABLE 1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Needs	Base Condition (present condition)	Alternatives: No Action (most probable future without Federal action)	Alternatives: Tentatively Selected Plan
Power	Regional energy deficit of 10,310,000 MWH in 1981-1982.	Regional energy deficit forecast to range from 23,600,000 MWH in 1985-1986 to 13,960,000 MWH in 1991-1992; forecast includes anticipated conservation and renewable resource development in 1990-1991. No Federal hydropower development at Wynoochee Dam; non-Federal hydropower development at Wynoochee Dam is possible but not certain (approximately 10.2 MW nameplate; 37,400 MWH).	Regional energy deficit forecast same as under no action. Federal hydropower development at Wynoochee Dam In partnership with non-Federal entity (10.2 MW nameplate; 37,400 MWH)
Anadromous Fish	Remain at present level or continue to decline.	Fish habitat improvement measures and fishery management by state fisheries agencies. Some improvement of anadromous fish runs over base condition, but runs expected to continue to decline. No Federal enhancement fish hatchery development at Wynoochee Dam; there are no proposals for non-Federal enhancement fish hatchery development at Wynoochee Dam.	Federal enhancement fish hatchery at Wynoochee Dam. Major enhancement of anadromous fishery (118,500 adult spring chinook salmon and and steelhead). Provides State of Washington opportunity to develop previous mitigation responsibilities.

3.06 Plans of Others.

a. Public Utility District No. 1 of Grays Harbor County, Washington. The Grays Harbor Public Utility District (PUD) is interested in developing the hydropower potential of Wynoochee Dam. An appraisal report prepared for the PUD by their consultant, R. W. Beck and Associates, recommended development of a 10-MW surface powerhouse on the right bank, 900 feet downstream of the dam (hydropower design option 2c), which would produce 43,000 MWH of average annual energy. An underground powerhouse in the right bank 200 feet downstream of the dam was also considered (hydropower design option 1c). A Federal Energy Regulatory Commission (FERC) preliminary permit was granted to the PUD in April 1981 to study hydropwoer development at Wynoochee Dam. The Seattle District, Corps of Engineers, has cooperated with the PUD and their consultant in providing data and in coordinating study efforts to avoid unnecessary duplication. In response to the public's desire, the Corps and PUD formed a hydropower partnership on 5 October 1981. The PUD, as local sponsor of the hydropower facility, would market the power output of the proposed hydropower facility at Wynoochee Dam and pay 100 percent of the hydropower costs. Further information on the hydropower partnership is presented in paragraph 4.19c. The PUD has also investigated the 22-MW Oxbow site at Wynoochee R.M. 42.5.

b. City of Aberdeen, Washington. In November 1980, the city of Aberdeen filed a competing application for a FERC preliminary permit to develop Wynoochee hydropower. In March 1981, the application was withdrawn. In return for supporting the PUD application, the city will receive up to $875,000 from the PUD to compensate the city for its investment in Wynoochee Dam. The effect of the Corps/PUD hydropower partnership on the PUD/City of Aberdeen agreement is not known. The City has officially endorsed the fish hatchery.

c. Washington Departments of Fisheries and Game. The Washington Department of Game (WDG), under a memorandum of agreement, with Seattle District, is responsible for developing and operating hatchery facilities for mitigating the loss of 1,700 adult steelhead caused by construction of Wynoochee Lake Project. Funds in the amount of $696,000 for this purpose were provided to the State of Washington under a Memorandum of Agreement dated 28 July 1977. Problems arose which prevented expansion of the Aberdeen hatchery by WDG, and only interim measures to produce steelhead have been undertaken. To date, the WDG has implemented temporary rearing pens in Lake Aberdeen for rearing a portion of the steelhead necessary to mitigate for the existing dam. If the Wynoochee fish hatchery is authorized, a portion of the fish hatchery would be used by the State of Washington to fulfill its obligation under the Memorandum of Agreement. Studies by WDG, Washington Department of Fisheries (WDF), and the Corps of Engineers have shown the runs of anadromous fish at Wynoochee Dam have declined since construction of the dam. Accordingly, the state agencies have requested additional mitigation. For additional information on existing project fish mitigation, see paragraph 1.06.

d. U.S. Forest Service. The U.S. Forest Service (USFS) manages the timber resources in the Shelton District of the Olympic National Forest according to the Shelton Cooperative Sustained-Yield Unit (CSYU) agreement with Simpson Timber Company. The Wynoochee hydropower/fish hatchery plan area lies within the boundaries of the Shelton District. The Shelton CSYU agreement, initiated in 1946, commits designated national forests and Simpson Timber Company lands to an integrated management plan for a sustained production of timber over the 100-year term of the agreement. The management plan is updated every 10 years. Of the total 350,176 acres of land in the Shelton CSYU, 112,874 are national forest land and 237,302 acres are Simpson Timber Company land. The current timber resource management plan prepared by USFS under the agreement covers the period of 1977-1986. A new management plan for the Shelton District is currently being developed by the USFS. The ongoing management study divides the forest into physical and biological units and compares existing output of these units to the various alternative management strategies for increasing the output for a selected use (e.g., wildlife, timber production, etc.). The EIS for this new plan is scheduled for public review in December 1981. In addition to its timber management program, the USFS has an ongoing program of fish habitat improvement projects in the Shelton District.

SECTION 4. TENTATIVELY SELECTED PLAN

4.01 Plan Description. The tentatively selected plan would be located in the immediate vicinity of the Corps of Engineers' Wynoochee Lake project, 35 road miles north of the town of Montesano in Grays Harbor County, Washington. Wynoochee Dam is located at R.M. 51.8 on the Wynoochee River. The tentatively selected plan is a 10.2-MW nameplate and 37,400-MWH per year hydropower addition to Wynoochee Dam and a 396,000-pound fish hatchery downstream of Wynoochee Dam. The fish hatchery would contribute 129,000 adult salmon and steelhead commercial/ Indian and sport harvests annually. An underground powerhouse would be located 200 feet downstream of the dam, 200 feet behind the right canyon wall. The fish hatchery would be located on a low meander bench on the right bank 3,000 feet downstream of the dam between R.M. 50.6 and 51.2.

4.02 A multilevel intake structure would be located adjacent to the upstream face of Wynoochee Dam monolith 5. From the intake foundation, a vertical shaft would be excavated down to meet the horizontal penstock tunnel where an emergency gate would be provided. The penstock would continue directly beneath the grout curtain under monolith 5 to the underground powerhouse. A bypass would be provided around the powerhouse to supply water to the fish hatchery when the powerhouse was shut down. A surface switchyard would be provided near the powerhouse. The power would be marketed by the Grays Harbor PUD, who would construct a transmission line following the Donkey Creek Road 22 miles to the PUD's Promised Land substation. A tailrace tunnel would exit from the right canyon wall about 400 feet downstream from the dam into the hydropower outlet/fish hatchery intake structure. The hydropower outlet/fish hatchery intake structure would increase the tailwater above normal to provide head to meet fish hatchery water flow requirements. The tailrace tunnel would house two separate conduits so that only the unit having flow diverted to the hatchery would be subject to increased tailwater elevation. A pressure pipeline would be constructed from the hydropower outlet/fish hatchery intake structure to the enhancement fish hatchery on the right bank. The fish hatchery would utilize the 190/140 c.f.s. minimum flow from Wynoochee Dam and would consist of raceways, rearing ponds, adult holding ponds for anadromous spring chinook salmon and steelhead, and appurtenant structures. Two satellite fish stations would enhance anadromous fish runs in other northern Washington coastal rivers. Plates 2 and 3 present the general design layout. Selected design details are presented in appendix E.

4.03 Hydrology.

a. Climatic Conditions. The climate of the Wynoochee Basin is cool, with relatively dry summers and mild, wet, and cloudy winters. Precipitation is abundant throughout the basin but varies locally and seasonally. Annual precipitation at Wynoochee Dam has ranged from 119 to 180 inches, with a mean of 153 inches. November through March are

the wettest months and June through August are the driest months. Temperatures at Wynoochee Dam have ranged from 1° F to 102° F.

b. Drainage and Streamflow. The Wynoochee River originates on the southern slopes of the Olympic Mountains and flows generally south for 67 miles to the Chehalis River. The Wynoochee River Basin is elongated in a north-south direction, has a drainage area of 195 square miles, and comprises 10 percent of the drainage area of the Chehalis River Basin. Tributaries to the Wynoochee River are generally small. Flow in the Wynoochee River is highest during the winter season from October to March. During this period, the streamflow is characterized by frequent sharp rises, a result of concentrated 2- to 5-day rainstorms or series of storms. Streamflow generally decreases by March or April as the winter rains subside. Seasonal temperatures then rise, melting the winter accumulation of snow. This results in another high-water period, usually in late May or June. From July through September, streamflow is at its lowest.

4.04 Existing Wynoochee Lake Project Purposes and Operation. The purposes and operation of the Corps of Engineers' Wynoochee Lake project are discussed in paragraphs 1.04 and 1.05.

4.05 Existing Water Quality. The water quality of the Wynoochee River is classified as Class AA (extraordinary) by the State of Washington. The water quality of Wynoochee Lake and River in the plan area is good and very suitable for a fish hatchery water supply. Discharges from Wynoochee Dam are in compliance with the water quality standards.

4.06 Environmental Setting. The plan area lies within the boundaries of the Olympic National Forest. Most of the land in the area is owned and managed by the USFS for recreation, wildlife preservation, and timber production. Vegetation is that typical of a northwestern rain forest, with western hemlock the climax species and Douglas fir the subclimax species. Wildlife includes a diversity of mammalian species, including Roosevelt elk and Columbia black-tailed deer, and numerous bird species, including the bald eagle, which is federally listed as threatened in Washington State. Both resident and anadromous fish presently spawn upstream and downstream of the plan area. Additional details on the environmental conditions in the plan area are presented in section 3 of the environmental assessment.

4.07 Geotechnical Considerations.

a. Geologic Setting. The Wynoochee Lake project lies on the southern flank of the Olympic Mountains in a structurally controlled, glaciated, U-shaped valley, partly filled with glacial sediments. The valley is cut principally in basaltic lava flows from about 8 miles upstream to 10 miles downstream of the dam. Wynoochee Dam spans a narrow, 120-foot-deep rock gorge cut through the high point of a midvalley rock knob, which is largely mantled by glacial materials. Submarine,

pillow basalt comprises the foundation of the dam and consists of tilted lava flows that strike roughly west to northwest. The foundation basalt is closely jointed and finely crystalline with carbonate veinlets. Most joint surfaces are coated with unweathered dark chlorite. The rock is generally competent and impermeable, though closely jointed and fractured. The area is close to the seismically active Puget Trough which has produced historic earthquakes in excess of Richter magnitude 7.

b. Exploration and Analyses. The Corps' geotechnical feasibility investigations of the powerhouse sites consisted of one recent diamond drill borehole in the underground powerhouse site, borehole camera photography, refraction seismic lines, geologic mapping, and reanalysis of earlier borings. Converse, Ward, Davis, Dixon, Geotechnical Engineers, supervised an exploration program for R. W. Beck and Associates, design engineers for the Grays Harbor PUD. Five boreholes were drilled during their exploration program. Preconstruction investigations for Wynoochee Dam consisted of 45 borings of which four borings gave useful information on rock character in the vicinity of the underground powerhouse site. Geologic maps prepared before and during previous construction show information on rock contours and geologic structure relative to the site area. Overburden cover at the underground powerhouse site is generally less than 10 feet thick. Correlation of the rock structure exists between the canyon wall and diamond drill borings. The data show one significant joint cluster with the following altitude: N20-35E, 35-45NW. Controlled blasting procedures will be required during excavation in the closely jointed basalt to minimize damage to excavated chambers and slopes and to insure the continued integrity of the canyon and existing dam. Systematic rock reinforcement (bolts) is necessary to prevent progressive loosening of the jointed material. No major problems are anticipated with either seepage or cut slope stability on the project. An evaluation of the results of these investigations, coupled with the structural analysis of the rock mass characteristics, confirmed that the underground powerhouse location is geotechnically sound and the most favorable powerhouse location. Drilling logs and detailed discussion are in appendix F.

c. Material Sources and Waste Area. Concrete aggregate investigation consists of eight backhoe trenches on the right meander bench about 3,000 feet downstream from the dam. Composite disturbed samples of sandy gravel were taken from several trenches for petrographic examination. Materials vary from zones of moderately clean, sandy gravel to silty, gravelly sand, with lenses of silty sand and areas with cobbles and boulders. Adequate quantities of materials for the production of concrete aggregate for the hydropower facility appear available from this area, the proposed location for the fish hatchery. Preliminary investigations showed no apparent foundation problems would be expected for the fish hatchery. Approximately 20,000 cubic yards (c.y.) of rock from excavation can be disposed of in the concrete aggregate borrow excavation and/or used for site grading at the fish hatchery site. Rock borrow may be obtained from a nearby quarry source 1/2 mile west of the project.

4.08 Design Criteria.

a. Intake Structure. The intake structure was designed to avoid interference with operation of the existing project water conveyance facilities and to provide multilevel withdrawal capability to control water quality.

b. Powerhouse. The powerhouse was designed as a baseload, run-of-river facility to utilize available flows between the 190/140 c.f.s. minimum flow of the existing project up to a total hydraulic capacity of 1,200 c.f.s.

c. Fish Hatchery. The 190/140 c.f.s. water supply to the fish hatchery would have to be provided under all possible operational conditions. The hatchery details must be standard and conform to state specifications which incorporate recent state-of-the-art advances.

4.09 Structural Features and Hydraulic Design. Refer to plates 2 and 3 for the general design layout of the tentatively selected plan. Selected design details are presented in appendix E.

a. Intake Structure. The intake structure would be a 30-foot by 25-foot tower constructed on a rock bench at elevation 720 feet, adjacent to the upstream face of dam monolith 5. The Wynoochee Reservoir would be drawn down to just below elevation 720 feet during construction to permit construction in the dry. The tower would have four independently operated, vertical lift, selective withdrawal slidegates. The slidegates could be raised or lowered to provide optimum temperature control through withdrawal at any one level of warmer surface water, colder water at depth, or intermediate temperature water. The intake structure opening would be between elevations 723 feet and 800 feet. If the reservoir level drops below elevation 730 feet (a once in 33 years occurrence with full water supply development), the powerhouse would be shut down. The tower would permit passage of the total powerhouse hydraulic capacity of 1,200 c.f.s. with an average velocity of about 1.6 feet per second (f.p.s.) and a negligible hydraulic loss. The intake would be located in the upstream face of the tower resulting in intake velocities of about 4.5 f.p.s. and head loss of about 0.5 foot at a discharge of 1,200 c.f.s. Trashracks would be provided over the intake. Stoplogs would be used for dewatering the intake structure. A vertical shaft 22 feet in diameter would be excavated from the intake foundation down approximately 50 feet to a horizontal penstock tunnel at elevation 670 feet. A hydraulically operated slidegate would be located at the entrance to the powerhouse penstock to provide emergency closure and penstock maintenance capability. Design of the intake structure will be verified through hydraulic model studies during advanced engineering and design to insure that both acceptable hydraulic conditions and water temperature control objectives are met.

b. Penstock. The 300-foot-long, 11.5-foot-diameter penstock would consist of a steel lined tunnel through rock beneath the grout curtain under monolith 5. At maximum discharge, the penstock velocity would be about 13.5 f.p.s. About 50 feet upstream from the powerhouse, the penstock would trifurcate into two 8-foot-diameter and one 5-foot-diameter steel penstocks supplying the three individual units. A slow-acting butterfly valve upstream of each unit would provide emergency closure capability. The turbine wicket gates would regulate turbine flows to synchronous speed. Both the butterfly valve and wicket gate operating speeds would be regulated to protect the penstocks and penstock tunnel against dynamic effects of a rapid shutdown. Total head loss through the penstock was estimated to be approximately 3 feet.

c. Powerhouse. The powerhouse would be located underground in the right bank of the river about 200 feet downstream from Wynoochee Dam. The underground powerhouse would be 128 feet long, 40 feet wide, and 57 feet high. The edge of the powerhouse would be located 200 feet behind the canyon wall and the top of the powerhouse would be 100 feet below the surface. The underground powerhouse would use the rock to form the walls and ceiling and would be coated with 6 inches of shotcrete and secured with rock bolts. Total powerhouse hydraulic capacity would be 1,200 c.f.s., the flow equalled or exceeded 20 percent of the time in December, the month with the highest runoff at Wynoochee Dam. The powerhouse would have an installed nameplate capacity of 10.2 MW from three units of 1.8, 4.2, and 4.2 MW and would provide 40,000 MWH of average annual energy. The small unit would utilize the 190/140-c.f.s minimum flow from Wynoochee Dam. The small unit was designed for a discharge of 190 c.f.s. (best efficiency) at a rated net head of 133 feet based on a reservoir elevation of 780 feet. When the reservoir is at the flood control elevation of 764 feet, the small unit output would be 1.7 MW. The two large units were designed for a discharge of 500 c.f.s. each ("full-gate" efficiency) at a rated net head of 117 feet based on a reservoir elevation of 764 feet. The continuous overload capacity of the three units would be about 11.3 MW (1.7, 4.8, and 4.8 MW). The turbines would be the horizontal shaft Francis-type and the generators would be synchronous type. The turbines would discharge approximately 1,200 c.f.s. at flood control pool elevation 764 feet and provide considerable flexibility for operation between 730- and 800-foot reservoir levels. The hydropower operation would be subordinate to all other purposes, and the facility would operate as a run-of-river plant producing baseload energy from the reservoir releases.

A vertical access shaft 22 by 27 feet would be excavated over the maintenance area in the powerhouse adjacent to the small turbine. The vertical access would contain a vent, power trunk, stairway, personnel elevator, and equipment shaft. Large equipment would be loaded into the powerhouse through a hatch in the access inclosure roof by use of a mobile crane. Once in the powerhouse the equipment would be handled by a 20-ton bridge crane. A valved, steel bypass pipe around the small unit from its steel penstock to its draft tube would provide flexibility

to insure continuous passage of the minimum flow to the fish hatchery during periods of total powerhouse shutdown for either maintenance or emergency conditions. The bypass pipe would contain a 2-foot-diameter upstream section for hydraulic energy dissipation and a 3.5-foot-diamater downstream section with a spherical valve for flow control. The bypass valve would operate automatically to provide a fail-safe water supply to the fish hatchery under emergency conditions.

d. Switchyard and Transmission Line. The 100-foot by 100-foot switchyard would be located at the surface, west of the powerhouse access inclosure and across the road out of sight. Under the partnership with the Corps of Engineers (see paragraph 4.29c), the Grays Harbor County PUD would be responsible for the transmission line. Various transmission line alternatives and routes for the Wynoochee hydropower/fish hatchery plan were considered. Routes considered were southwesterly from Wynoochee Dam 22 miles along Donkey Creek Road to the PUD's Promised Land substation and southerly from the dam 35 miles down the Wynoochee Valley Road to Montesano. Alternative lines considered were a buried transmission line and an aerial transmission line. The detailed studies required to definitively determine the economics and operational advantages or disadvantages of an aerial transmission line as opposed to a buried transmission line will be conducted during further studies. The PUD, which would be responsible for construction, operation, and maintenance of the transmission line, will be responsible for the final decision as to type of line and location. That decision will be made in cooperation with the Corps of Engineers, BPA, and the USFS. For the purpose of describing the impacts in the feasibility report and EIS, a buried transmission line within the existing power right-of-way along Donkey Creek Road was chosen by the Corps of Engineers based on preliminary studies. This alternative is considered the least environmentally damaging plan by the Corps of Engineers and is consistent with the USFS policy requiring burial of transmission lines on national forest land. However, the Grays Harbor PUD has stated a preference for an aerial transmission line based upon its preliminary studies. If a decision is made to construct an aerial transmission line, it would be designed to minimize environmental impacts, including placement of the line to minimize timber production losses and esthetic impacts to the extent possible. Such a decision would require that a supplemental environmental document to discuss the impacts of the aerial transmission line be prepared and distributed for public and agency review and comment. Extensive coordination with the USFS would be necessary to minimize significant conflicts with current land use along the transmission corridor.

e. Draft Tubes and Tailrace Tunnel. Flow from the powerhouse would exit to the Wynoochee River about 400 feet downstream of the dam through concrete lined draft tubes and a tailrace tunnel about 20 feet in overall diameter and 350 feet in length. The tunnel was sized to limit velocities to about 6 f.p.s. at 1,200 c.f.s. and would result in about 1 foot of head loss. This head loss, combined with losses in the intake structure and penstock, would cause approximately 5 feet of total head loss to the units. Downstream from the powerhouse, the draft tubes would be vented to the atmosphere to prevent damage to the units in the

event of a rapid unit shutdown. Emergency gates for each draft tube would be incorporated with the air vent shafts. The draft tubes from each unit would merge into a tailrace tunnel housing two conduits. The upper tailrace conduit was sized to convey 1,000 c.f.s. It would accommodate flow from the two large units which would exit directly to the river. The lower tailrace conduit was sized to convey 500 c.f.s. During periods when the small unit is out of service, water could be diverted from the draft tube of the large unit adjacent to the small unit into the lower conduit. The lower conduit, which would be the hatchery diversion conduit, would accommodate flow from either the small unit or one large unit. Flow in this smaller tailrace conduit would be diverted to the fish hatchery intake structure where sufficient head would be maintained to insure flow to the hatchery. Final design of the draft tubes and tailrace tunnel system will be verified by model studies during advanced engineering and design.

f. Hydropower Outlet/Fish Hatchery Intake Structure. The lower tailrace conduit would exit the tailrace tunnel via a structure at the canyon wall designed to provide approximately 4 feet hydraulic head which is sufficient to supply the required 190/140 c.f.s. to the fish hatchery. The hatchery intake structure was also designed to dissipate residual energy when the turbines were bypassed. The hydropower outlet would consist of a retaining wall at the mouth of the tailrace tunnel where slots would be provided for stoplogs for dewatering the tailrace conduits. The lower tailrace conduit would be connected to the fish hatchery intake structure which would be 20 feet wide, 50 feet long and 25 feet deep. The design water surface in the fish hatchery intake structure would be approximately 641 feet. A flap gate would release surplus water from the fish hatchery intake structure into the river to maintain the 641-foot water surface. Because the tailrace conduits would be separated, only that unit having flow diverted to the fish hatchery would be subject to a tailwater elevation higher than normal. Riverflows with a frequency in excess of 100 years are expected to overtop the intake structure. A 140-foot-long, 6-foot-diameter gated steel pipe would extend from the existing overflow weir located just downstream from Wynoochee Dam to the fish hatchery intake structure. This pipe would be provided to insure the uninterrupted flow of good quality water for the 190/140 c.f.s. fish hatchery water supply during periods when the entire powerhouse complex (intake structure, penstock, powerhouse, draft tubes, and tailrace) was shut down for maintenance, which would be a scheduled event. This water would come from the six existing low flow passages through Wynoochee Dam. The water behind the weir would be flushed out before diverting water to the fish hatchery. Providing water to the fish hatchery via this alternate pipeline could only occur when the two existing sluices through the dam were not in use because their discharges could possibly cause nitrogen supersaturation problems in the fish hatchery water supply. Final design of the hydropower outlet/fish hatchery intake structure will be verified by model studies during advanced engineering and design studies.

g. Fish Hatchery Water Supply Pipeline. The fish hatchery gravity flow water supply would be via a buried 5.0-foot-diameter steel pipeline approximately 2,400 feet long from the fish hatchery intake structure to the fish hatchery head tank. The gravity flow water supply pipeline was selected in lieu of pumping directly from the river at the hatchery site because annual pumping costs would more than offset the initial construction cost of the fish hatchery intake structure and water supply pipeline. The pipeline would operate under pressure at 190 c.f.s. design flow with the water surface elevation of 641 feet in the fish hatchery intake structure. From the intake structure the pipeline would be concrete encased and buried in the gorge as it crossed the river. The pipeline would exit the river and would be placed in an excavated trench on the left bank, with thrust blocks placed at changes in alinement or grade. The pipeline would then cross under the river to the fish hatchery site on the right bank. At this river crossing the pipeline would be deeply buried and encased in concrete to avoid problems if scouring occurred. On the right bank, the pipeline would cut through a 35-foot-high ridge composed of common materials before emptying into the fish hatchery headwater tank. The right bank topography from the intake structure to the fish hatchery makes it impractical for a pipeline route. A second, small pipeline to the fish hatchery is discussed below.

h. Fish Hatchery. The fish hatchery would be constructed on a 50-acre site about 3,000 feet downstream of the dam and was designed to operate with the minimum 190/140 c.f.s. release from Wynoochee Dam. The hatchery head tank would operate at water surface elevation 631 feet, 16 feet above the estimated 100-year frequency Wynoochee River water surface elevation at the hatchery outflow. Water would be distributed to the various hatchery components via a once-through water system from the head tank. For the spring chinook salmon, twenty 10-foot by 100-foot fingerling raceways, three 1/2-acre rearing ponds, and two 1/2-acre adult holding ponds would be provided. For steelhead, twenty 10-foot by 100-foot raceways, four 2-acre rearing ponds, and two 10-foot by 100-foot adult holding ponds would be provided. A common hatchery building would house both salmon and steelhead egg incubation facilities, offices, living quarters for temporary personnel, and visitor exhibits. A separate building would be provided for food storage, garage, and maintenence shop. Six residences for permanent personnel would also be provided. The existing adult fish collection facility located at R.M. 49.6 would be utilized for the collection of adult fish that would be held at the hatchery until ready for spawning. A 100-foot by 100-foot sedimentation pond would be provided for holding effluent from raceways while they are being cleaned. The existing access road to the fish hatchery site would be upgraded. The road would have a gravel surface down to the first residence and a paved surface in front of the residences and around the hatchery area.

An insulated 12-inch pipeline would lead directly from the reservoir to the adult salmon holding pond. This would provide about 7 c.f.s. of cold water (approximately 48° F) for optimum holding conditions for

spring chinook salmon prior to spawning. This pipeline would start deep in the cold water levels of the reservoir and parallel the penstock powerhouse bypass, draft tube, tailrace tunnel, and fish hatchery water supply pipeline to the fish hatchery. This pressure line could also provide fire protection, wash-down lines, and irrigation for the houses and hatchery ground. An oxygenation system for the water would be provided at the holding pond since water at low levels in the reservoir can often be low in oxygen content. The potential for a small (approximately 50 kW) generating unit at the end of this pipeline will be investigated during advanced engineering and design studies.

An existing high ridge on the upstream side of the fish hatchery site prevents flooding of the site up to the estimated 100-year frequency flow. The ridge is subjected to erosive action by the river and its failure would result in flooding of the hatchery by relatively high exceedence frequency floods. A 2-foot-thick riprap blanket designed to withstand velocities of 10 to 13 f.p.s. would be provided on the right bank of the river along 700 feet of the ridge to preserve its integrity for floods up to the 100-year frequency flow.

i. Existing Fish Collection Facility. Under the proposed plan, the upstream anadromous fish run would be stopped at the existing fish collection facility located 2.2 miles downstream of Wynoochee Dam. The existing facility would no longer be used as part of the existing Wynoochee Lake Project to collect fish for truck hauling above the reservoir. Instead, the fish collection facility and two fish haul trucks would be transferred from the existing project to the fish hatchery. Fish would be collected at the fish collection facility, hauled to the fish hatchery, and placed in the holding ponds. Since the existing fish collection facility and truck hauling system are a fish mitigation feature of the existing project, a portion of the fish hatchery would substitute for the existing project mitigation by producing an equivalent number of fish. For this feasbility study, all cost savings to the existing project and associated cost increases to the fish hatchery from the transfer of the facility from the existing project to the fish hatchery were considered to be equal to all cost increases to the existing project and associated cost sharing of the fish hatchery from the substitution production in the fish hatchery as part of the existing project. The loss of the upstream fish run would therefore be a cost to the proposed hydropower/fish hatchery project (see paragraph 4.13). A detailed examination of the transfer and substitution savings and costs will be conducted during advanced engineering and design studies. The need for any modification of the existing fish collection facility will also be examined during advanced engineering and design.

j. Satellite Fish Stations. Federal and state fish agenices and other fisheries experts have recognized that the Wynoochee Hatchery would be a regional hatchery not only enhancing production in the Wynoochee River but also providing the opportunity for improving production on nearby northern Washington coastal rivers, such as the Hoh, Queets,

Humptulips, and Quinault Rivers, through an outplanting program involving a simple release of juvenile salmonid fish into these rivers and/or construction of satellite fish stations. To allow for the development of this opportunity, two satellite fish stations have been included as a feature of the tentatively selected plan. The specific locations of these stations and the details of their management will be developed in advanced engineering and design by the resource agencies in close coordination with the Indian tribes. The satellite stations would primarily be designed to provide a method of utilizing anadromous fish stocks indigenous to each particular river system.

Each station would include an adult attraction, collection, and holding system and an acclimation pond for rearing and imprinting juvenile salmonids. A fish collection system would collect fish from the river or tributary and trap them in a holding facility. Subsequently, the fish would be transported in fish haul trucks to the Wynoochee fish hatchery for continued holding and for spawning. Depending upon the species, approximately 2 months to 2 weeks prior to normal relese, the progeny from these fish would be transported from the hatchery back to the satellite station and placed in an acclimation pond where the fish would be reared until ready for their seward migration, at which time they would be released into the stream. The time spent in the acclimation pond should result in the fish having a keener homing instinct to that stream when they return as adults. Additionally, use of the satellite fish stations would provide the flexibility for a greater overall production from the fish hatchery facilities.

4.10 Relocations. No permanent relocations would be necessary to implement the tentatively selected plan. Alternative parking at the existing Wynoochee Lake project visitor center would have to be utilized during construction because the powerhouse construction would temporarily involve the parking lot. The existing access road to the fish hatchery site would be upgraded.

4.11 Real Estate. Approximately 5 acres would be involved in the hydropower portion of the tentatively selected plan. Most of these lands are already under Corps of Engineers' jurisdiction, with a small area under USFS jurisdiction. Approximately 60 acres would be needed for the fish hatchery portion of the tentatively selected plan (site, water supply pipeline right-of-way, and access road). Most of these lands are under Corps of Engineers' and USFS jurisdiction, with a small area under private ownership. All lands associated with the tentatively selected plan were determined to cost approximately $2,000 per acre. The buried power transmission line from the switchyard to the Promised Land substation would be the responsibility of the Grays Harbor PUD and would involve less than 50 acres along 22 miles of existing right-of-way. Most of these lands are under USFS jurisdiction or in private ownership, primarily Simpson Timber Company and ITT Rayonier, with a small area under Corps of Engineers' jurisdiction. Property transfers of USFS lands to the Corps of Engineers and the Federal fish agency in lieu of

land purchase will be pursued during advanced engineering and design studies. Easements to use USFS and private roads will also be required. The USFS and Simpson Timber Company have expressed their willingness to cooperate with the Corps of Engineers in all real estate t ansactions.

4.12 Environmental Features. The major environmental feature of the tentatively selected plan is the fish hatchery, which would utilize up to 190 c.f.s., the existing minimum flow release from the dam; produce 180,000 pounds of spring chinook salmon smolts and 216,000 pounds of steelhead smolts (see appendix C), and enhance the anadromous fish runs in the Chehalis River Basin and other northern Washington coastal rivers, Grays Harbor area, and in the northern Pacific Ocean. The annual contribution to the anadromous fish harvest (commercial, Indian, and sport) is conservatively estimated at 79,000 adult chinook salmon and 50,000 adult steelhead (see table 2 and appendix C). Total fish enhancement would be 188,450 fish. Final design, species selection, and operation of the hatchery and a management plan will be determined in advanced engineering and design as a coordinated effort among the Corps of Engineers, and Federal and state fish agencies. Other environmental features of the tentatively selected plan include the multilevel intake structure, the bypass pipe in the powerhouse, the 12-inch pressure pipeline leading from the reservoir to the salmon holding pond, the pollution abatement/settlement pond, landscape plantings and native grass seeding, and a postconstruction monitoring program. These environmental features were designed to insure the successful operation of the hatchery facility, minimize project impacts on the environment, and monitor the effectiveness of the fish hatchery in its role in the management of the total regional fishery.

4.13 Mitigation. Part of the hatchery production would be utilized to mitigate for termination of the use of anadromous fish spawning habitat upstream of the Wynoochee reservoir due to implementation of the tentatively selected plan. The estimated number of fish that could be accommodated by that habitat is 1,500 coho salmon adults and 570 steelhead adults (see table 2 and appendix C). Another portion of the hatchery production would be used for mitigation of previous steelhead spawning habitat losses associated with the existing Wynoochee Lake project. The estimated number of fish that could have been accommodated by that habitat is 1,700 steelhead adults. This latter mitigation is the responsibility of the State of Washington under the 28 July 1977 Memorandum of Agreement with the Corps of Engineers (see table 2 and appendix C). Reference paragraph 1.06 for additional information on existing project fish mitigation. The two mitigation portions of the hatchery would total approximately 5.5 percent and 2.6 percent of the total annual fish hatchery production, respectively, based on adult salmon and steelhead harvest from the fish hatchery (see table 2). The remaining production (91.9 percent), which is not attributable to mitigation, is considered the enhancement portion of the fish hatchery. The species of fish in the Wynoochee River requiring mitigation for the construction of the Wynoochee hydropower/fish hatchery plan are coho salmon, steelhead trout,

TABLE 2
ADULT SALMON AND STEELHEAD HARVEST
FROM WYNOOCHEE FISH HATCHERY

	Salmon	Steelhead	Total
Total Fish Production			
Commercial/Indian	66,000	25,000	91,000
Ocean	(47,000)		
Terminal	(19,000)		
Sport	13,000	25,000	38,000
Ocean	(6,000)		
Terminal	(7,000)		
Total	79,000	50,000	129,000 (100.0%)
Project Caused Fish Losses (Project Mitigation)			
Commercial	5,000	570	5,570
Sport	1,000	570	1,570
Total	6,000	1,140	7,140 (5.5%)
Previous State of Washington's Mitigation Responsibility			
Commercial		1,700	1,700
Sport		1,700	1,700
Total		3,400	3,400 (2.6%)
Enhancement Fish Production (Total Fish Production - Project Mitigation - Previous State of Washington's Mitigation Responsibility)			
Commercial	61,000	22,730	83,730
Sport	12,000	22,730	34,730
Total	73,000	45,460	118,460 (91.9%)

and searun cutthroat trout. The conceptual Wynoochee fish hatchery plan includes the production of spring chinook using one-half of the available water supply and the production of steelhead trout using the other one-half. Coho salmon, for purposes of developing this conceptual plan, are being mitigated by spring chinook, a species with a conservative benefit-to-cost ratio because of more costly propagation methods that must be utilized for spring chinook salmon. Steelhead trout is preferred over cutthroat trout by most sportsmen and Indian fishermen because of its larger size at maturity. Since hatchery costs are virtually the same for both species, the WDG generally substitutes steelhead for searun cutthroat production in mitigation facilities, as is being done for the conceptual Wynoochee hatchery plan. Final species selection for the hatchery would be determined in advanced engineering and design when the Federal and state fish agencies will consider the specific species/stocks of anadromous trout to be raised and will consider including coho salmon and other salmon species/stocks to best integrate the hatchery with natural production and the various salmonid fisheries.

4.14 Cultural Resources. Implementation of the tentatively selected plan would have no known impacts on prehistoric or historic cultural resources. Cultural resources reconnaissances were conducted at the existing Wynoochee Lake project in 1966 and in the plan area in June 1980. Neither reconnaissance found evidence of prehistoric or historic cultural resource sites. A letter dated 20 June 1980 from the Deputy State Historic Preservation Officer (appendix B) indicated that no archeological and historic resources are listed within the plan area in the National or State Registers of Historic Places or the State Inventory of Historic Places.

4.15 Recreation Facilities. No expansion of existing Wynoochee project recreation facilities or development of new recreation facilities is included in the tentatively selected plan. One or more fishermen access sites could be provided downstream of the hatchery. The final plans and location of these sites will be determined during advanced engineering and design studies in coordination with the State of Washington, U.S. Fish and Wildlife Service, and U.S. Forest Service. However, the hatchery building would house some visitor exhibits in addition to salmon and steelhead egg incubation facilities, offices, and living quarters for temporary personnel. The major recreational benefit of the tentatively selected plan would be the sport fishery enhancement in the Chehalis River Basin, Grays Harbor area, and northern Pacific Ocean that would result from operation of the Wynoochee fish hatchery.

4.16 Project Costs. Total investment cost for the tentatively selected plan would be $42.4 million (October 1981 price level). Table 3 presents a summary of the project costs by major feature. Details of the cost estimate for the tentatively selected plan and cost estimate summaries for the single-purpose alternatives are presented in appendix E.

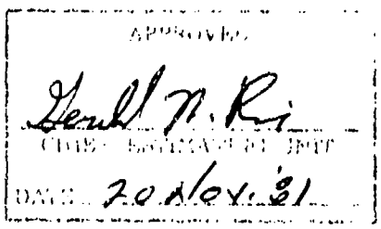
TABLE 3

COST ESTIMATE SUMMARY

TENTATIVELY SELECTED PLAN

(UNDERGROUND HYDROPOWER PLUS FISH HATCHERY)

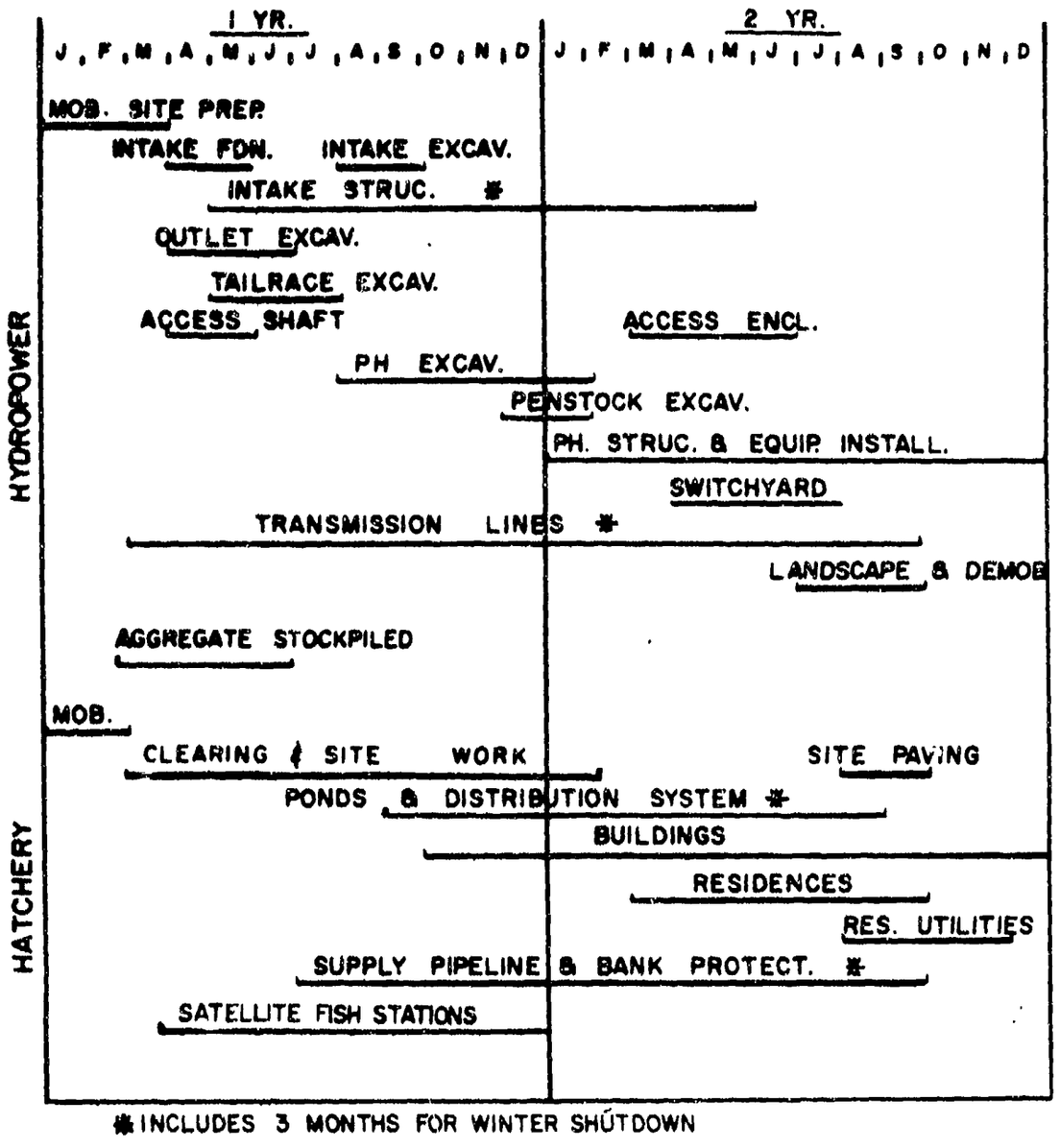
Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$210
04	DAM		
.4	Power Intake Works	$4,550	5,270
06	FISH AND WILDLIFE FACILITIES		16,960
	Fish Hatchery	11,980	
07	POWERPLANT		13,430
.1	Powerhouse	5,320	
.2	Turbines and Generators	4,350	
.3	Accessory Electrical Equipment	960	
.4	Miscellaneous Powerplant Equipment	220	
.5	Tailrace	2,340	
.6	Switchyard	240	
19	BUILDINGS, GROUNDS, AND UTILITIES		280
20	PERMANENT OPERATING EQUIPMENT		950
	Subtotal		$37,100
30	ENGINEERING AND DESIGN		2,900
	Engineering and Design (7-1/2 Percent)	2,780	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 Percent)		2,400
	TOTAL (October 1981 Price Level)		$42,400



4.17 Construction. Assuming congressional authorization of the recommended plan and appropriation of advanced engineering and design funds by 1984 with subsequent construction funding, project construction could be initiated in FY 1986. Construction of the hydropower, fish hatchery, and satellite fish stations portions of the tentatively selected plan would be concurrent and take approximately 2 years to complete. The construction schedule is presented in figure 4. Cofferdams and drainage wells would be required at two locations: one would be at the hydropower outlet/fish hatchery intake structure and the other where the pipeline crosses the river near the hatchery site. Aggregate for concrete would come from a borrow pit at the hatchery site. Material removed from other construction sites would be used to level the fish hatchery site. To avoid conflict with hatchery construction, the aggregate would be stockpiled ahead of time.

4.18 Drawdown of the reservoir while constructing the multilevel intake structure would be necessary. By 1 March of the first year of construction, the reservoir would have to be down to elevation 720 feet and maintained at that level for 2 months while the intake foundation is constructed and the first section of the precast structure is anchored in place. As the water is allowed to rise after 30 April to refill the reservoir, the intake structure would form a cofferdam for excavation of the penstock tunnel. There is a 10 percent frequency of occurrence of the reservoir level exceeding elevation 720 feet and getting the construction area wet during the 1 March to 30 April drawdown period. This frequency incorporates the desirability to provide 245 c.f.s. at R.M. 8.1 for Aberdeen water supply diversion (125 c.f.s.) and fish flows below R.M. 8.1 (120 c.f.s.). The frequency of not maintaining the 245 c.f.s. at R.M. 8.1 would be 5.8 percent. An earlier drawdown period would increase the chance of getting the construction area wet to above 10 percent and a later spring drawdown period would increase the chance of not providing the 245 c.f.s. at R.M. 8.1. Reservoir storage is needed for low flow augmentation during the summer months, and the frequency of using the reservoir for flood regulation during the fall and winter months would be greater than 20 percent.

4.19 Operation and Maintenance. The powerhouse was designed to operate over a wide range of flows and reservoir levels. If the reservoir dropped below elevation 730 feet (a once in 33-year occurrence with full water supply development), the powerhouse would be shut down. Reservoir releases would be made by the Corps of Engineers to meet the congressionally authorized purposes of the existing Wynoochee Lake project and the water quality and quantity needs of the proposed fish hatchery. The hydropower operation would be subordinate to all other purposes and the facility would operate as a run-of-river plant producing baseload energy from the reservoir releases. In general, energy production would be low during the period of water supply conservation operation (April to August) when reservoir releases are low; energy production would be high during the period of flood control operation (November to February) when reservoir releases are high.



Tentatively Selected Plan Construction Schedule

FIGURE 4

4.20 Four selective withdrawal bulkheads in the intake structure would control the temperature of the water to the river and the fish hatchery. The elevation of the withdrawal would be a function of temperature gradient in the reservoir and the temperature needed for fish production. Generating units would automatically shut down either individually or totally by butterfly valves in the penstocks depending upon the extent of the emergency. In such case, water supply to the hatchery would be maintained by a powerhouse bypass, which would also be automatically operated. Gates in the draft tube tunnels would make it possible to divert water from either the small unit or one of the large units to the hatchery via the lower tailrace conduit, fish hatchery intake structure, and fish hatchery water supply pipeline. Stoplogs would be used to dewater the multilevel intake structure. If water were completely shut off in the penstock, water could be supplied to the hatchery by opening the existing selective withdrawal system in the dam and diverting water from behind the existing overflow weir through a pipe to the fish hatchery intake structure. This activity would be scheduled to coincide with the periods in which the sluices would not be operated so as to avoid nitrogen supersaturation problems in the fish hatchery water supply.

4.21 The hydropower facility would be operated and maintained by Corps of Engineers personnel but paid for by the Grays Harbor PUD, who would market the power. The facility would not have to be staffed on a 24-hour basis but would be provided with automatic shutdown features and an alarm system that would sound in the Wynoochee project office and residence area. Existing project staffing would be augmented with not over three additional spaces, as one or more additional existing spaces would be eliminated with transfer of the fish collection facility to the fish hatchery. The additional personnel spaces for the proposed hydropower facility plant would include two powerhouse mechanics and one electrician. In addition, the existing Wynoochee Lake project staff has been recently restructured to include a project engineer who could assume the powerhouse supervisory functions. Additional restructuring and training within the existing staff would provide necessary staffing for minor maintenance. Major maintenance would be accomplished using staff on assignment from existing power projects within the Seattle District. The proposed hydropower facility would also receive necessary support from other elements of the Seattle District, as the existing Wynoochee Lake project does now. A maintenance area would be provided in the powerhouse adjacent to the access shaft, and an elevator in the access shaft would handle small parts and equipment. Large objects would be handled by mobile crane and lowered or raised through a hatch in the roof of the access inclosure. A bridge crane would handle material within the powerhouse. Some permanent operating equipment for the hydropower facility would be purchased; existing equipment at the Wynoochee Lake project office could also be used. The fish hatchery and satellite fish stations would be operated and maintained by fish agency personnel for salmon and steelhead. Detailed operation and maintenance procedures and staffing requirements will be developed during advanced engineering and design studies.

4.22 A 25-year monitoring program for the tentatively selected plan would include post-construction water quality monitoring of the hatchery effluent; an evaluation of the effects of enrichment from the hatchery effluent on the biota of the Wynoochee River and of any consequent increases in salmonid and resident fish natural production downstream of the hatchery outlet; an evaluation of fishery contribution rates and harvest management strategies of Wynoochee hatchery-released fish for the purpose of maximizing harvest with minimal impact on wild stocks; and monitoring hatchery operation to insure maximum efficiency and to minimize the potential adverse effects of disease and competition or predation on native fish runs due to hatchery-released fish. The program would be funded by the Federal fish agency. Information from the monitoring program would provide continual input to fisheries management of the Chehalis River Basin and Grays Harbor area as well as provide important data on salmonid production for application in other watersheds. The details of the monitoring program for the Wynoochee hatchery would be formulated in coordination with state and Federal fisheries agencies, Indian tribes, and interested public during advanced engineering and design studies.

4.23 Generalized annual operation and maintenance costs for the hydropower portion of the recommend plan were taken from the Corps of Engineers' Hydropower Cost Estimating Manual (May 1979) and updated to October 1981. A 10.2-MW nameplate plant was determined to have an annual operation and maintenance cost of $212,000. Annual operation and maintenance costs for the fish hatchery portion of the tentatively selected plan were based on the cost per pound of fish production (excluding pumping costs) using figures provided by WDG and WDG (appendix C), updated to October 1981. Based on $1.68 per pound for fish production, the 396,000-pound fish hatchery would have an annual operation and maintenance cost of $665,000. The satellite fish sations would have an annual operation and maintenance cost of $70,000, based on 14 man-months of effort per year. The monitoring program was estimated to have an average annual cost of $141,000 for manpower, equipment, equipment operation, maintenance of onsite monitoring and field facilities, and travel.

4.24 Replacement. All mechanical and electrical items in the recommended plan would be replaced during the 100-year economic life of the project. These replaceable items are noted in the detailed cost estimate (appendix E). Hydropower items would be replaced at year 30 and year 60; fish hatchery items would be replaced at year 25 and year 75 and the fish hatchery would be completely rebuilt at year 50. The annual replacement cost was determined by discounting the future replacement costs at the current (Fiscal Year (FY) 1982) Federal interest rate of 7-5/8 percent back to project initiation, and then amortizing the values at 7-5/8 percent over the 100-year economic life of the project. The average annual replacement cost of the tentatively selected plan would be $237,000.

4.25 Economics of Recommended Plan.

a. Power Benefits. Benefits for the hydropower portion of the tentatively selected plan were determined using a simplified hydropower benefit analysis developed in response to the Water Resources Council's procedures on small-scale hydropower (Procedures for Evaluation of National Economic Development Benefits and Costs in Water Resources Planning, 14 December 1979, Federal Register, Section 713.501(b), page 72938). The analysis includes development of the project's dependable capacity and fuel cost escalation of energy values. Details of the power benefit analysis are presented in appendix C. Average annual power benefits were computed using a dependable capacity of 7.2 MW, an average annual energy output of 37,400 MWH, and 1 October 1981 power values prepared by the San Francisco Regional Office of the FERC. The average annual power benefits
are as follows:

Capacity:	7.2 MW dependable capacity x $127.66 kW/yr =	$919,000
Energy:	37,400 MWH average annual energy x 40.1 mills/KWh =	$1,500,000
Total:		$2,419,000

b. Fish Benefits. The enhancement fish benefits were determined as the difference in economic values for the commercial/Indian fishery harvest and sport fishery recreation-day use between the with-project and without-project conditions in accordance with Water Resources Council's procedures. Based on data furnished by WDG and WDF, 180,000 pounds of spring chinook salmon smolts and 216,000 pounds of steelhead smolts raised in the fish hatchery would contribute 79,000 adult salmon and 50,000 adult steelhead to the annual anadromous fish harvest as the with-project condition. Both species have commercial/Indian and sport fisheries, with the salmon being caught in both the ocean and the freshwater fishing areas. The without-project condition consists of a spawning run of 1,500 adult coho salmon and 570 adult steelhead at the existing fish collection facility, plus 1,700 adult steelhead to fulfill the State of Washington's obligation for mitigation of previous steelhead habitat losses associated with the existing Wynoochee Lake Project under the 28 July 1977 Memorandum of Agreement with the Corps of Engineers. Based on catch-to-escapement ratios of 4:1 for salmon and 2:1 for steelhead, 6,000 adult salmon and 4,540 adult steelhead would be available for harvest under the without-project condition and 1,500 salmon and 2,270 steelhead would escape back to the Wynoochee River. Using harvest and recreation-day use values provided by WDG and WDF for the with-project and without-project condition, the following annual enhancement fish benefits were determined:

	Commercial/Indian	Sport	Total
Salmon	$2,032,000	$1,699,000	$3,731,000
Steelhead	594,000	2,955,000	3,549,000
Total	$2,626,000	$4,654,000	$7,280,000

Details of the fish benefit analysis are presented in appendix C.

c. Cost Allocation. Project costs were allocated between the two project purposes, power and fish, using the separable costs-remaining benefits cost allocation procedure. Costs associated with the State of Washington's previous mitigation responsibility were excluded from the cost allocation. A summary of the cost allocation is presented in table 4; details of the cost allocation are presented in appendix C. The allocated power and fish costs (in $1,000) are as follows:

	Power	Fish	Previous State of Washington Mitigation Responsibility
Investment Cost	$21,580	$20,250	570
Annual Investment	1,646	1,545	
Annual Operation, Maintenance, and Replacement	341	957	27
Total Annual Costs	$1,987	$2,502	

d. Economic Justification. The allocated annual benefits and costs of the tentatively selected plan are as follows:

	Power	Fish	Total
Average Annual Benefits	$2,419,000	$7,280,000	$9,699,000
Average Annual Costs	$1,987,000	$2,502,000	$4,489,000

Comparing benefits to costs results in the following net benefits over costs and benefit-to-cost ratios:

	Power	Fish	Total
Net Annual Benefits	$432,000	$4,778,000	$5,210,000
Benefit-to-Cost Ratio	1.2	2.9	2.2

Since average annual benefits would exceed average annual costs for each project purpose as well as the total project, the proposed Wynoochee Hydropower/Fish Hatchery project would be economically justified. The average annual cost of energy produced by the hydropower facility would be 53 mills per kWh ($1,987,000 average annual cost divided by 37,400 MWH average annual energy output).

TABLE 4
ECONOMICS OF TENTATIVELY SELECTED PLAN
(October 1981 Prices in $1,000)

	Hydropower	Enhancement Fish Hatchery	Sub-Total	State of Washington Previous Mitigation Responsibility	Total
Project Costs:					
Estimated Federal Cost					
Corps of Engineers	0	18,780	18,780	0	18,780
Federal Fish Agency	0	0	0	0	0
Estimated Non-Federal Cost					
Grays Harbor PUD	21,580	0	21,580	0	21,580
State of Washington[1/]	0	1,470	1,470	570	2,040
Total Project Cost	21,580	20,250	41,830	570	42,400
Interest During Construction[2/]	0	0	0	0	0
Total Investment Cost	21,580	20,250	41,830	570	42,400
Average Annual Costs:					
Interest and Amortization	1,646	1,545	3,191	43	3,234
Operation and Maintenance					
Estimated Federal Cost					
Corps of Engineers	0	0	0	0	0
Federal Fish Agency	0	576	576	0	576
Estimated Non-Federal Cost					
Grays Harbor PUD	253	0	253	0	253
State of Washington	0	236	236	23	259
Replacement					
Estimated Federal Cost					
Corps of Engineers	0	0	0	0	0
Federal Fish Agency	0	103	103	0	103
Estimated Non-Federal Cost					
Grays Harbor PUD	88	0	88	0	88
State of Washington	0	42	42	4	46
Total Average Annual Cost	1,987	2,502	4,489	70	4,559
Economic Justification:					
Average Annual Benefits	2,419	7,280	9,699		
Net Benefits	432	4,778	5,210		
Benefit-to-Cost Ratios	1.2	2.9	2.2		

1/Under former President Carter's proposed cost sharing policy, the State of Washington would be required to provide an additional $2,158,000 for hydropower construction and $1,041,000 for fish hatchery construction.
2/No interest during construction as construction period is 2 years.

4.26 Effects of Recommended Plan. The principal beneficial environmental impact of the tentatively selected plan would be the enhancement of the anadromous sport, Indian, and commercial fisheries in the Grays Harbor area, the Chehalis River Basin, and other northern Washington coastal rivers, and in the northern Pacific Ocean. The prinicpal adverse environmental impacts would be the permanent loss of approximately 50 acres of wildlife habitat due to construction of the hatchery and associated facilities, the elimination of anadromous fish runs in the Wynoochee River upstream of Wynoochee Dam, and reduced instream flows in the 6,800-foot reach of the Wynoochee River between the existing weir and the hatchery outlet during extreme low flow periods (April-June) due to operation of the hydropower/fish hatchery plan. Any unavoidable environmental losses associated with the plan are considered an acceptable tradeoff in view of the enhancement of the anadromous fisheries. To the extent possible, final hatchery plans would be designed to minimize the loss of vegetation. Hatchery grounds would be seeded with native grass species and the area landscaped with native plant species, providing some limited wildlife value. The specific impacts of the two satellite fish stations would be assessed during advanced engineering and design when the exact locations of the stations are determined. Mitigation for the loss of the upstream anadromous fish runs has been incorporated as part of the hatchery production. Impacts associated with low instream flow conditions in the reach between the weir and the hatchery outlet are potential reduced water quality, esthetics, and aquatic habitat with resulting effects on fish and wildlife which utilize the area. An analysis of instream flow conditions for the hydropower/fish hatchery plan has indicated that the impacts would not be significant. The Washington Departments of Ecology, Game, and Fisheries have agreed that instream flows for the reach would be determined in advanced engineering and design when hatchery details, including specific species, number of fish, specific water requirements, the scope and design of the satellite fish stations, and management flexibility are determined. The hydropower facility would have negligible environmental impacts. The switchyard would be landscaped to reduce esthetic impacts. The 22-mile buried transmission line would be placed within the existing power right-of-way adjacent to Donkey Creek Road from Wynoochee Dam to the Promised Land Substation and would have minor environmental impacts. The effects of the tentatively selected plan on particular resources recognized by Federal policies are presented in table 5. A complete discussion of the environmental impacts associated with the tentatively selected plan is presented in the EIS.

4.27 The principal beneficial socioeconomic impacts of the tentatively selected plan would be the contribution of 10.2 MW of nameplate capacity and 37,400 MWH per year of energy to the Pacific Northwest power needs and approximately 79,000 adult spring chinook salmon and 50,000 adult steelhead to the annual anadromous sport, Indian, and commercial fish harvest in the Chehalis River Basin and other northern Washington coastal rivers, Grays Harbor area, and northern Pacific Ocean. Total fish enhancement would be 118,450 fish. Other beneficial impacts include increased utilization of the existing fish collection facility associated with Wynoochee Dam and short-term construction and long-term project operation employment opportunities. The principal adverse socioeconomic

TABLE 5

EFFECTS OF THE TENTATIVELY SELECTED PLAN ON
RESOURCES OF PRINCIPAL NATIONAL RECOGNIZATION

Types of Resources	Principal Sources of National Recognition	Measurement of Effects	
Air quality	Clean Air Act, as amended (42 U.S.C. 1857h-7, et seq.)	No effect	
Areas of particular concern within the coastal zone	Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451, et seq.)	No effect	
Endangered and threatened species critical habitat	Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.)	No effect	
Fish and wildlife habitat	Fish and Wildlife Coordination Act (16 U.S.C 661, et. seq.)	(1) 50 acres of wildlife habitat lost (primarily rain forest vegetation).	(4) Use by anadromous fish of 4 miles of Wynoochee River above the existing dam foregone.
		(2) Resident fish habitat reduced in 6,800 feet of river during extreme low flows.	(5) Anadromous fish runs in Chehalis River Basin, other Washington coastal streams, Grays Harbor area, and in northern Pacific Ocean enhanced. Contribution of approximately 79,000 adult spring chinook and 50,000 adult steelhead to the sport, commercial, and Indian fishery.
		(3) Aquatic productivity of Wynoochee River below the hatchery potentially increased.	
Flood plains	Executive Order 11988, Flood Plain Management	No effect	
Historic and cultural properties	National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.)	Not present in the plan area.	
Prime and unique farmlands	Council on Environmental Quality Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act	Not present in the plan area.	
Water quality	Clean Water Act of 1977 (33 U.S.C. 1251, et seq.)	(1) Potential reduction in water quality in reach of Wynoochee River between existing dam and hatchery outlet during certain periods of the year.	(3) Hatchery discharge may result in increased aquatic productivity and an alteration in aquatic benthic community in the area near the effluent outlet. A possible beneficial impact.
		(2) Short term impacts to water quality due to project construction.	
Wetlands	Executive Order 11990, Protection of Wetlands	2 acres of sedge marsh lost.	
Wild and scenic rivers	Wild and Scenic Rivers Act, as amended (16 U.S.C. 1271, et seq.)	No effect	

impacts of the tentatively selected plan are the loss of existing dispersed recreation use in the hatchery site area and potential problems associated with the provision of public services for the construction workers and project operation staff and families (for example, schools, fire and police protection, and transportation). A complete discussion of the socioeconomic impacts associated with the tentatively selected plan is presented in the EIS.

4.28 Implementation Alternatives. Three alternative ways to implement the tentatively selected plan were considered: (1) Federal hydropower and Federal hatchery development, (2) Federal/non-Federal hydropower and Federal fish hatchery development, and (3) non-Federal hydropower and Federal fish hatchery development. The primary differences between the implementation alternatives were whether BPA or the Grays Harbor PUD would market the power output and whether there would be Federal multiple-purpose hydropower/fish hatchery development of Federal single-purpose fish hatchery development. Multiple-purpose Federal hydropower/fish hatchery development with non-Federal involvement in the hydropower (implementation alternative 2) was desired by the local public because the power output of the project could be marketed in the local area by the Grays Harbor PUD without jeopardizing Federal fish hatchery development. In addition, greater emphasis is being placed on non-Federal involvement in Federal water resources development by President Reagan's administration and a creative Federal/non-Federal hydropower cost-sharing partnership was encouraged by William R. Gianelli, Assistant Secretary of the Army for Civil Works, during his 8 July 1981 visit to the Seattle District and Wynoochee Dam. Details on non-Federal involvement in the hydropower development are presented in paragraphs 4.29c and 6.02.

4.29 Non-Federal Cost Sharing. Non-Federal cost sharing would be in four parts:

(1) The State of Washington's responsibility for a part of the fish hatchery to fulfill its mitigation obligation under the 28 July 1977 Memorandum of Agreement with the Corps.

(2) State of Washington's participation in the fish hatchery as local sponsor responsible for a share of the sport fishery cost under existing cost-sharing laws.

(3) Grays Harbor PUD's participation in the hydropower facility as local sponsor for 100 percent of the hydropower costs.

(4) State of Washington's participation in the combined hydropower/fish hatchery project under former President Carter's proposed cost-sharing policy.

A summary of non-Federal and Federal cost sharing is presented in table 6.

TABLE 6

NON-FEDERAL AND FEDERAL COST SHARING

	Federal		Non-Federal		
	Corps	Fed. Fish	WA	PUD	Total
Construction Cost					
Corps/PUD Power				21,580	21,580
Fish Enhancement	18,780		1,470		
WA Mitigation Responsibility			570		20,820
Total Under Existing Law	18,780	---	2,040	21,580	42,400
Carter's Proposed Policy					
Power (10%)			+2,158	-2,158	
Fish (5%)	-1,041		+1,041		
Subtotal	-1,041		+3,199	-2,158	0
Total with Carter's Policy	17,739	---	5,239	19,422	42,400
Annual OM&R Cost					
Corps/PUD Power				341	341
Fish Enhancement	---	679	278		
WA Mitigation Responsibility			27		984
Total under Existing Law	---	679	305	341	1,325

a. State of Washington's Previous Mitigation Responsibility. As discussed in paragraph 4.13, the State of Washington has a previous mitigation responsibility for steelhead spawning habitat losses associated with the existing Wynochee Lake Project under the 28 July 1977 Memorandum of Agreement between the WDG and the Corps of Engineers. The portion of the fish production from the fish hatchery necessary to meet the State's obligation is 3,400 fish or 2.6 percent of the 129,000 fish produced from the fish hatchery based on a 2:1 catch to escapement ratio. Two and 6/10ths percent of the fish hatchery costs result in a first (construction) cost of $570,000 and an annual operation, maintenance, and replacement (OM&R) cost of $27,000. The State would probably pay these costs with funds provided to the WDG by the Corps under the 28 July 1977 Memorandum of Agreement.

b. Non-Federal Cost-Sharing Requirements Under Existing Laws. The Federal Water Project Recreation Act (Public Law 89-72, 9 July 1965) and Section 177 of the Water Resources Development Act of 1974 (Public Law 93-251, 7 March 1974) require non-Federal cost sharing for the costs attributable to the recreation (sport) fish enhancement portion of the fish hatchery, 25 percent of the separable first costs and 100 percent of the separable annual OM&R costs. The Federal Government pays 75 percent of the separable sport fishery first costs, 100 percent of the joint sport fishery first and annual cost, and 100 percent of the separable and joint commercial/Indian fishery first and annual costs. These cost-sharing percentages exclude the 2.6 percent previous State of Washington mitigation responsibility. There is no non-Federal cost-sharing requirement for hydropower under existing law.

Since there is no difference between the cost for raising commercial fish and the cost of raising sport fish in the fish hatchery, a use of facilities suballocation of fish hatchery cost between the commercial and sport fisheries can be used. This suballocation distributes cost based on the percentage of commercial and sport fish, instead of the established practice of suballocation based on the percentage of commercial and sport benefits. The distribution of enhancement fish harvest (total fish hatchery production minus project mitigation production minus previous Washington mitigation responsibility production) based on the number of commercial and sport fish that would be harvested is as follows:

	Salmon	Steelhead	Total
Commercial	61,000 fish (51.5%)	22,730 fish (19.2%)	83,730 fish (70.7%)
Sport Fishery	12,000 fish (10.1%)	22,730 fish (19.2%)	34,730 fish (29.3%)
TOTAL	73,000 fish (61.6%)	45,460 fish (38.4%)	118,460 fish (100.0%)

The fish harvest numbers were provided by the WDF and WDG based on actual catch figures (see appendix C).

Seventy and 7/10ths percent of enhancement fish harvest, hence 70.7 percent of the fish enhancement cost, is attributable to the commercial fishery; 29.3 percent of the enhancement fish harvest, hence 29.3 percent of the fish enhancement cost, is attributable to the sport fishery. The commercial fish enhancement benefits and the sport fish enhancement benefits would exceed the average annual commercial and sport costs, respectively, based on the above cost percentages. The sport cost percentage was applied to the separable fish cost as derived in the separable costs-remaining benefits cost allocation (see appendix C) to determine the separable first and annual sport fish enhancement costs to be cost shared. The non-Federal cost-sharing requirements for fish enhancement under the existing laws are as follows:

	Separable Sport Costs	Non-Federal Cost-Sharing Percentage	Non-Federal Share for Fish Enhancement
Construction	$5,870,000 (29.3% of $20,060,000)	25%	$1,470,000
Annual OM&R Cost	$278,000 (29.3% of $948,000)	100%	$278,000

c. Proposed Non-Federal Hydropower Cost Sharing. Under section 5 of the 1944 Flood Control Act (Public Law 534, 22 December 1944), power produced at Federal water resources projects must be marketed by a Federal power marketing agency. BPA, the marketing agency for Federal power in the Pacific Northwest, was requested to determine the marketability of power to be generated by the tentatively selected plan (10.2 MW, 37,400 MWH per year, 53 mills per KWh). The BPA responded that, under critical water conditions, the region is faced with both energy and peak deficits every year in the coming decade and that resource additions which can serve to offset a segment of these forecasted deficits will, therefore, be marketable. BPA also stated that the power output of the project is needed and is generated by a renewable resource, its cost can be repaid from revenues of the Federal system within 50 years of completion, and the project merits approval conditional upon favorable cost-effective analysis being upheld in subsequent feasibility reports.

However, the public in the Grays Harbor, Washington, area stated at 18 May 1981 Public Information Meeting their desire for the power to be marketed in the local area, instead of regionally by BPA. Accordingly, a hydropower partnership has been developed between the Corps and the Grays Harbor PUD No. 1. Such a partnership will require an exemption by

Congress from the power marketing provisions of Section 5 of the 1944 Flood Control Act. Under the partnership, the Corps would design and construct the hydropower portion of the tentatively selected plan, and the PUD would pay 100 percent of the allocated hydropower costs and market the power output. The hydropower construction cost is $21,580,000 and the annual hydropower OM&R cost is $341,000, which would be paid 100 percent by the Grays Harbor PUD.

On 17 August 1981, the Corps requested a letter of intent from the PUD (appendix C). On 5 October 1981 the PUD stated (appendix C) its willingness to act as local sponsor for all the costs allocated to the hydropower facility, subject to a satisfactory agreement being reached on the concerns of the PUD. Particular areas of concern by both the Corps and the PUD are ownership, control of operation and maintenance, transmission line, and financial arrangements. Details of the partnership will be worked out in the next few months and will be presented in the final feasibility report.

d. Former President Carter's Proposed Cost-Sharing Policy. Former President Carter, in his June 1978 water policy message to Congress, proposed several changes in cost sharing for water resources projects to allow states to participate more actively in project implementation decisions. This proposed policy, if implemented by Congress, would require a cash contribution from benefiting states of 5 percent of the first costs of construction assigned to nonvendible project purposes and 10 percent of the first costs of construction assigned to vendible project purposes. Contributing states would share with the Federal Government the net revenue from vendible outputs in proportion to their shares of project costs. This contribution would be in addition to non-Federal cost sharing required under existing law.

The Wynoochee hydropower/fish hatchery project would produce fish enhancement outputs which are considered nonvendible and hydropower outputs which are considered vendible. Of the total project first costs, $20,820,000 was allocated to fish (includes State of Washington's previous mitigation responsibility) and $21,580,000 was allocated to hydropower (see table 3). Application of former President Carter's proposed cost-sharing policy to this project would require a contribution from the State of Washington of an estimated $3,199,000 in cash (5 percent of $20,820,000 for nonvendible project purposes plus 10 percent of $21,580,000 for nonvendible project purposes). In return, the State of Washington would receive 10 percent of the net revenues from the hydropower outputs.

e. State of Washington Participation. In the 23 April 1980 letter from the governor of the State of Washington requesting the Corps to study the feasiblity of a fish hatchery in conjunction with hydropower development of Wynoochee Dam, the governor stated that it is the intent of the State to act as local sponsor of the hatchery (appendix C). Accordingly, the Corps formally requested a letter on 22 October 1981

from the State of Washington advising of the State of Washington's intent to act as a local sponsor of the fish hatchery portion of the tentatively selected plan. The Corps' letter (appendix C) stated items of contingency and items of responsibility. The tentatively selected plan includes and is contingent upon the following:

(1) The Corps of Engineers, as owner and operator of the Wynoochee Lake Project and planned owner and operator of the proposed appurtenant hydropower facility, providing a water supply of adequate volume (up to 190 c.f.s.) and temperature to the fish hatchery intake structure within the operational constraints of the Wynoochee Lake Project.

(2) A Federal fish agency accepting ownership of the fish hatchery from the Corps of Engineers and assuming responsibility for the management of the fish hatchery and the Federal government's share of the annual operation, maintenance, and replacement costs contributable to the fish hatchery.

(3) The State of Washington fulfilling its obligation under the signed Memorandum of Agreement dated 28 July 1977 (Construction of Fish Hatchery Facilities for Prevention of Natural Spawning Areas for Anadromous Trout Occasioned by Construction of Wynoochee Lake Project) by providing funds for accomplishing said construction and subsequent operation, maintenance, and replacement as part of the proposed fish hatchery. The Memorandum of Agreement dated 28 July 1977 may need to be amended or supplemented, as legally required, to reflect this change in fulfilling the state obligation.

The responsiblities of the State of Washington as local sponsor of the fish hatchery are as follows:

(1) Provide a cash contribution equal to the allocated first costs attributable to the fish hatchery for constructing a part of the fish hatchery to fulfill the State's obligation under the signed Memorandum of Agreement dated 28 July 1977 (as amended or supplemented as legally required), a contribution presently estimated at $570,000.

(2) Provide a cash or in-kind annual contribution for the life of the fish hatchery equal to the annual operation, maintenance, and replacement costs attributable to the fish hatchery for operating, maintaining, and replacing a part of the fish hatchery to fulfill the State's obligation under the signed Memorandum of Agreement dated 28 July 1977 (as amended or supplemented as legally required), an annual contribution presently estimated at $27,000.

(3) Provide a cash contribution equal to 25 percent of the separable first cost attributable to the recreation (sport) enhancement portion of the fish hatchery, a contribution presently estimated at $1,470,000.

(4) Provide a cash or in-kind annual contribution for the life of the fish hatchery equal to 100 percent of the separable operation, maintenance, and replacement costs attributable to the recreation (sport) enhancement portion of the fish hatchery, an annual contribution presently estimated at $278,000.

(5) In accordance with former President Carter's proposed cost-sharing policy, provide a cash contribution equal to 10 percent of the allocated construction cost attributable to hydropower plus 5 percent of the allocated construction cost attritutable to the fish hatchery, a contribution presently estimated at $3,199,000.

(6) Enter into a Memorandum of Understanding with the sponsoring Federal fish agency regarding fish hatchery operation, maintenance, and replacement.

(7) Obtain any necessary permits.

(8) Hold and save the United States free from damages due to the construction and subsequent operation and maintenance of the fish hatchery, except where such damages are due to the fault or negligence of the United States or its contractors.

The governor of the State of Washington replied to the Corps letter on 20 November 1981 (appendix C). He stated that the combined project is important to the State of Washington and expressed the State of Washington's intent to act as local sponsor of the fish hatchery for items of responsibility 1 through 4 and 6 through 8 listed above, subject to funding by the State Legislature. However, former President Carter's proposed cost-sharing policy requirement (item of responsibility 5) causes the State some concern. If the policy is implemented by Congress, State sponsorship could become highly uncertain.

4.30 Federal Sponsorship of Fish Hatchery. The U.S. Army Corps of Engineers would construct the combined hydropower/fish hatchery project and would operate the hydropower facility in partnership with the Grays Harbor PUD, who would market the power. A Federal fish agency, either NMFS or FWS, would own and manage the fish hatchery. Accordingly, the Corps formally requested a letter from both NMFS and FWS (see appendix C) advising of their intent to act as Federal sponsor of the fish hatchery portion of the tentatively selected plan. The responsibilities of the Federal sponsor of the fish hatchery are:

a. Become owner and operator of the proposed Wynoochee fish hatchery.

b. Provide, for the life of the fish hatchery, 100 percent of the separable annual operation, maintenance, and replacement costs attributable to the commercial enhancement portion of the fish hatchery and 100 percent joint annual operation, maintenance, and replacement costs attributable to the fish hatchery, a total annual amount presently estimated at $679,000.

c. Enter into a Memorandum of Understanding with the State of Washington regarding fish hatchery operation, maintenance, and replacement.

On 18 June 1981 (appendix C), the Northwest Regional Director of the NMFS heartily endorsed the proposed fish hatchery, on the condition that any NMFS financial and administrative responsibility for project operation and maintenance be subject to specific authority and appropriation from Congress. The FWS has not replied to the Corps' request.

4.31 Implementation of Recommended Plan. The tentatively selected plan is a combined hydropower/fish hatchery facility, and development of the plan is supported by the public and agencies. Implementation of the recommended plan as a combined, integrated hydropower/fish hatchery facility would result in construction efficiencies and cost savings and meet project mitigation needs within the plan. Implementation of the recommended plan as two projects, with non-Federal development of the hydropower facility and Federal development of the fish hatchery, could cause construction inefficiencies and additional costs to both the hydropower and fish hatchery facilities. In addition, non-Federal hydropower development, if constructed in the absence of a Federal fish hatchery or in advance of Federal fish hatchery development, would need to provide mitigation facilities for impacts on anadromous fish runs. Therefore, integrated implementation of the combined hydropower/fish hatchery plan as a joint Federal/non-Federal project with its creative non-Federal cost-sharing arrangements is recommended (see section 6). Timely implementation of the tentatively selected plan will provide additional power to the Grays Harbor, Washington, area and increased anadromous fish harvests at an early date.

SECTION 5. STUDY COORDINATION AND PUBLIC INVOLVEMENT

5.01 Study Coordination and Public Involvement Framework. Agency coordination and public involvement were conducted throughout the study to inform the agencies and public about the study, gather data, request and receive comments, and seek sponsorship. Formal coordination letters were sent to the state and Federal agencies having jurisdiction by law or special expertise. A notice of intent to prepare a draft EIS was published in the Federal Register on 30 June 1980. The public involvement and scoping process involved meetings held with Federal, state, and local agencies; various organizations and groups; Indian tribes; and individuals (see appendix B for details). In addition, the Corps was represented on the Grays Harbor Fishery Enhancement Task Force and presented a statement at the Grays Harbor PUD public meeting in Aberdeen on 6 March 1980. The study announcement was distributed in July 1980; study brochures were distributed in April and November 1981, a public information meeting was held in Aberdeen on 18 May 1981, and a final public meeting will be held in Aberdeen on 15 December 1981.

5.02 Summary of Views. Based on the study coordination and public involvement to date, especially through agency coordination and at the public information meeting, there is strong public support for development of both the hydropower facility and the enhancement fish hatchery, with no expressed opposition to either. In addition, the public desires the power output to be marketed in the local area through a partnership with the Grays Harbor PUD.

5.03 Coordination with Key Agencies.

a. State of Washington. The WDF and WDG were involved in the initiation of the fish hatchery portion of the study, design of the fish hatchery, resolution of issues relating to anadromous fish runs and fishery management, fish hatchery benefit computations, project mitigation, and cost sharing of the fish hatchery portion of the tentatively selected plan. In addition, WDG was involved in the fulfillment of the State of Washington's responsibility for mitigation of previous steelhead spawning habitat losses associated with the existing Wynoochee Lake project under the 28 July 1977 Memorandum of Agreement with the Corps of Engineers. Washington Department of Ecology (WDE), the state agency responsible for coordinating water resource projects, was primarily involved in the discussions of instream flows between the existing overflow weir and the outlet of the fish hatchery during periods of extreme low flow. WDE has agreed that the determination of instream flows would be made in advanced engineering and design when the details of the fish hatchery are formulated. The analysis of instream flows associated with the implementation of the Wynoochee hydropower/fish hatchery plan is presented in Section 2 of appendix H. Washington State Energy Office was instrumental in finding an acceptable common ground between the Corps and the Grays Harbor PUD regarding the enhancement fish hatchery and

potential future hydropower development at the Oxbow site. The State of Washington has expressed its intent to act as local sponsor of the fish hatchery (see paragraph 4.29e).

b. National Marine Fisheries Service (NMFS). NMFS has been requested to express its intent to become the owner and manager of the Wynoochee fish hatchery. In a letter dated 18 June 1981, the Northwest Regional Office of NMFS expressed its indorsement of the Wynoochee fish hatchery and has been coordinating with NMFS higher authority in Washington D.C., regarding Federal sponsorship of the hatchery (refer to NMFS letter in appendix B). Other coordination has been conducted with NMFS to respond to their concerns expressed in a comment letter on the FWCA report prepared for the tentatively selected plan. As a result of discussions among the Corps, WDG, WDF, and NMFS, to resolve these concerns, NMFS plans to prepare a revised comment letter to the FWCA report. The letter will be included in the final Wynoochee feasibility report/EIS.

c. U.S. Fish and Wildlife Service (FWS). The FWS has been requested to express its intent to become the owner and manager of the Wynoochee fish hatchery; to date no response has been received. The major impacts of the Wynoochee hydropower/fish hatchery plan that were identified in the final Fish and Wildife Coordination Act (FWCA) report wer the impcts of hatchery produced fish on the remaining anadromous fish runs, the loss of anadromous fish upstream of the existing Wynoochee Dam, and the loss of wildlife habitat at the fish hatchery site. The FWS recognizes that with well-planned hatchery management strategies, the impacts of hatchery-released fish on the native fish runs can be minimized and that hatchery development at Wynoochee Dam offers a potential solution to unmet mitigation needs associated with the existing Wynoochee Lake project as well as much needed fishery enhancement for the drainage. Since preparation of the final FWCA report in July 1981, the principal changes in the project plan that could effect the FWCA report recommendations have been the expansion of the Wynoochee fish hatchery into a regional facility with provision for two satellite fish stations on northern Washington coastal rivers and a change of the transmission line alternative from an aerial line along Donkey Creek Road to a buried line. Additional coordination has been accomplished with the FWS regarding these changes. In response, the FWS plans to prepare an addendum to the final FWCA report for inclusion in the final Wynoochee feasibility report/EIS. Generally, the FWS is in agreement with the regional concept for the Wynoochee fish hatchery given the accomplishment of baseline disease studies during development of the final hatchery design and management plan and the appropriate studies during the hatchery monitoring program to insure minimal disease problems due to interregional transfers of hatchery-released fish. Based on preliminary discussions, the FWS is also in agreement with a buried transmission line alternative.

The final FWCA report is presented in appendix D. The FWS provided recommendations for the hydropower portion alone, the fish hatchery portion alone, and the combined hydropower/fish hatchery plan. Detailed Corps responses are provided below to the recommendations for the tentatively selected plan. The Corps basically concurs with the recommendations provided for hydropower alone. The recommendations provided for the hatchery portion alone are essentially the same as the combined plan with one exception. Under the hatchery alone, the FWS recommends maintenance of the anadromous fish runs above Wynoochee Dam making use of the existing downstream fish passage facility. Because the existing facility has not been successful, the Corps believes that the most practical means of accomplishing mitigation for the existing Wynoochee Lake project as well as making fullest use of the enhancement opportunity at Wynoochee Dam is to incorporate mitigation for loss of the upstream runs into the fish hatchery production.

FWS Recommendation 1. Fish production at the proposed facility should emphasize protection of native Grays Harbor stocks, and should be compatible with long-range managment goals of WDF and WDG.

Corps Responses 1. Concur. It is the intent of the hatchery portion of the proposal to emphasize protection of native Grays Harbor stocks and to be compatible with long-range managment goals of the WDF and WDG. In a letter dated 6 March 1981, the Governor of the State of Washington provided the Corps a letter of intent to become the local sponsor of the hatchery. The Corps views this letter as indication that enhancement of the anadromous fish runs in the Chehalis River Basin is a high state priority and that the Wynoochee hatchery offers the state an opportunity to achieve a portion of a recognized need.

FWS Recommendation 2. Funds for a comprehensive, long-term examination of anadromous fish restoration needs and potentials in the Chehalis drainage be included in your authorization request in order to maximize fish production benefits from the proposed hatchery over the project life.

Corps Response 2. Concur. Examination of anadromous fish restoration needs and potentials in the Chehalis River drainage and in other northern Washington coastal rivers in order to maximize fish production benefits from the hatchery is included in the authorization request as part of the monitoring program over the life of the hatchery. The current estimated cost of the monitoring program is an annual amount of $180,000 for 25 years. Other aspects of this program would include postconstruction water quality monitoring of the hatchery effluent, assessment of the effects of the effluent on the biota of the Wynoochee River and of any consequent increased in salmonid and resident fish natural production downstream of the hatchery outlet, and evaluation of fishery contribution rates and hatchery managment strategies of Wynoochee hatchery released fish for the purpose of maximizing harvest with the least impacts on wild stocks, including minimization of competition, predation, and disease. Information from the monitoring program would provide

continial input to fisheries managment of the Chehalis River Basin and Grays Harbor area as well as provide important data on salmonid production for application in other watersheds. The details of the monitoring program for the Wynoochee hatchery would be formulated in coordination with state and Federal fisheries agencies, Indian tribes, and interested public during advanced engineering and design studies.

FWS Recommendation 3. Maintenance flows between Wynoochee Dam and the hatchery outfall be included as a project feature.

Corps Response 3. Flow in the Wynoochee River in the 6,800-foot reach between the existing overflow weir and the hatchery outlet could become extremely low should the full complement of water be supplied to the hatchery during a time of minimum flows (190/140 c.f.s.) from the reservoir. The impacts of a low flow in that reach would primarily be reduced visual esthetics and reduced aquatic habitat with consequent impacts on fish and wildlife. There is an estimated 20 c.f.s. inflow into this reach from groundwater springs and seepage; therefore, it is not expected that the reach would go dry during extreme low flow periods (April-June). Coordination regarding the instream flow issue has been ongoing, with the WDE, WDG, and WDF and all parties have agreed that the determination of instream flows would be made in advanced engineering and design when the details of the hatchery and its management are formulated. A concrete weir in the river just upstream of the powerhouse tailrace would assure water in the 250-foot reach of the river between the main dam and the weir. Downstream of the hatchery outlet, the River discharge would be the same as that without a hatchery and powerhouse project.

FWS Recommendation 4. As presently proposed, water flow and quality be maintained at preproject levels to avoid adverse impact to downstream fishery values.

Corps Response 4. No adverse impacts to downstream fishery values are expected to result from the tentatively selected plan. As discussed in the response to 4 above, downstream of the hatchery outlet the river discharge would be the same as that without a hatchery and powerhouse project. Water supply to the hatchery and the operation of the powerhouse would not result in a change to the existing operational mode of Wynoochee Dam, and river discharge frequency in the Wynoochee River would not change from existing conditions. The powerhouse would operate as baseload and would not be operated for peaking. Accordingly, no flow-related adverse impacts to downstream fishery values would occur.

Short-term increases in suspended sediment and turbidity would occur in the Wynoochee River and reservoir during instream construction activities associated with the tentatively selected plan. Although increases in turbidity may result in exceeding the Washington State water quality standard, the effect on water quality is not considered significant due to the short term, localized nature of the impact. The construction contractor(s) would be required to utilize methods which would minimize

turbidity. Cofferdams would be used for instream construction of the hatchery supply pipeline crossings, the hatchery outlet channel, and the powerhouse outlet structure to minimize impacts to water quality.

The powerhouse intake would be a selective withdrawal structure to maintain preproject water quality from reservoir releases. The hatchery effluent could affect water quality by the addition of nutrients to the Wynoochee River with resulting increases in aquatic productivity and an alteration in the aquatic benthic community in the area near the effluent outlet. The impact may be beneficial to downstream fishery value because aquatic productivity in the Wynoochee River is rather low naturally.

As a project feature of the hatchery, a pollution abatement pond would be constructed for the treatment of the water from the raceways and rearing ponds during cleaning. Additionally, when chemotheraputics are used in large doses, the water would be routed to the pollution abatement pond. The hatchery would be operated to meet the effluent limitations established by the Environmental Protection Agency for suspended and settleable solids, and the limitations for other parameters (biological oxygen demand, nitrates, ammonia, fecal coliforms, etc). as determined by the WDE in coorperation with the WDG and WDF. Water quality monitoring would be accomplished at the outlet, and if allowable limits were approached, provision would be made for treatment of the effluent water prior to release to the river. The carcasses of returning adult salmon and steelhead used for spawning or surplus to spawning needs would be sold commercially under WDG and WDF policies or disposed of in an approved landfill. These procedures, as required by Federal law, would eliminate water quality impacts generated from large quantities of carcasses decomposing in the Wynoochee River. All domestic wastes from the hatchery and residences would be treated by a septic tank system.

FWS Recommendation 5. As presently proposed, natural vegetation destruction be minimized at the project site and revegetation accomplished when feasible.

Corps Response 5. Concur. To the extent possible, the Wynoochee hydropower/hatchery plan would be designed to reduce the loss of vegetation. Hatchery grounds would be seeded with native grass species and the area would be landscaped with native plant species, providing limited wildife value. The water supply pipeline to the hatchery would be buried minimizing its permanent impact on vegetation. Following construction, the pipeline corridor would be seeded with native grass species to aid in the natural reestablishment of vegetation. The satellite fish stations would be sited to minimize vegetation losses and landscaped as necessary. Construction of the underground powerhouse, the surface switchyard, and the buried transmission line would have minor impacts on vegetation. Further, the construction contractor would be required to replace vegetation losses in temporary construction easements, and in temporary stockpiling and staging areas.

d. U.S. Forest Service (USFS). The USFS is the owner of most of the fish hatchery site and has jurisdiction over most of the transmission line corridor through either ownership, easements, or use agreements with private landowners. The primary concerns of the USFS regarding the tentatively selected plan are the loss of dispersed recreation and wildlife habitat at the fish hatchery site and esthetic and timber resource impacts in the transmission line corridor. These impacts and any measures to mitigate or minimize them are discussed in the EIS. Specific analyses of elk habitat and dispersed recreation losses associated with the hydropower/fish hatchery plan are presented in sections 4 and 5 of appendix H, respectively. A buried transmission line alternative has been tentatively selected for implementation (see paragraph 4.09d). This alternative is the least environmentally damaging and is consistent with the USFS policy requiring burial of lines on national forest land. The analysis of transmission line alternatives is ongoing. Coordination has been conducted with the USFS and will continue throughout advanced engineering and design and project construction to insure that conflicts with the various uses of the plan area are minimized to the extent possible and to develop a memorandum of understanding regarding implementation of the plan on a national forest land.

e. Environmental Protection Agency. EPA's primary concern is related to the impact of project construction and operation on water quality and any potential project related impacts on the use of Wynoochee Lake and the upstream reach of the Wynoochee River as a viable habitat for resident fishery. These impacts and measures to minimize water quality effects are discussed in the EIS. An evaluation of baseline Wynoochee River and Lake Water quality data is presented in section 1 of appendix H. The overall resident fishery in Wynoochee Lake and River system upstream of the reservoir is expected to improve by implementation of the tentatively selected plan due to the elimination of competition between resident fish and juvenile salmon and steelhead.

f. Bonneville Power Administration. BPA was requested to determine the marketability of power to be generated by the tentatively selected plan. BPA stated that the power is marketable and the project merits approval (see paragraph 4.24c). In addition, BPA encouraged implementation of the enhancement fish hatchery. BPA was also requested to conduct an analysis of transmission line alternatives and is working with the Grays Harbor PUD, the USFS, and the Corps to develop an economically feasible alternative which minimizes environmenal impacts. Both aerial and buried lines are being studied. A buried line has been tentatively selected as discussed in paragraph d above.

g. Public Utility District No. 1 of Grays Harbor County, Washington. Coordination was maintained with the Grays Harbor PUD throughout the study because of the PUD's interest in developing the hydropower

potential of Wynoochee Dam (see paragraph 3.06a). A preliminary FERC permit was granted to the PUD on April 1981 to study hydropower development of Wynoochee Dam. Several meetings were held with the PUD and their consultant, R. W. Beck and Associates, to discuss each other's plans and interests, share data, and reduce unnecessary duplication of effort. The PUD actively supports non-Federal involvement in the hydropower of Wynoochee Dam in combination with Federal development of the fish hatchery. The Corps presented a statement at the PUD's public meeting on 6 March 1980 on the Federal interests that must be protected in the event of non-Federal hydropower development at Wynoochee Dam. Based on the public's desire for the power to be marketed in the local area, a hydropower partnership has been developed between the COE and the PUD (see paragraph 4.29c). Under the partnership, the COE would design and construct the hydropower portion of the tentatively selected plan, and the PUD would pay 100 percent of the allocated hydropower costs and market the power output. On 17 August 1981, the COE requested a letter of intent from the PUD (appendix C). On 5 October 1981 the PUD stated (appendix C) its willingness to act as local sponsor for all the costs allocated to the hydropower facility, subject to a satisfactory agreement being reached on the concerns of the PUD. Particular areas concerned by both the COE and the PUD are ownership, control of operation and maintenance, transmission line, and financial arrangements. Details of the partnership will be worked out in the next few months and will be presented in the final feasibility report. An acceptable common ground between the PUD and the Corps regarding the fish hatchery location and future hydropower development at the Oxbow site was found with the assistance of the Washington State Energy Office (see appendix G).

h. City of Aberdeen, Washington. Coordination was maintained with the city of Aberdeen throughout the study because of its contractual water supply interests and temporary interest in developing the hydropower potential of Wynoochee Dam. The city of Aberdeen supports hydropower and fish hatchery development at Wynoochee Dam. Further discussions will be held with the city of Aberdeen to discuss any items of mutual interest.

5.04 Coordination of Draft Report.

(This paragraph will be completed after receipt of agency and public comments on the draft feasibility report and EIS.)

SECTION 6. PRELIMINARY CONCLUSIONS AND RECOMMENDATION

6.01 Preliminary Conclusions. The tentatively selected plan is the most effective alternative plan for meeting the study planning objectives. The tentatively selected plan would cause no significant environmental impacts, and any unavoidable environmental losses associated with the plan are considered an acceptable tradeoff in view of the enhancement of the anadromous fisheries. The energy generated by the hydropower facility would be marketable in the Grays Harbor Public Utility District's (PUD) market area, would satisfy a portion of the region's total energy needs, and would be economically justified. The fish hatchery would be economically justified and meet a portion of the area's fishery needs. The integrated hydropower/fish hatchery plan would provide investment and operating savings for hydropower over a single purpose hydropower facility. The tentatively selected plan is consistent with national policy statutes, administrative directives, and the administration's intent to increase local cost sharing, except it would require exemption of Section 5 of the 1944 Flood Control Act (Public Law 534, 78th Congress) to allow power marketing by Grays Harbor PUD. There is strong agency and public support for development of both the hydropower facility and the fish hatchery, with no expressed opposition to either. My preliminary conclusion, therefore, is that the total public interest would be best served by implementation of the tentatively selected plan. Further, I conclude that Federal implementation of the tentatively selected plan, with the cooperation of state and local governments, would insure complete integration of the proposed project with the operation of the existing federally owned Wynoochee Lake project for its authorized project purposes, would insure provision for the water quality and quantity needs of the proposed fish hatchery, and would result in construction efficiencies and cost savings.

6.02 Preliminary Recommendation. My preliminary recommendation is that an integrated hydropower/fish hatchery project at Wynoochee Dam capable of generating approximately 37,400 megawatthours of electrical energy per year and producing approximately 396,000 pounds of anadromous smolts annually, as described in this report, be authorized for Federal construction, operation, maintenance, and replacement. The first cost to the United States as part of a combined hydropower/fish hatchery project is presently estimated at $18,780,000 under existing cost sharing laws and $17,739,000 under former President Carter's proposed cost sharing policy; the annual cost to the United States is $679,000. This recommendation is made with the provision that, prior to construction, Grays Harbor PUD will comply with the following requirements:

a. Provide a cash contribution equal to 100 percent of the total project first cost attributable to hydropower, presently estimated at $21,580,000.

b. Provide a cash or in-kind annual contribution for the life of the hydropower facility equal to 100 percent of the total annual project

operation, maintenance, and replacement costs attributable to hydropower, an annual contribution presently estimated at $341,000.

c. Distribute any energy and capacity which is produced from the hydropower facility.

d. Furnish power free of cost to the United States for operation and maintenance of the Wynoochee Lake project and recommended fish hatchery at voltage and frequency required and at a point adjacent thereto.

e. Hold and save the United States free from damages due to the construction and subsequent operation and maintenance of the hydropower facility, except for such damages that are due to the fault or negligence of the United States or its contractors.

f. Hold and save the United States free from any and all claims and damages for lost power revenues and additional operation costs resulting from operation and maintenance of the Wynoochee Lake project and from the construction, operation, and maintenance of the recommended fish hatchery.

This recommendation exempts this project from the power marketing provisions of Section 5 of the 1944 Flood Control Act (Public Law 534, 78th Congress, 22 December 1944).

This recommendation is also made with the provision that, prior to construction, the State of Washington will, in addition to the general requirements of law for these types of projects, agree to comply with the following requirements:

a. Provide a cash contribution equal to the first costs attributable to the fish hatchery for constructing a part of the fish hatchery to fulfill the state obligation under the signed Memorandum of Agreement dated 28 July 1977 (as amended or supplemented as legally required), a contribution presently estimated at $570,000.

b. Provide a cash or in-kind annual contribution for the life of the fish hatchery equal to the annual operation, maintenance, and replacement costs attributable to the fish hatchery for operating, maintaining, and replacing a part of the fish hatchery to fulfill the state's obligation under the signed Memorandum of Agreement dated 28 July 1977 (as amended or supplemented as legally required), an annual contribution presently estimated at $27,000.

c. Provide a cash contribution equal to 25 percent of the separable first costs attributable to the recreation (sport) enhancement portion of the fish hatchery, a contribution presently estimated at $1,470,000.

d. Provide a cash or in-kind annual contribution for the life of the fish hatchery equal to 100 percent of the separable annual operation, maintenance, and replacement (sport) costs tributable to the recreation enhancement portion of the fish hatchery, an annual contribution presently estimated at $278,000.

e. In accordance with former President Carter's proposed cost sharing policy, provide a cash contribution equal to 10 percent of the construction costs attributable to hydropower plus 5 percent of the construction costs attributable to the fish hatchery, a contribution presently estimated at $3,199,000.

f. Enter into a Memorandum of Understanding with the sponsoring Federal fish agency regarding fish hatchery operation, maintenance, and replacement.

g. Obtain any necessary permits.

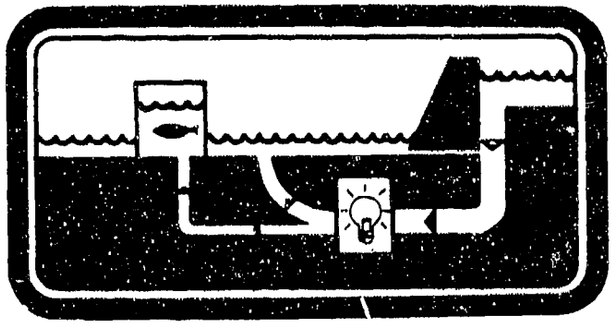
h. Hold and save the United States free from damages due to the construction and subsequent operation and maintenance of the fish hatchery, except for such damages that are due to the fault or negligence of the United States or its contractors.

This recommendation is also made with the provision that prior to construction, a Federal fish agency will agree to be the owner and manager of the fish hatchery and sponsoring agency for the Federal Government's share of the annual operation, maintenance, and replacement costs attributable to the fish hatchery.

NORMAN C. HINTZ
Colonel, Corps of Engineers
District Engineer

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



DRAFT
ENVIRONMENTAL IMPACT STATEMENT

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Wynoochee Hydropower/Fish Hatchery Study

The responsible agency is the U.S. Army Corps of Engineers

Abstract: The Seattle District has investigated the development of hydropower and fish enhancement opportunities at the existing Wynoochee Dam on the Wynoochee River in Grays Harbor County, Washington. The final alternative plans considered were no action and an integrated hydropower facility and enhancement fish hatchery. The hydropower/fish hatchery plan has been tentatively selected based upon its performance in addressing the identified public concerns and its net positive contributions to National Economic Development and Environmental Quality. This plan consists of the construction of a 10.2-megawatt (MW) hydropower addition to Wynoochee Dam and a 396,000-pound salmon and steelhead fish hatchery downstream of Wynoochee Dam. The total construction cost of the plan is $42,400,000; the benefit-to-cost ratio is 2.2 to 1. The principal beneficial impacts of the plan would be the enhancement of the anadromous sport, Indian, and commercial fisheries in the Grays Harbor area, the Chehalis River basin and other Washington coastal rivers, and in the northern Pacific Ocean, and the contribution of 10.2 MW of nameplate capacity and 37,400 megawatt hours (MWH) per year of energy to the Pacific Northwest power needs. The principal adverse impacts are associated with the loss of 50 acres of wildlife habitat, the elimination of anadromous fish runs in the Wynoochee River upstream of Wynoochee Dam, reduced instream flows in a 6,800-foot reach of the Wynoochee River, and a change in the existing dispersed recreation use of the hatchery site. None of the adverse environmental impacts are considered significant. There is strong agency and public support for development of both the hydropower facility and the fish hatchery.

Send your comments to the District Engineer by 31 January 1982. If you would like further information regarding this draft environmental impact statement (EIS), please contact Karen Northup, U.S. Army Corps of Engineers, Seattle District, Post Office Box C-3755, Seattle, Washington 98124, commercial telephone (206) 764-3624, FTS telephone 8-399-3624.

NOTE: Information, displays, maps, etc. discussed in the Wynoochee hydropower/fish hatchery draft feasibility report are incorporated by reference in the draft EIS.

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
Wynoochee Hydropower/Fish Hatchery Study

Summary

1. Major Conclusions and Findings. The tentatively selected plan is an integrated hydropower/fish hatchery project on the Wynoochee River at Wynoochee Dam capable of generating approximately 37,400 MWH of electrical energy per year and producing approximately 396,000 pounds of anadromous smolts annually and is the most effective alternative plan for meeting the study planning objectives. Total construction cost of the integrated plan would be $42,400,000 (October 1981 prices); the benefit-to-cost ratio is 2.2 to 1. The annual operation, maintenance, and replacement costs of the plan are estimated at $1,325,000. As currently planned, the hydropower facility would be constructed by the Corps of Engineers, and the power produced would be marketed by Grays Harbor Public Utility District (PUD). The hatchery would be a regional enhancement facility and includes provisions for two satellite fish stations in watersheds within the vicinity of the Wynoochee River. For feasibility purposes, cost and benefit estimates for the hatchery were based on spring chinook salmon and steelhead, although final species selection would be made in advance engineering and design. Following construction by the Corps of Engineers, the hatchery would be owned and managed by a Federal fish agency which would cost share operation, maintenance, and replacement with the non-Federal sponsor of the hatchery. The State of Washington has expressed its intent to act as local sponsor; the Northwest Regional Office of the National Marine Fisheries Service (NMFS) has expressed an interest in becoming the Federal sponsor and has pursued Federal sponsorship with their higher authority. The principal beneficial impacts of the plan would be the enhancement of the anadromous sport, Indian, and commercial fisheries in the Grays Harbor area, the Chehalis River Basin and other northern Washington coastal rivers, and in the northern Pacific Ocean, and the contribution of 10.2 MW of nameplate capacity and 37,400 MWH per year of energy to the Pacific Northwest power needs. The principal adverse impacts would be the loss of approximately 50 acres of wildlife habitat, the elimination of anadromous fish runs in the Wynoochee River upstream of Wynoochee Dam, reduced instream flows in a 6,800-foot reach of the Wynoochee River between the existing overflow weir and the fish hatchery outflow, and the change of the existing dispersed recreation use of the hatchery site. Measures have been incorporated into the plan to minimize impacts to the extent practicable. None of the adverse environmental impacts are significant. The plan has a net benefit to the environment, the enhancement of anadromous fisheries. There is strong agency and public support for development of both the hydropower facility and the fish hatchery, with no expressed opposition to either.

2. Areas of Controversy. There are two primary areas of controversy associated with the tentatively selected plan:

(1) Grays Harbor Public Utility District (PUD) has received a preliminary permit from the Federal Energy Regulatory Commission to study hydropower development at Wynoochee Dam. Their plan does not include a fish hatchery. Toward resolution of this area of controversy, the Corps has entered into a partnership with the PUD in which the Corps would construct the hydropower facility, and the PUD would pay for its design and construction and would market the power produced. The PUD would also be responsible for constructing, operating, and maintaining the transmission line and for the final decision regarding type of line and location. Such a partnership requires an exemption to Section 5 of the 1944 Flood Control Act which established that power produced at a Corps hydropower facility must be marketed by the Bonneville Power Administration (BPA). The partnership does not affect the fish hatchery portion of the combined plan.

(2) The U.S. Forest Service (USFS) has expressed concerns regarding the hatchery site selection and impacts to elk winter range and dispersed recreation use, and concerns relative to the impacts of the transmission line corridor. In response to the USFS concerns, additional elk and recreation analyses have been performed and results incorporated into the draft feasibility report/EIS. A buried transmission line along the existing power right-of-way adjacent to the road from Wynoochee Dam 22 miles to the Promised Land Substation has been chosen by the Corps of Engineers based on preliminary studies. This line would have minimal environmental impacts and is consistent with the USFS's national policy requiring buried transmission lines on national forest lands However, the Grays Harbor PUD has stated a preference for an aerial transmission line based upon its preliminary studies. The detailed analyses required to definitively determine the economics and operational advantages or disadvantages of an aerial transmission line as opposed to a buried transmission line will be conducted during further studies. Should the outcome of detailed studies be a change of selection to that of an aerial transmission line, a supplemental environmental document will be prepared and distributed for public and agency review and comment. An aerial line, if selected, would be designed to minimize environmental impacts, including placement of the line to minimize timber production losses and esthetic impacts to the extent possible. Extensive coordination with the USFS would be necessary to avoid significant conflicts in current land use along the transmission corridor.

3. Unresolved Issues. There are no remaining unresolved issues associated with the Wynoochee hydropower/fish hatchery plan.

4. Relationship to Environmental Requirements. The relationship of the Wynoochee hydropower/fish hatchery plan to environmental requirements is summarized in the following table. Implementation of the plan would require a change in the current land use classification of the hatchery site by the USFS. Presently, the hatchery site is classified as a visual resource and, as such, is on a 200-year timber rotation. A memorandum of understanding with the USFS regarding implementation of the hydropower/fish hatchery plan on national forest land would be completed in advanced engineering and design. Full compliance with the requirement for a State National Pollution Discharge Elimination System (NPDES) permit for the hatchery outlet would be accomplished just prior to construction of the hydropower/fish hatchery plan when the permit is obtained. Full compliance with the state instream flow requirements would be accomplished in advanced engineering and design studies when the instream flows are determined through coordination with the State of Washington. Full compliance with the Coastal Zone Management Act would be accomplished just prior to construction when the Shoreline Management permit is obtained by the local sponsor in compliance with the State Shoreline Management Program. The tentatively selected plan is in full compliance with all other environmental statutes and requirements.

RELATIONSHIP OF THE WYNOOCHEE HYDROPOWER/FISH HATCHERY PLAN TO ENVIRONMENTAL REQUIREMENTS

Environmental Requirements	Compliance
Archeological and Historic Preservation Act, as amended by PL 96-515, December 12, 1980, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 7401, et seq.	Full compliance
Clean Water Act, as amended, 33 U.S.C. 1251, et seq.	Full compliance
Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451, et seq.	Partial compliance

Environmental Requirements	Compliance
Endangered Species Act of 1973, as amended, 16 U.S.C. 1531, et seq.	Full compliance
Estuary Protection Act, 16 U.S.C. 1221, et seq.	Not applicable
Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12, et seq.	Full compliance
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, et seq.	Full compliance
Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4, et seq.	Not applicable
Marine Protection Research and Sanctuary Act of 1972, as amended, 33 U.S.C. 1401, et seq.	Not applicable
National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321, et seq.	Full compliance
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470, et seq., as amended by PL 96-515, December 12, 1980	Full compliance
Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401, et seq.	Full compliance
Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001, et seq.	Not applicable
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.	Full compliance
Executive Order (E.O.) 11988, Floodplain Management, 24 May 1977	Full compliance
E.O. 11990, Protection of Wetlands, 24 May 1977	Full compliance
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 30 August 1976)	Full compliance

Environmental Requirements	Compliance
Timber Resource Management Plan, Shelton Cooperative Sustained Yield Unit, U.S. Forest Service, Olympic National Forest, 1978	Partial compliance
State Shoreline Management Plan	Full compliance
State National Pollution Discharge Elimination System Permit	Partial compliance
State Instream Flow Requirements	Partial compliance
Grays Harbor Regional Comprehensive Plan	Full compliance
Grays Harbor County Management Plan	Full compliance
Report of the Grays Harbor Fishery Enhancement Task Force, adopted by the Grays Harbor Regional Planning Commission, 28 August 1980	Full compliance
Memorandum of Understanding With the U.S. Forest Service regarding the Wynoochee Lake Project	Partial compliance

ENVIRONMENTAL IMPACT STATEMENT
WYNOOCHEE HYDROPOWER/FISH HATCHERY STUDY

TABLE OF CONTENTS

Paragraph		Page
	COVER SHEET - ABSTRACT	EIS-i
	SUMMARY	EIS-ii
	TABLE OF CONTENTS	EIS-vii
	SECTION 1. NEED FOR AND OBJECTIVES OF ACTION	
1.01	Study Authority	EIS-1
1.02	Public Concerns and Planning Objectives	EIS-1
	SECTION 2. ALTERNATIVE PLANS	
2.01	Plans Eliminated from Further Study	EIS-2
	a. Preliminary Studies	EIS-2
	(1) Development of Hydropower at Wynoochee Dam	EIS-2
	(2) Fish Enhancement at Wynoochee Dam	EIS-2
	b. Detailed Studies	EIS-3
	(1) Development of Hydropower at Wynoochee Dam	EIS-3
	(2) Transmission Line	EIS-3
	(3) Fish Enhancement at Wynoochee Dam	EIS-3
2.02	Final Plans	EIS-4
	a. Alternative Plan 1: No Action (Without Conditions)	EIS-4
	b. Alternative Plan 2: Combined Underground Hydropower and Enhancement Fish Hatchery (National Economic Development Plan/Environmental Quality Plan/Tentatively Selected Plan)	EIS-5
	(1) Design Features	EIS-5
	(2) Environmental Features	EIS-6
	(3) Mitigation	EIS-8
	(4) Operation and Maintenance Responsibilities	EIS-8
	(5) Economics	EIS-9
2.03	Comparative Impacts of Alternative Plans	EIS-9
	SECTION 3. AFFECTED ENVIRONMENT	
3.01	Study and Plan Areas	EIS-15
3.03	Environmental Conditions	EIS-15
3.06	Significant Resources	EIS-16
	a. Physical Features of the Plan Area	EIS-16
	b. Biological/Ecological Features of the Plan Area	EIS-17
	c. Historic and Prehistoric Features of the Plan Area	EIS-18
	d. Socioeconomic Features of the Plan Area	EIS-19

TABLE OF CONTENTS

Paragraph		Page
	SECTION 4. ENVIRONMENTAL IMPACTS OF THE FINAL ALTERNATIVE PLANS	
4.01	Alternative Plan 1: No Action	EIS-20
4.02	Alternative Plan 2: Combined Underground Hydropower and Enhancement Fish Hatchery (National Economic Development Plan/Environmental Quality Plan/ Tentatively Selected Plan)	EIS-20
	a. Physical Impacts and Their Significance	EIS-20
	(1) Air Quality, Noise, and Traffic	EIS-20
	(2) Water Quality and Supply	EIS-21
	(3) Mineral Resources	EIS-26
	b. Biological/Ecological Impacts and Their Significance	EIS-26
	(1) Vegetation	EIS-26
	(2) Wildlife	EIS-28
	(3) Fish	EIS-30
	(4) Threatened and Endangered Species	EIS-34
	c. Historic and Prehistoric Impacts and Their Significance	EIS-35
	d. Socioeconomic Impacts and Their Significance	EIS-35
	(1) Energy and Fish Production	EIS-35
	(2) Esthetics	EIS-35
	(3) Recreation	EIS-37
	(4) Employment and Public Services	EIS-38
	e. Energy Impacts and Their Significance	EIS-39
	f. Relationship of the Tentatively Selected Plan to Existing Land Use Plans, Policies, and Controls	EIS-40
	(1) Existing Land Use	EIS-40
	(2) Land Use Plans, Policies, Studies, and Projects	EIS-40
	(3) Laws, Regulations, and Controls	EIS-42
	g. Adverse Environmental Impacts Which Cannot Be Avoided	EIS-43
	h. Irreversible and Irretrievable Commitments of Resources Which Would Be Involved in the Tentatively Selected Plan Should It Be Implemented	EIS-43
	i. The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity	EIS-43
	SECTION 5. STUDY COORDINATION AND PUBLIC INVOLVEMENT	
5.01	Study Coordination and Public Involvement	EIS-48
5.02	Remaining Coordination	EIS-48
5.03	Statement Recipients	EIS-48
5.04	Public Views and Responses	EIS-48

TABLE OF CONTENTS

Number		Page
	INDEX	EIS-49
	LIST OF PREPARERS	EIS-54
	BIBLIOGRAPHY	EIS-56
	TABLES	
EIS-1	Comparative Impacts of Alternative Plans	EIS-10
EIS-2	Adverse Environmental Impacts Which Cannot Be Avoided	EIS-44
	FIGURES	
EIS-1	Wynoochee Hydropower/Fish Hatchery Plan Area (Showing Referenced River Reaches)	EIS-22

SECTION 1. NEED FOR AND OBJECTIVES OF ACTION

1.01 Study Authority. As presented in paragraph 1.01 of the draft feasibility report, the authority to reexamine the need for power at Wynoochee Dam is provided under Public Law 87-874. The examination of fish enhancement opportunities at Wynoochee Dam is being conducted under the authority of the Chehalis River Basin study and the Fish and Wildlife Coordination Act.

1.02 Public Concerns and Planning Objectives. Energy and anadromous fishery resource needs in the Pacific Northwest have increased considerably since Wynoochee Dam was authorized for construction. Average annual energy deficits in the West Group Area (Pacific Northwest) are forecast to range from 10,310,000 megawatthours (MWH) (1,177 megawatts (MW)) in 1981-1982 to 23,600,000 MWH (2,694 MW) in 1985-1986 to 13,960,000 MWH (1,594 MW) in 1991-1992, according to the West Group Forecast (Pacific Northwest Utilities Conference Committee, June 1981). The demand for anadromous fish by commercial, Indian, and sport fishermen has exceeded the available depressed stocks and the remaining natural spawning and rearing areas available for producing anadromous fish have proven to be insufficient to meet the increasing demand. Accordingly, the primary public concerns and, therefore, the primary planning objectives addressed by this study are the development of the hydropower potential and fish enhancement opportunities at Wynoochee Dam, Washington, to meet a portion of the identified energy and anadromous fishery resource needs. In formulating plans to meet the objectives, a wide range of criteria was considered. These criteria and additional details regarding the need for and objectives of the study are presented in section 2 of the draft feasibility report.

SECTION 2. ALTERNATIVE PLANS

2.01 Plans Eliminated from Further Study.

a. Preliminary Studies.

(1) Development of Hydropower at Wynoochee Dam. Studies of hydropower were limited to the existing Wynoochee Dam project site and included engineering, cost, and environmental considerations. Seven powerhouse locations, with various penstock configurations, were considered during preliminary studies. The evaluation of these configurations is presented in paragraph 3.02a of the draft feasibility report. Hydropower design options were dropped from further study if the alternative (1) presented a potential hydraulic and operational constraint on the operation of the spillway of the Wynoochee Dam, (2) would operate with relatively high loss in net power head when compared to the other alternatives, (3) would result in insufficient room or access for construction of the feature, or (4) was located in the rock canyon bottom below known overburden slide areas. All but two hydropower design options, a surface powerhouse and an underground powerhouse on the right bank downstream of Wynoochee Dam, were eliminated from further study because they fell into one or more of the above stated constraint categories.

(2) Fish Enhancement at Wynoochee Dam. Three possible structural alternatives to enhance the anadromous fish runs were examined in the vicinity of Wynoochee Dam during preliminary studies: spawning channels, rearing ponds, and a fish hatchery. The evaluation of these alternatives is discussed in paragraph 3.02b of the draft feasibility report and in appendix G. Construction of a new fish hatchery was considered to be the most viable structural fish enhancement alternative primarily because it would provide optimum use of the opportunity at Wynoochee Dam in terms of production and efficiency. The other alternative would create only minor enhancement benefits not in keeping with the growing fishery demands and would not take advantage of the full opportunity available for fish production at Wynoochee Dam. Refer to appendix G for a discussion of the unique factors that make construction of an enhancement fish hatchery at Wynoochee attractive.

Three alternative sites are available for location of the fish hatchery alternative in the vicinity of Wynoochee Dam. The preferred site is the lower level site (elevation 615 feet) located on the right bank 3,000 feet downstream of the dam (see plate 2). A hatchery constructed on this site would result in less hydropower head loss if the fish hatchery has a direct pipeline connection to a hydropower facility. For additional detail regarding the hatchery siting, refer to paragraph 3.02b of the draft feasibility report and appendix G.

b. Detailed Studies.

(1) Development of Hydropower at Wynoochee Dam. Of the two powerhouse alternatives, the surface powerhouse was eliminated from consideration during detailed studies due to potential costs associated with geotechnical problems (refer to paragraph 3.03a of the draft feasibility report and appendix F). The underground powerhouse site was selected as the preferred site and was considered alone and in combination with a fish hatchery as discussed below. Hydropower development was optimized with a 1,200 c.f.s. powerhouse based on net power benefits and energy production (refer to 3.03b of the draft feasibility report).

(2) Transmission Line. Various transmission line alternatives and routes for the Wynoochee hydropower/fish hatchery plan were considered as discussed in paragraph 4.09d of the draft feasibility report. A buried transmission line within the existing power right-of-way along Donkey Creek road was chosen by the Corps of Engineers based on preliminary studies. This alternative is considered the least environmentally damaging plan by the Corps of Engineers and is consistent with the U.S. Forest Service (USFS) policy requiring burial of transmission lines on national forest land. However, the Grays Harobr PUD has stated a preference for an aerial transmission line based upon its preliminary studies. The detailed analyses required to definitively determine the economics and operational advantages or disadvantages of an aerial transmission line as opposed to a buried transmission line will be conducted during further studies. The PUD, which would be responsible for construction, operation, and maintenance of the transmission line, will be responsible for the final decision as to type of line and location. That decision will be made in cooperation with the Corps of Engineers, BPA, and the USFS. Should the outcome of further studies be a change of selection to that of an aerial transmission line, a supplemental environmental document will be prepared and distributed for public and agency review and comment. An aerial line, if selected, would be designed to minimize environmental impacts, including placement of the line to minimize timber production losses and esthetic impacts to the extent possible. Extensive coordination with the USFS would be necessary to avoid significant conflicts in current land use along the transmission corridor.

(3) Fish Enhancement at Wynoochee Dam. Two hatchery design options for development of the hatchery at the preferred site were examined in detail. One option would take the water supply for the hatchery directly from the dam; the other would take the water supply from the tailrace of a hydroelectric powerhouse located below the

Wynoochee Dam. Detailed studies showed an economic advantage in development of a combined hydropower and fish hatchery project. Environmental studies concluded no significant difference between hatchery only and a combined hydropower/hatchery plan. The combined plan was selected as the preferred structural alternative and, after evaluation against the without condition (no action), was selected as the plan that would best meet the objectives of energy and fish enhancement. The fish hatchery was sized at 190 c.f.s. to provide the maximum opportunity for fish enhancement development. For additional information regarding plan formulation, refer to section 3 of the draft feasibility report and appendix G.

2.02 Final Plans.

a. Alternative Plan 1: No Action (Without Conditions). Under the no-action alternative, no Federal action would be taken at the existing Wynoochee Dam to develop hydropower or to enhance the anadromous fishery within the Chehalis River Basin. There is a possibility of non-Federal hydropower development; there are no proposals for complete non-Federal development of an enhancement fish facility at the dam. Energy conservation programs and efforts by fisheries agencies to improve the fishery would continue. In accordance with the Pacific Northwest Electrical Power Planning and Conservation Act, the BPA must give highest priority to cost effective conservation programs. These programs will be undertaken by public and private utilities and state and local governments with BPA's technical assistance and financial backing. The probability of the region being without sufficient resources to meet electrical needs has caused power planners to focus on smaller renewable resource projects as well as conservation methods. Both structural and conservation methods are considered necessary to relieve the potential energy deficits in the Pacific Northwest.

Management and fish habitat improvement measures are within the jurisdiction of the fisheries agencies. Measures include rigorous management of the fisheries to effect maximum sustained yield and fish habitat improvements by changes in streams such as removing silt from gravel, controlling flood runoff, improving vegetative coverage of the watershed, providing vegetative cover over streams, removing barriers to upstream movement of anadromous fish, and improving water quality. Some stream areas could be improved by providing ideal spawning grounds through the removal of undesirable gravels and replacement with desirable substrate or, similarly, through provision of spawning channels adjacent to the stream. These methods are now being employed or planned where practicable by the agencies and will continue with or without implementation of a structural alternative such as a hatchery. However, the increasing need for anadromous fish cannot be completely met by habitat improvement and management measures alone and under no action, fish runs in the study area would be expected to continue to decline.

b. Alternative Plan 2: Combined Underground Hydropower and Enhancement Fish Hatchery (National Economic Development Plan/Environmental Quality Plan/Tentatively Selected Plan). The tentatively selected plan is the construction of a 10.2-MW and 37,400-MWH hydropower addition to Wynoochee Dam and a 396,000-pound salmon and steelhead fish hatchery downstream of Wynoochee Dam. The underground powerhouse would be located on the right bank of the Wynoochee River under an existing visitors' parking lot 200 feet below the Wynoochee Dam. The site of the fish hatchery is a flat meander bench on the right bank of the river 3,000 feet downstream of the Wynoochee Dam (refer to plate 2).

(1) Design Features. The hydropower facility would operate as a run-of-river plant, producing baseload energy from the releases of the Wynoochee Dam. A multilevel intake structure to the powerhouse penstocks would be built in the reservoir to maintain preproject water quality. The penstock would be tunneled beneath the grout curtain under the dam to the underground powerhouse located 200 feet downstream of the dam. The powerhouse would have an installed capacity of 10.2 MW and produce 37,400 MWH of average annual energy from three commercially available units of 1.8, 4.2, and 4.2 MW. The small unit would utilize the 190/140 cubic feet per second (c.f.s.) minimum flow from the existing project, and the total hydraulic capacity of the powerhouse would be 1,200 c.f.s. The tailrace would exit from the right canyon wall about 400 feet downstream of the dam, approximately 100 feet downstream of the USFS bridge. A transmission line, constructed by the Grays Harbor PUD, would transmit the power to the PUD's Promised Land Substation, approximately 22 miles southwest of the study area on Highway 101. The transmission line would follow the existing power right-of-way adjacent to the road between Wynoochee Dam and the substation.

Water supply to the hatchery would be via a 2,400-foot gravity feed pipeline from the hydropower outlet/fish hatchery intake structure. Supply to the hatchery would be 190 c.f.s., except in May and June when it may drop to a minimum of 140 c.f.s. The hatchery complex would include a hatchery building, two series of raceways, four 2-acre rearing ponds for steelhead, five 1/2-acre holding and rearing ponds for salmon, two holding ponds for steelhead, six residences for operators, a service building, a visitor facility, and access roads. The existing adult fish collection facility for the Wynoochee Dam project would be utilized for collection of adult prespawning fish (see figure 2 of the feasibility report for location of facility). With the construction of the hatchery, transport of adult salmon and steelhead above Wynoochee Dam for upstream spawning would be discontinued. The hatchery, appurtenant facilities, and water supply pipeline would occupy approximately 55 acres. Provision for the construction of two satellite fish stations for the enhancement of anadromous fish runs in other Washington coastal streams in the vicinity of the Wynoochee watershed has been made in the plan. Each of these stations would include an adult fish attraction, collection, and holding system and a juvenile fish acclimation pond.

Concrete aggregate for construction of the powerhouse and fish hatchery would be taken from the hatchery site. Rock borrow may be obtained from a nearby quarry 0.5 mile west of the Wynoochee Dam. Construction of the hydropower and fish hatchery portions of the tentatively selected plan would be concurrent and would take approximately 2 years to complete. Additional information regarding engineering features and construction is found in paragraphs 4.09 and 4.17 of the draft feasibility report. Also refer to plates 2 and 3 and appendix E.

(2) Environmental Features. The major environmental feature of the tentatively selected plan is the fish hatchery, which has been designed to produce 180,000 pounds of spring chinook salmon smolts and 216,000 pounds of steelhead smolts. The hatchery would result in an enhancement of the anadromous fish runs in the Grays Harbor area, the Chehalis River Basin and other Washington coastal rivers, and in the northern Pacific Ocean. The hatchery was sized based on a gravity feed water supply of 190 c.f.s. available at the Wynoochee Lake project. For the purposes of the feasibility level stage planning effort, spring chinook and steelhead were selected as the anadromous species to be raised at the hatchery. Spring chinook is a hard-to-raise species but as a group are the most seriously depressed of the anadromous salmonids in the State of Washington. The Wynoochee site is capable of offering one of this species key environmental requirements, an abundance of cool water through the summer for both adult holding and juvenile rearing. Utilizing the 190 c.f.s. available water supply and dividing it equally for production of spring chinook and steelhead, the WDF and WDG believe under the present state-of-the-art that the Wynoochee hatchery could produce 396,000 pounds of fish. Utilizing spring chinook results in less production and more conservative benefit figures than other salmonid species and thus is a good test of hatchery feasibility; although it is expected that other salmonid species such as coho salmon, in addition to spring chinook salmon, would be raised at the hatchery. The final species selection and species numbers would be determined in advanced engineering and design through coordination with state and Federal agencies, Indian tribes, and other interested public.

Although the details of hatchery production and its management have not been developed, it is recognized by the state and Federal fish agencies and other fisheries experts that the Wynoochee hatchery would be a regional hatchery not only enhancing production in the Wynoochee River but also improving production on nearby Washington coastal rivers, such as the Hoh, Queets, Humptulips, and Quinault Rivers, through an outplanting program involving a simple release of juvenile fish into these rivers and/or construction of satellite fish stations. Each satellite fish station would include an adult attraction, collection, and holding system and an acclimation pond for rearing and imprinting juveniles, as described in paragraph 4.09j of the draft feasibility report. Two of these stations have been included as features of the tentatively selected plan. The specific locations of these stations and the details of their management would be developed in advanced engineering and

design by the resource agencies in close coordination with the Indian tribes. The concept of the regional hatchery and its management is further discussed in section 3 of appendix H, which includes a summary of the results of a study conducted by Mathews (1981) under contract with the Seattle District, Corps of Engineers, to address the issue of hatchery management.

Many environmental features of the tentatively selected plan were designed to insure the successful operation of the hatchery facility, minimize project impacts on the environment, and monitor the effectiveness of the fish hatchery in its role in the management of the total regional fishery. Environmental features to insure the successful operation of the hatchery facility include a multilevel intake structure to provide selective withdrawal capability for temperature control, a bypass pipe in the powerhouse to supply water to the hydropower outlet/fish hatchery intake structure when the powerhouse units would be shut down, a pipe from the existing overflow weir downstream of the dam to the fish hatchery intake structure to supply water to the fish hatchery when the powerhouse complex would be completely shut down, and a 12-inch pressure pipeline leading directly from deep within the reservoir to the adult salmon holding pond to provide cold water holding conditions for adult spring chinook prior to spawning (refer to appendix E).

Environmental features which serve to minimize the potential water quality impacts of the tentatively selected plan include a pollution abatement/settlement pond for holding effluent from the fish hatchery raceways while they are being cleaned or when prophylactics are used, a single-pass water use design for the hatchery, and provision of a septic tank system for the hatchery residents. During the construction phase, all surface runoff water from disturbed areas would pass through settling ponds to minimize suspended sediment load to the river. Cofferdams would be used for instream construction of the hatchery supply pipeline crossing and the hydropower outlet/fish hatchery intake structure, and the reservoir would be drawn down for construction of the powerhouse intake structure in the dry. Following construction, water quality at the hatchery outlet would be monitored to insure compliance with the Environmental Protection Agency (EPA) criteria. Scheduling of a shutdown of the entire powerhouse complex would occur only when the two existing sluices through the dam were not in use to avoid a possible nitrogen supersaturation problem in the fish hatchery water supply as a result of sluiceway discharges.

Water supply to the hatchery would be via a gravity flow system which minimizes the energy requirement to operate the hatchery and eliminates the need for emergency water supply pumping equipment necessary at most hatcheries. The pressure line directly from the reservoir providing cold water to the prespawning adult chinook holding ponds could also provide fire protection, washdown lines, and irrigation water for the residential and hatchery grounds. Both the powerhouse and the fish hatchery water supply pipeline would be buried. The existing access road to the hatchery site would be utilized. The transmission line

would be buried and would utilize the existing power right-of-way adjacent to the existing road between Wynoochee Dam and the Promised Land Substation. These project features contribute to reducing the esthetic and terrestrial habitat impacts associated with the project. Potential impacts to wild fish stocks in the Chehalis River basin would be reduced by management of the hatchery on a wild stock basis, which is consistent with the current management philosophy of the state and Federal fish agencies. Local stocks would be utilized in the hatchery to the extent practicable. The degree of run timing and harvest conflicts with other species that would potentially be raised at the Wynoochee hatchery can be minimized by the proper choice of stocks as summarized in section 3 of appendix H. The development of the harvest management and outplanting strategy will be a continuing effort among the various fish agencies and interested public throughout advanced engineering and design studies and actual hatchery operation.

(3) Mitigation. As discussed in paragraph 4.13 of the draft feasibility report, part of the hatchery production would be utilized to mitigate for the termination of the use of anadromous fish spawning habitat upstream of the Wynoochee reservoir due to implementation of the tentatively selected plan. The estimated number of fish that could be accommodated by that habitat is 1,500 coho salmon adults and 570 steelhead adults. Another portion of the hatchery production would be used for mitigation of previous steelhead spawning habitat losses associated with the existing Wynoochee Lake project. The estimated number of fish that could be accommodated by that habitat is 1,700 steelhead adults. This latter mitigation is the responsibility of the State of Washington under the 28 July 1977 Memorandum of Agreement with the Corps of Engineers. The two mitigation portions of the hatchery would total approximately 5.5 percent and 2.6 percent of the annual production, respectively, based on the contribution of adult salmon and steelhead to the annual harvest. The remaining production, which is not attributable to mitigation, is considered the enhancement portion of the fish hatchery. That production represents 91.9 percent or 118,450 of the total hatchery contribution of 129,000 adult fish to the annual harvest.

(4) Operation, Maintenance, and Replacement Responsibilities. The Corps of Engineers would construct the powerhouse. Grays Harbor PUD would be responsible for funding the construction, operation, maintenance, and replacement (OM&R) costs of the hydropower facility and for construction and OM&R of the transmission line. Energy output from the powerhouse would be owned and marketed by the Grays Harbor County PUD. Operation and hourly discharge patterns of the existing Wynoochee Dam would not be altered. Production of power at Wynoochee Dam would be subordinate to all other project purposes, including the production of fish. Following contruction of the hatchery by the Corps of Engineers, title to the hatchery would be turned over to a Federal fish agency, which would become the hatchery owner and manager. Through contract with the hatchery owner, operation of the hatchery would be accomplished by the WDF and the WDG for salmon and steelhead, respectively. OM&R

funding would be cost shared between the Federal fish agency and the State of Washington, the local sponsor for the hatchery. For details regarding operation and maintenance of the tentatively selected plan, refer to paragraphs 4.19 through 4.23 of the draft feasibility report.

A 25-year postconstruction monitoring program for the fish hatchery has been incorporated into the tentatively selected plan to monitor the effectiveness of fish production from the hatchery, the effectiveness of the hatchery management strategy, the effects of the hatchery on anadromous fish production in the region, and to minimize the potential adverse effects of disease and competition or predation on native fish runs due to hatchery released fish. Information from the monitoring program would provide continual input into the management of the Chehalis River Basin and Grays Harbor area fisheries as well as provide important data on salmonid production for application in other watersheds. The details of the monitoring program would be formulated in coordination with state and Federal resource agencies, Indian tribes, and other interested parties during advanced engineering and design studies. Implementation of the monitoring program would be the responsibility of the Federal fish agency that becomes the hatchery owner. Funding for the program would be part of the annual hatchery OM&R costs of the fish hatchery. Additional information regarding the monitoring program is provided in paragraph 4.22 of the draft feasibility report.

(5) Economics. The total investment cost of the tentatively selected plan would be $42.4 million (October 1981 price levels), of which $21.6 million would be the cost of the hydropower facility and $20.8 million the cost of the hatchery. The average annual power benefits of the hydropower facility would be $2,419,000. Total average annual enhancement benefits of the hatchery would be $7,280,000. The hydropower benefit-to-cost ratio is 1.2 to 1; the fish hatchery benefit-to-cost ratio it 2.9 to 1. Construction of the hydropower facility would be a 100 percent non-Federal cost borne by the Grays Harbor PUD. The State of Washington, as local sponsor of the fish hatchery, would be required to contribute 25 percent of the separable first costs and 100 percent of the separable annual costs attributable to the sport fishery portion of the fish hatchery production associated with enhancement. The Federal share is based on 100 percent of the commercial harvest and 75 percent of the sport fishery harvest associated with the enhancement portion of the fish hatchery and 100 percent of the hatchery production attributable to mitigation for the termination of the anadromous fish runs upstream of the Wynoochee reservoir. The State of Washington would also be required to pay 2.6 percent of the total hatchery first costs and annual costs to fulfill its obligation for mitigation associated with the existing Wynoochee Dam under the 28 July 1977 Memorandum of Agreement with the Corps of Engineers. A description of the economics and Federal and non-Federal cost-sharing responsibilities of the tentatively selected plan is presented in paragraphs 4.25 and 4.29 of the draft feasibility report. Refer to appendix C for information regarding the benefits analysis and cost-sharing coordination accomplished for the tentatively selected plan.

2.03 Comparative Impacts of Alternative Plans. A comparison of the impacts of the final plans for the Wynoochee hydropower/fish hatchery feasibility study is presented in table EIS-1.

TABLE EIS-1
COMPARATIVE IMPACTS OF ALTERNATIVES
WYNOOCHEE HYDROPOWER/FISH HATCHERY PLAN

Category	Base Condition	Alternative Plan 1 - Without Condition - Most Probable Future Without Federal Action	Alternative Plan 2 Combined Underground Hydropower and Enhancement Fish Hatchery
PLAN DESCRIPTION			
Major Features	Existing Wynoochee Lake project which consists of a 177-foot-high dam, mitigation lands for elk habitat inundated by the reservoir, and a fish collection and trucking program for anadromous fish. Plan area is generally located within the Olympic National Forest and involves Wynoochee River and nearby river systems.	Non-Federal hydropower development possible but not certain. Fish habitat improvement measures and fishery management by state fisheries agencies.	Intake structure; penstock; 10.2-megawatt (MW) nameplate underground powerhouse; switchyard; and 22-mile PUD transmission line; draft tubes and tailrace tunnel; hydropower outlet/fish hatchery intake structure; fish hatchery water supply pipeline; 396,000-pound fish hatchery, including residences and upgraded access road; two satellite fish stations.
Plan Outputs	Wynoochee Lake project provides 70,000 acre-feet of total storage and is presently operated for city of Aberdeen industrial water supply, winter flood control, and fisheries. No hydropower is currently provided. Anadromous fish mitigation has not been successful. In general, natural anadromous fish runs in the Pacific Northwest have been adversely impacted by logging, pollution, and water resources development. In particular, the fish runs in the Chehalis River Basin and Grays Harbor area have declined.	Continue regional energy deficit of over 22 million MW hours. Provide 10.2-MW nameplate capacity which may produce approximately 37,400 MW hours of energy per year. Some improvement of anadromous fish runs but the trend of declining fish runs is expected to continue.	Continue regional energy deficit of over 22 million MW hours. Provide 10.2-MW nameplate capacity which produces 37,400 MW hours of energy per year. Major enhancement of anadromous fishery; 129,000 adult spring chinook salmon and steelhead annual contribution to anadromous fish harvest. Final species selection and numbers would be determined in advanced engineering and design (AE&D).
Construction Costs	Not applicable.	Not available.	Federal - $18,780,000 Non-Federal - $23,620,000
Annual Operation, Maintenance, and Replacement Costs	Not applicable.	Not available.	Federal - $679,000 Non Federal - $646,000
Benefit-to-Cost Ratio	Not applicable.	Not determined.	Hydropower - 1.2 Fish Hatchery - 2.9 Combined Plan - 2.2
ENVIRONMENTAL QUALITY EFFECTS			
Wetlands (Executive Order 11990)	353 acres in the Wynoochee drainage.	No impact expected.	Loss of 2 acres due to hatchery construction. Potential of additional losses with construction of satellite fish stations.
Water Quality and Supply	The reach of Wynoochee River in the plan area is classified an AA stream by the State of Washington water quality standards. 190 c.f.s. minimum flow from Wynoochee Dam.	With hydropower development utilizing surface powerhouse, potential reduction in quality of 1,000-foot reach of Wynoochee River between dam and hydropower outlet. Water would be ponded in this reach when reservoir releases are no greater than that quantity of water diverted to the powerhouse.	Potential water quality impact in 6,800-foot reach of the Wynoochee River between the weir and the hatchery outlet if extreme low flows occur (April-June). Impacts would primarily be reduced visual esthetics and reduced aquatic habitat. Potential water quality reduction in 250-foot reach between dam and the

TABLE EIS-1 (con.)

Category	Base Condition	Alternative Plan 1 Without Condition - Most Probable Future Without Federal Action	Alternative Plan [illegible] Hydropower and Enhancement Fish Hatchery
			existing overflow weir. Water would be bonded in this reach when reservoir releases are no greater than the quantity of water diverted to the powerhouse. Impacts to water quality would not be significant.
		Short-term water quality impacts associated with potential construction of non-Federal hydropower and habitat improvement measures.	
			Hatchery discharge may result in increased aquatic productivity and an alteration in the aquatic benthic community in the area near the effluent outlet, a possible benefit (no impact because aquatic productivity in the river is rather low naturally).
			Water supply downstream of the hatchery would not be affected.
			Short-term impacts to water quality would be associated with project construction.
			A multilevel intake structure would maintain preproject water quality from reservoir releases.
Noise	Plan area located within Olympic National Forest. Human related noise is associated with logging operations, low density recreation, and operation of Wynoochee Lake project. Area is largely forested and undeveloped.	Increased noise associated with potential construction of non-Federal hydropower facility. Long-term impact should be minimal.	Increased noise associated with project construction. Long-term permanent increase in noise levels and traffic due to project operation, residences, and increased recreational fishery.
Air Quality	High level of air quality.	Short-term associated with potential construction of non-Federal hydropower.	Short-term associated with construction. Long-term associated with increased traffic.
Flood Plain (Executive Order 11988)	Wynoochee Valley flood plain.	Minor potential impact from implementation of fish habitat improvements.	Minor potential impact from construction of satellite fish stations.
Threatened and Endangered Species	Bald eagle is known to exist in the study area; no reported nesting in the area of the Wynoochee Lake project.	Continued existence of bald eagle would not be expected to be jeopardized; although, use in the area could decrease with decreasing available food supply (anadromous fish).	Continued existence of bald eagle would not be jeopardized. Threatened and endangered species analysis for the satellite fish stations would be accomplished in AE&D when the stations are sited.
Wildlife	Resident and migratory elk and deer; numerous small mammal and bird species.	Temporary disruption during potential construction of non-Federal hydropower and habitat improvement measures.	Temporary disruption during construction. Long-term permanent changes in habitat due to hatchery construction. Permanent losses would total approximately 50 acres of rain forest vegetation, of which 25 acres are considered old growth and constitute critical elk winter range. Big game use of the hatchery site would be lost and use would be reduced in the area around the hatchery due to increased human disturbance.

TABLE EIS-1 (con.)

Category	Base Condition	Alternative Plan 1 - Without Condition - Most Probable Future Without Federal Action	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
			Construction of the satellite fish stations would impact wildlife due to loss of approximately 10 acres of habitat and increased human disturbance. Loss of habitat associated with buried transmission line and powerhouse would be minor. Hatchery water supply pipeline would be buried and the corridor reseeded. Reduced habitat in the 6,800-foot reach between the existing overflow weir and the hatchery outlet during critical low flow periods would have minimal impact on wildlife. Impacts to wildlife during ponding in the reach from the Wynoochee Dam to the existing weir would be negligible.
Fish	Resident game species include cutthroat and rainbow trout and whitefish. Anadromous species in the Wynoochee River include coho, chum, fall chinook, and a few spring chinook salmon, and steelhead and searun cutthroat trout.	Minor fish improvement; however, overall declining trend expected to continue.	Enhancement of anadromous fish runs in Grays Harbor area, in the Chehalis River Basin and other Washington coastal streams, and in the northern Pacific Ocean. Provides opportunity for improvement of anadromous fish runs in river systems in vicinity of the Wynoochee River through development of satellite fish stations and implementation of an outplanting program. Anadromous fish runs above Wynoochee Dam would be terminated; the resident fishery in Wynoochee Lake should improve. Potential adverse impacts on resident fishery in the 6,800-foot reach of the Wynoochee River between the existing overflow weir and the hatchery outlet from reduced aquatic habitat during critical low flow periods (Apr-Jun). Impacts to fish as a result of ponding in the reach from the dam to the existing overflow weir would be negligible.
Cultural Resources	No evidence of cultural resources found in the plan area.	No impact to any known cultural resources.	No impact to any known cultural resources. Cultural resources reconnaissances for the satellite fish stations would be accomplished in AE&D when the stations are sited.
Prime and Unique Farmlands	None in Wynoochee River valley.	No impact.	No impact.
Wild and Scenic Rivers Value	The Hoh River, a potential river for placement of a satellite fish station under alternative plan 2, is listed on the nationwide rivers inventory.	No impact expected.	Potential construction of a satellite fish station and enhancement of fish runs would be expected to contribute positively to the wild and scenic river values of the Hoh River.
	The West Fork of the Humptulips River is listed on the nationwide rivers inventory and would be crossed by the transmission line under alternative plans 1 and 2.		No impact expected from construction of a buried transmission line. The line would be routed under bridges over stream crossings.
Mineral Resources	Mineral prospects and developments exist in the Wynoochee River Basin for manganese, sand and gravel, and foundry sands. The general location of the hatchery site suggests the potential for placer gold.	No significant impact on any known mineral resource deposits.	No significant impact on any known mineral resource deposits. Local borrow sources would not be significantly depleted by project construction.

TABLE EIS-1 (con.)

Category	Base Condition	Alternative Plan 1 - Without Condition - Most Probable Future Without Federal Action	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
REGIONAL ECONOMIC DEVELOPMENT EFFECTS			
Employment	Employment in Grays Harbor County is dependent upon four basic industries: forest products, tourism, fishing, and	Short-term construction employment opportunities.	Short-term construction and minor long-term project operation employment opportunities.
Community Development, Cohesion, and Public Services	Plan area is located 35 miles from the nearest full service community of Montesano. Limited public services are provided by the logging community of Griesdale, which is located 3 miles from the Wynoochee Lake project residences.	Beneficial impact from potential provision of local power to the Grays Harbor area.	Beneficial impact from provision of local power to the Grays Harbor area. Minor beneficial impact on community development due to enhanced fisheries and resulting increased use of fisheries associated businesses. Increased pressure on existing public services in the plan area.
Net Income to Region	Major contributors to regional economy are forest industry, fisheries, tourism, and agriculture.	Minor beneficial contribution from provision of local power and from minor fish improvements.	Positive contribution to regional economy as a result of enhancement of anadromous fish available for harvest.
Displacement of People, Businesses, and Farms	Not applicable.	No impact.	No impact.
Safety and Well-Being	Not applicable.	Moderate contribution from provision of energy; minor contribution from fish habitat improvement measures.	Moderate contribution from provision of energy; major contribution to fishing livelihood in Chehalis River Basin and Grays Harbor area. Potential for contribution to fishing livelihood in other Washington coastal rivers.
Long-Term Productivity	Plan area contains significant forest and water resources which contribute to its long-term productivity to man and to fish and wildlife.	Makes use of a renewable resource for energy production; provides minor fish habitat improvements.	Makes use of a renewable resource for energy production with minimal environmental impacts; provides for major fish enhancement in the Chehalis River Basin and Grays Harbor area. Also provides an opportunity to improve anadromous fish runs in other Washington coastal rivers through development of satellite fish stations.
Recreation	Plan area includes developed campgrounds and a trail system managed by the U.S. Forest Service and day use facilities managed by the Corps of Engineers as part of the Wynoochee Lake project. Dispersed recreation use of the area is popular and includes use of the hatchery site at an average rate of 300 visitor days per year.	Minor, due to some potential increase in recreational fishery. Potential short-term disruption to area recreational activities if non-Federal hydropower is developed.	Major increase in area recreational fishery. Loss of hunting use of hatchery site. Change in dispersed recreation character of the hatchery site from overnight camping and water-related activities to hatchery visitation and limited picnicking and hiking. Short-term disruption to area recreational activities during project construction.
Property Values and Tax Revenues	Most of the plan area is under Federal ownership and thus is removed from the tax base. Some land is under the private ownership of Simpson Timber Company and ITT Rayonier.	An aerial transmission line would result in adverse impacts due to some removal of private lands for use as the transmission corridor if non-Federal hydropower is developed. No impact is expected if the transmission line is buried.	No impact expected.

TABLE EIS-1 (con.)

Category	Base Condition	Alternative Plan 1 - Without Condition - Most Probable Future Without Federal Action	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
Energy	The existing Wynoochee Dam provides the opportunity for hydropower development.	May contribute approximately 37,400 MW hours of energy to the Grays Harbor area.	Contributes 37,400 MW hours of energy to the Pacific Northwest.
OTHER SOCIAL EFFECTS			
Esthetics	Plan area setting includes evidence of man's impact on the landscape combined with the natural character of the rain forest, steep canyon gorges, and the Wynoochee River.	Short-term effects during potential construction of non-Federal hydropower. Long-term effects due to powerhouse, switchyard, and transmission line.	Short-term effects during construction. Long-term effects due to hatchery, satellite fish stations, switchyard, and by hatchery operation resulting in low flows in the reach of Wynoochee River between existing overflow weir and hatchery outlet in certain times of the year and ponding in reach between dam and existing weir. Instream flows will be determined during AE&D. Terrestrial esthetic impacts would be reduced by native grass seeding and landscape plantings. A buried transmission line would have minimal esthetic impact.
Energy Requirements and Energy Conservation	Both structural and conservation methods are considered necessary to relieve the potential energy deficits in the Pacific Northwest.	Would contribute energy to Grays Harbor area and provide station power to existing dam if non-Federal hydropower is developed.	Would contribute energy to the Grays Harbor area and provide station power to the existing dam. The energy requirement of this alternative is minimized by use of a gravity feed water supply pipeline to the hatchery.
Land Use	Land use in plan area consists primarily of national forest, logging, and the Wynoochee Lake project.	Extent of impact would depend upon transmission line alternative.	Construction of fish hatchery would result in a change in land use classification of the hatchery site from its current designation under the U.S. Forest Service timber management plan of "visual variety A." Powerhouse, switchyard, and a buried transmission line would have minimal impacts on land use.

SECTION 3. AFFECTED ENVIRONMENT

3.01 Study and Plan Areas. The study area for the Wynoochee hydropower/fish hatchery study is the Chehalis River Basin and Grays Harbor area in west central Washington. This area includes the Wynoochee River Basin and the plan area in the immediate vicinity around the Wynoochee Dam (refer to paragraphs 1.03 and 1.04 and figures 1 and 2 of the draft feasibility report). Wynoochee Dam, constructed from 1969 to 1972, is a concrete and earthfill dam at river mile (R.M.) 51.8 of the Wynoochee River, a tributary of the Chehalis River in Grays Harbor County, Washington.

3.02 As the Wynoochee hydropower/fish hatchery study progressed, the potential of the Wynoochee hatchery as a regional facility was recognized by the various resource agencies and interested parties involved in study planning. Such a facility would involve an outplanting program and/or construction of satellite fish stations resulting in the enhancement of not only the Chehalis River Basin but also other nearby Washington coastal rivers, such as the Hoh, Queets, Quinault, and Humptulips Rivers. To allow for the development of the Wynoochee hatchery as a Washington coastal facility, provision for two satellite fish stations was added to the tentatively selected plan. The detailed design and siting of these facilities would be accomplished during advanced engineering and design studies when the details of the hatchery and its management are formulated through coordination with resource agencies, Indian tribes, and other interested parties. The siting of the satellite stations, the environment they would affect, and their impacts on that environment will be specifically addressed in a supplemental environmental document prepared during advanced engineering and design. Refer to paragraph 4.09j of the draft feasibility report, paragraph 2.02b(1) and (2) of the draft EIS, and section 3 of appendix H, for additional information regarding the satellite fish stations.

3.03 Environmental Conditions. The Wynoochee River originates on the southern slopes of the Olympic Mountains within the Olympic National Forest. At R.M. 62, it plunges over Wynoochee Falls and meanders approximately 4 to 5 miles before entering the full pool reservoir area of the Corps of Engineers' Wynoochee Lake project at R.M. 51.8. Downstream of the dam, the river flows through alternating gorges and open brushy bottomland and at R.M. 27 opens into a 1/2-mile-wide valley. The lower mile of the river crosses the Chehalis River flood plain and is under tidal influence. The confluence of the Wynoochee River with the Chehalis River is approximately 13 miles upstream of the mouth of the Chehalis River which flows into Grays Harbor.

3.04 The reach of the Wynoochee River in the plan area lies within the boundaries of the Olympic National Forest. Water within this reach is regulated by the Wynoochee Dam for provision of water supply for the Aberdeen-Hoquiam industrial area in Grays Harbor, for irrigation of

Wynoochee Valley farmland, for winter flood control, and for fish enhancement measures. The surface water quality is classified as Class AA (stipulating management of the water resources quality for potable water use, fishing, swimming, and fish and shellfish reproduction and rearing) by the State of Washington.

3.05 Vegetation of the area is that typical of a northwestern rain forest, with western hemlock being the climax species and Douglas fir the subclimax species. Wildlife includes a diversity of mammalian species, including Roosevelt elk, Columbia black-tailed deer, and numerous bird species, including the bald eagle, federally listed as threatened in Washington State. Anadromous fish that spawn in the Wynoochee River include coho, fall chinook, and chum salmon; cutthroat and steelhead trout; and Dolly Varden, contributing to the commercial, Indian, and sport fishery in the region. Spring chinook salmon utilized the river at one time; however, the run is now nearly nonexistent. Resident fish include cutthroat and rainbow trout and whitefish. Suckers, squawfish, and other nongame species are also present. An average of about 5,000 coho salmon, 2,500 chum salmon, 2,000 fall chinook salmon, 4,300 steelhead trout, 3,300 searun cutthroat trout, and a few spring chinook salmon enter the Wynoochee River annually. Chum salmon spawn primarily in the lower 40 miles of the river. Spring chinook salmon spawn in the main river above the Wynoochee Lake project. (About eight spring chinook were seen in the first year of operation of the Wynoochee fish collection facility; then the run dropped to zero. In 1979, spring chinook were again seen at Wynoochee, returning from hatchery plants made by the WDF.) Approximately 75 percent of the fall chinook salmon spawn in the lower 40 miles of the river, with the remaining spawning in the lower reaches of Carter and Shaefer Creeks. Steelhead and searun cutthroat trout spawn in the main river and tributaries from tidewater to the upstream limit of migration at R.M. 62 above Wynoochee Dam. Lands in the vicinity of the plan area are primarily owned and managed by the USFS for recreation, wildlife, and timber production.

3.06 Significant Resources.

a. Physical Features of the Plan Area. The most significant physical features of the plan area are the Wynoochee River and the Wynoochee Lake project. The present topography of the area has resulted from a long period of erosion by the river forming a deep rock canyon, and from the dam which impounded the river to create a 1,170-acre lake. The functioning of the Wynoochee River and Wynoochee Lake project contributes to the provision of significant resources to the region, including fish and wildlife habitat, water supply for industrial use and irrigation, and recreation. Preservation of the current good water quality and regulation of streamflows are essential for maintaining a balance among the various uses of the Wynoochee River. To provide for a balanced program, the existing Wynoochee Lake project includes both fish passage and operational features to reduce adverse impacts on anadromous fish runs. These features include multilevel withdrawal passages in the dam

to permit selective withdrawal of water from the reservoir for temperature control and passage of salmonid smolts; a concrete existing overflow weir located approximately 250 feet below the dam to regulate depth of water and assure that downstream adult steelhead migrants exit the conduit under water to minimize injuries; and a concrete barrier dam 2.2 miles downstream of the dam where adult salmon and steelhead are collected, transferred to fish haul trucks, and released in the river above the lake to spawn naturally. The existing Wynoochee Lake project is operated to reduce discharges in the lower reaches during winter floods, to augment natural flows during the dry summer season for industrial water supply and irrigation, and to improve fish rearing habitat and fish migration. Refer to paragraphs 1.04 through 1.06 of the draft feasibility report for additional information regarding the existing Wynoochee Lake project.

b. Biological/Ecological Features of the Plan Area. The most significant biological/ecological features of the plan area are the vegetation, the river, and the fish and wildlife which depend on those features for their habitat. The Wynoochee plan area lies within the western hemlock vegetation zone. The canopy is dominated by mixed stands of western hemlock (the climax species) and Douglas fir, interspersed with large stands of bigleaf maple. The subcanopy is largely dominated by vine maple. The shrub layer is composed of vine maple, cascara, and snowberry in relatively open areas and is virtually nonexistent under closed canopy. The herb layer, which is relatively diverse, especially in the more open areas, is dominated by sword fern and wood sorrel. These species comprise the rain forest community which provides food, cover, and breeding sites for a variety of birds and mammals. A small sedge marsh is found within the plan area on the hatchery site. The marsh is approximately 2 acres in size and consists of open water surrounded by stands of sedges and bulrushes. Vegetation along the river's edge beyond the canyon downtream of the Wynoochee Dam consists primarily of a red alder community growing on gravel bars. Clearing of land associated with construction of the Wynoochee Lake project and with logging has resulted in opening up the canopy in some areas within the plan area and has permitted increased sunlight penetration. As a result, understory vegetation along the margins of cleared areas and along the reservoir shoreline has increased. This transition vegetation is diverse in plant life supportive to wildlife.

At present, there are both resident and migratory elk and deer in the plan area, which forms a complete range, having summer, spring, fall, and winter food supplies mixed with protective cover and water. As part of the Wynoochee Lake project, approximately 1,030 acres of rangeland are maintained as mitigation for elk and deer habitat lost by formation of Wynoochee Lake. Bald eagles have been sighted in the plan area during 9 months of the year; most sightings have been during the winter. Bald eagles may be feeding on spawned-out fish carcasses, particularly those in the reach of the river available to anadromous fish. The nearest reported active nest is located in the Olympic National Forest

along a tributary of the Middle Fork Satsop River, about 10 miles from the existing Wynoochee project. A pair of bald eagles has frequently been sighted in the vicinity of Little River, about 5 miles south of the reach of the Wynoochee River within the plan area. The pair is suspected to be nesting in the area, but no nest has been reported. Only one night roost is known from the general vicinity and it is located on the Skokomish Indian Reservation about 20 miles east of the plan area.

The presence of Wynoochee Dam guarantees higher summer flows in the river downstream of the damsite than those under natural pre-Wynoochee Dam conditions. To mitigate the blockage by the dam of anadromous fish runs up the Wynoochee River, coho and spring chinook salmon and steelhead and cutthroat trout are collected 2.2 miles downstream of the dam at R.M. 49.6, trucked upstream, and released to spawn naturally in the river above the Wynoochee reservoir. Upstream migration is naturally blocked at R.M. 61 by Wynoochee Falls. Studies by WDG, WDF, and the Corps of Engineers have shown the runs of anadromous fish have declined since construction of the dam. Accordingly, the state agencies have requested additional mitigation; however, no action has yet occurred (refer to paragraph 1.06 of the draft feasibility report).

In addition to mitigation for the blockage of anadromous fish runs, the Wynoochee Lake project also included mitigation for the loss of steelhead spawning habitat due to inundation by the reservoir. To provide for that mitigation, the Flood Control Act, as amended by Public Law 93-251, 93rd Congress, H.R. 10203, Section 47, dated 7 March 1974, authorized the Corps of Engineers to transfer to the State of Washington, as part of the costs for the existing Wynoochee Lake project, "an amount not to exceed $696,000 for construction of fish hatchery facilities for prevention of loss of natural spawning areas for anadromous trout occasioned by the project construction." Since there was no appreciable spawning of salmon within the inundated area of the reservoir, there was no mitigation for salmon. The WDG is responsible for fulfilling the mitigation agreement for steelhead by developing and operating hatchery facilities to release sufficient steelhead smolts to increase the number of returning adult fish by 1,700 fish over the natural run. Problems have arisen which have prevented the intended expansion of the Aberdeen hatchery by the WDG, and only interim measures to produce steelhead have been undertaken. To date, the WDG has implemented temporary rearing pens in Lake Aberdeen for rearing a portion of the steelhead necessary to mitigate for the existing Wynoochee Dam.

c. Historic and Prehistoric Features of the Plan Area. In 1966, a cultural resource reconnaissance was conducted of the existing Wynoochee Lake project site. On 17 June 1980, a reconnaissance of the Wynoochee hydropower/hatchery plan area was conducted by the Corps of Engineers. Neither reconnaissance found evidence of prehistoric or historic cultural resource sites. Further, a letter dated 20 June 1980 from the Deputy State Historic Preservation Officer (see appendix B) indicated that no archeological or historic resources within the plan area are listed on the National or State Registers of Historic Places or the State Inventory of Historic Places.

d. Socioeconomic Features of the Plan Area. Significant socioeconomic features of the plan area include its timber production potential and the regulation of the river by the Wynoochee Dam for a variety of human uses, including recreation, flood control, irrigation, and industrial water supply. No use of the river is made for domestic water supply. Both raw timber and water supply are provided by the plan area for the Aberdeen-Hoquiam industrial area which is dominated by the forest products industry. Salmon which migrate through the plan area contribute to the commercial and sport fisheries in the Pacific Ocean, the commercial gillnet fishery in Grays Harbor, and the Indian and sport fisheries in the Chehalis and Wynoochee Rivers. The steelhead and searun cutthroat trout contribute to the Indian and sport fisheries in the Chehalis and Wynoochee Rivers and resident fish contribute to the sport fishery in the Wynoochee Valley.

Downstream of the plan area, the flood plain of the Wynoochee Valley consists of some of the most productive bottomlands in Grays Harbor County. Wynoochee Dam was designed with the capability to provide 35 c.f.s. for irrigation needs. The dam also provides an opportunity for hydropower development.

Within the plan area, provision for recreation activities such as dam visitation, camping, picnicking, boating, swimming, and trails has been made. The esthetic setting of the plan area consists of evidence of man's impact on the landscape, including the Wynoochee Dam and support facilities, a campground and trail system, paved roads, and logging, combined with the natural undeveloped character of the rain forest, steep canyon gorges, and the Wynoochee River.

SECTION 4. ENVIRONMENTAL IMPACTS OF FINAL ALTERNATIVE PLANS

4.01 Alternative Plan 1: No Action. Under the no-action plan, there would be no Federal hydropower or enhancement fish hatchery development at Wynoochee Dam. Energy conservation programs and renewable resources development by public and private utilities and state and local governments would continue. Fish habitat improvement measures and fishery management by state fisheries agencies would also continue. There is a possibility of non-Federal hydropower development at Wynoochee Dam as discussed in paragraphs 3.06a and 5.03g of the draft feasibility report. Although the enhancement fish hatchery site has been recognized as a quality site by non-Federal entities, there are no proposals for complete non-Federal development of an enhancement fish hatchery at Wynoochee Dam. Without a major enhancement program, fish runs are expected to remain status quo or continue to decline within the Chehalis River Basin and other Washington coastal rivers with resulting impacts on the available commercial, Indian, and recreational fisheries and potential annual economic losses in harvest value.

4.02 Alternative Plan 2: Combined Underground Hydropower and Enhancement Fish Hatchery (National Economic Development Plan/Environmental Quality Plan/Tentatively Selected Plan).

a. Physical Impacts and Their Significance.

(1) Air Quality, Noise, and Traffic. Increased noise and exhaust emission levels are unavoidable during project construction. Construction activities, including heavy equipment operation, stripping, stockpiling of soil materials, and clearing and disposal of vegetation, would cause temporary impacts to air quality due to exhaust emissions and dust. These impacts are of short duration and are not considered significant. Dust would be minimized by sprinkling haul roads and construction areas with water, as necessary.

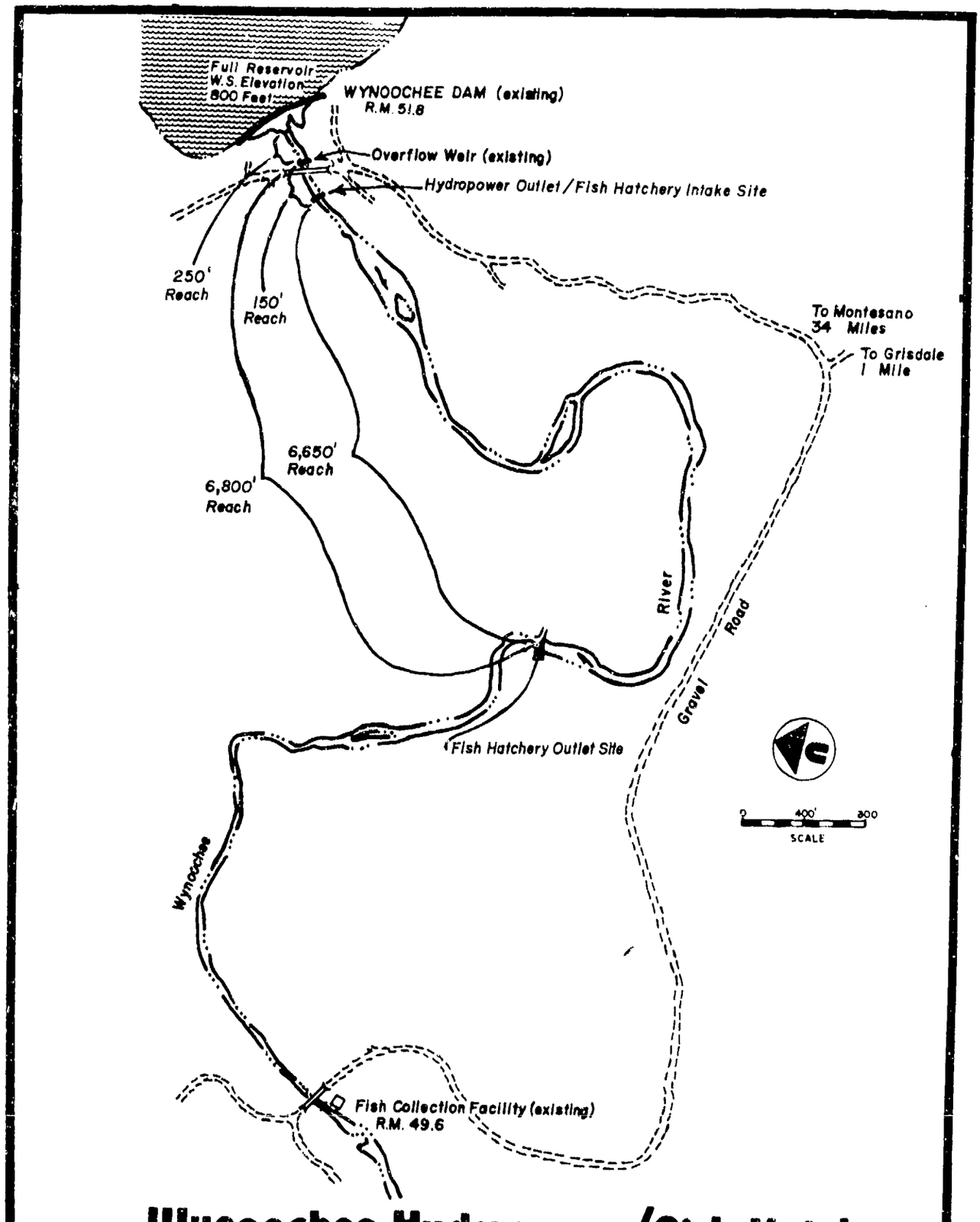
The completed plan would result in long-term permanent increases in noise levels and traffic due to operation activities, residences in the plan area, and increased recreational fishery; however, the impacts that would be imposed upon existing activities in the area are not expected to be significant. Further, any noise from the project would be buffered by the surrounding rain forest. Minor long-term impacts to air quality from exhaust emissions and dust associated with increased vehicular activity in the plan area would result from plan implementation. Continued coordination with the USFS and Simpson Timber Company regarding road easements and use standards during project design and construction should minimize any short-term construction and long-term project operation-related impacts to traffic movement in this area of the Olympic National Forest. The existing access road to the hatchery site would be improved and utilized for access to the hatchery.

(2) Water Quality and Supply. The Wynoochee hatchery is designed for a water supply of 190 c.f.s. Except for the months of May and June, 190 c.f.s. is the operational minimum flow from the existing Wynoochee Dam. In May and June, the operational minimum flow may drop to 140 c.f.s. The powerhouse is designed to utilize the 190/140 c.f.s. minimum flow from the existing project up to a hydraulic capacity of 1,200 c.f.s. Water supply to the hatchery and the operation of the powerhouse would not result in a change to the existing operational mode of Wynoochee Dam. River discharge frequency in the Wynoochee River would not change from existing conditions. The powerhouse would operate as baseload and would not be operated for peaking. Accordingly, there is no anticipated stranding of juvenile fish from river fluctuations due to operation of the powerhouse.

Discharge from the reservoir that is not passed through the powerhouse would be discharged from the existing dam's spillway, sluiceways, and/or multilevel outlets. Flows from the powerhouse that are not passed to the hatchery would be discharged to the Wynoochee River via a tailrace tunnel structure located about 400 feet downstream of Wynoochee Dam. The concrete overflow weir in the river just upstream of the powerhouse tailrace would assure water in the river between the main dam and the weir. The water supply system to the hatchery is designed with an intake structure at the hydropower outlet, which is supplied with water from the powerhouse and dam discharges. Accordingly, should the powerhouse be shut down for any reason, water supply to the hatchery would not be interrupted.

Due to the diversion of up to 1,200 c.f.s. of reservoir releases to the hydropower facility, the water in the 250-foot reach (refer to figure EIS-1) of the Wynoochee River from the dam to the existing weir would be ponded rather than flowing when releases from the reservoir are 1,200 c.f.s. or less and that quantity is discharged through the powerhouse. This condition would occur in the late spring through summer months and could last throughout the entire year. As a result of ponded conditions, chemical elements and biological organisms would increase, although some dilution would be expected as a result of seepage from the reservoir. When the reservoir release exceeds 1,200 c.f.s. and the water is forced out of the ponded area and into the mainstream of the Wynoochee River, the temperature and dissolved elements would be rapidly diluted and would have no significant impact on the overall water quality of the reach of the Wynoochee River between the dam and the hatchery outlet and no measurable impact on the ambient hatchery outflow conditions.

Flows in the Wynoochee River in the 6,800-foot reach (refer to figure EIS-1) between the existing overflow weir (located approximately 150 feet upstream of the hydropower outlet/fish hatchery intake structure) and the hatchery outlet could become extremely low should the full complement of water (190/140 c.f.s.) be supplied to the hatchery during a time of minimum discharge (190/140 c.f.s.) from the reservoir. The



Wynoochee Hydropower/Fish Hatchery Plan Area

(Showing Referenced River Reaches)

Figure EIS-1

critical period when discharge from the reservoir may only be 190 c.f.s. is April through May; the critical period when discharge could drop to 140 c.f.s. is May through June. During the spring refill period (April-May) for the reservoir, the Grisdale streamgage located 2,000 feet downstream of Wynoochee Dam records approximately 20 c.f.s. more streamflow than the Wynoochee Lake project releases according to operational controls. This flow is due to groundwater inflow from seeps and springs. Accordingly, it is not anticipated that the reach of the river between the existing overflow weir and the hatchery outlet would be dry should the supply to the hatchery ever equal the total discharge of the powerhouse. During extremely low flow periods, under the "worst case" condition of no flow in the reach between the existing overflow weir and the outlet other than 20 c.f.s. from ground water springs and seepage, the river would resemble a small channel with a wide gravel and rock streambed and pools possibly formed in shallow holes, providing habitat for a small aquatic community of algae and invertebrates. Any shallow water communities would be scoured as soon as reservoir releases are increased. The low flow condition would be temporary and of short duration and would not be expected to result in significant impacts from nuisance algal growth, odor problems, or low dissolved oxygen levels. Some stranding and subsequent mortality of resident fish could occur during a reduction in stream discharge. Decomposition of fish carcasses would cause some minor organic nutrient loading to the river. Any contribution would be diluted in the Wynoochee River below the hatchery outlet.

In addition to low flows when the full 190/140 c.f.s. minimum discharge from the reservoir is supplied to the hatchery, the 150-foot reach (refer to figure EIS-1) between the existing overflow weir and the hydropower outlet/fish hatchery intake structure would be receiving no discharge from the Wynoochee Dam when releases from the reservoir are 1,200 c.f.s. or less and that quantity is diverted to the powerhouse. This condition could potentially occur throughout most of the year. During times when the minimum discharge from the reservoir may be 190/140 c.f.s. (April through June), the 150-foot reach would receive some inflow from groundwater springs and seepage. During times when minimum reservoir discharge exceeds 190 c.f.s. and all reservoir releases (up to 1,200 c.f.s.) are diverted to the powerhouse, any flow above 190 c.f.s. would be released to the river at the hydropower outlet/fish hatchery intake structure and would create a backwater effect in the 150-foot reach. It is therefore expected that impacts associated with low flows in the 150-foot reach would essentially be the same as those associated with low flows in the 6,650-foot reach (refer to figure EIS-1) of the Wynoochee River from the hydropower outlet/fish hatchery intake structure to the hatchery outlet. For purposes of impact discussion, the 150-foot reach plus the 6,650-foot reach are treated as one 6,800-foot reach from the existing overflow weir to the hatchery outlet.

Coordination has been ongoing with the State of Washington including the Washington Department of Ecology (WDE), WDF, and WDG regarding the instream flow issues related to the tentatively selected plan. The

determination of an instream flow requirement is based primarily on fish, wildlife, navigation, recreation, water quality and esthetic considerations. In this case, another consideration in determining an instream flow would be the impacts of any flow requirement on the hatchery operation and production capability. Until the hatchery details, including the specific species, numbers of fish, specific water requirements, and management are determined in advanced engineering and design, establishment of an instream flow would be premature and could jeopardize making full use of the available water supply in design of the hatchery in the feasibility planning stage. WDG, WDF, and WDE have agreed that instream flows for the reach of the Wynoochee River between the Wynoochee Dam and the hatchery outlet would be determined during advanced engineering and design studies. Refer to section 2 of appendix H for additional details regarding the instream flow analysis performed for the Wynoochee hydropower/fish hatchery plan.

As presented in section 1 of appendix H, the water quality of the Wynoochee River in the plan area is good and very suitable for a hatchery water supply. During the project construction period, water quality would be impaired. Construction of the powerhouse intake and outlet structures would result in short-term, localized increases in suspended sediment and turbidity in the reservoir and river in the area of the construction site. The powerhouse intake structure would be sited on a bench at elevation 720 feet on the right bank adjacent to the upstream side of the dam. For ease of construction and to minimize impacts to water quality, the reservoir level would be drawn down to elevation 720 feet (note that low pool is 700 feet and full pool is 800 feet) and the powerhouse intake constructed in the dry. The intake facility would be made from precast structures to minimize the time of construction and time the reservoir would be drawn down. The drawdown for construction of the intake structure would not jeopardize meeting minimum flows in the river. A cofferdam would be used for construction of the powerhouse outlet structure to minimize impacts to water quality.

Short-term localized increases in suspended sediment and turbidity would occur in the Wynoochee River during instream construction of the hatchery supply pipeline and the hatchery outlet channel. Surface water runoff from the hatchery construction site may also cause an increase in turbidity of the river. Although increases in turbidity may result in exceeding the Washington State water quality standard, the effect on water quality is not considered significant due to the short-term, localized nature of the impact. The construction contractor(s) would be required to utilize methods which would minimize turbidity. Cofferdams would be used for instream construction of the hatchery supply pipeline crossings and the hatchery outlet channel. Pursuant to Section 404 of the Clean

Water Act of 1977, a water quality and ecologic evaluation of the proposed construction activities involving fill into waters of the United States and adjacent wetlands has been accomplished and has identified no significant environmental effects resulting from instream construction activities (refer to appendix A). Any necessary Section 404 actions required for construction of the satellite fish stations would be accomplished during advanced engineering and design studies when siting and detailed design of such stations are determined.

The powerhouse intake would be a multilevel intake structure to maintain preproject water quality from reservoir releases. The hatchery effluent could affect water quality of the Wynoochee River. With the hatchery, organic waste solids consisting of fecal material, dead fish, and unconsumed food and debris would increase the biochemical oxygen demand of the effluent receiving waters. Nitrogen and phosphorus residue from the feed used may also cause an increase in those constituents in the effluent receiving waters. The cumulative effect may be an increase in aquatic productivity and an alteration in the aquatic benthic community in the area near the effluent outlet. The impact may be beneficial because aquatic productivity in the river is rather low naturally.

As a plan feature of the hatchery, a pollution abatement pond would be constructed for treatment of the water from the raceways and rearing ponds during cleaning. The chemotherapeutics that are routinely used as drips or baths at hatcheries include potassium permanganate ($KMnO_4$), Hyamine 3500 (a quaternary ammonium compound), formalin, and diquat (a herbicide). Use of diquat could potentially result in some loss of aquatic vegetation downstream of the hatchery outlet; however, this would not be expected to occur if label requirements for use are followed. Additionally, when chemotherapeutics are used in large doses, the waters would be routed to the pollution abatement pond.

The hatchery would be operated to meet the effluent limitations established by the EPA for suspended and settleable solids, and the limitations for other parameters (biological oxygen demand, nitrates, ammonia, fecal coliforms, etc.) as determined by the WDE in cooperation with the WDG and WDF. Water quality monitoring would be accomplished at the outlet, and if allowable limits were approached, provision would be made for treatment of the effluent water prior to release to the river.

The carcasses of returning adult salmon and steelhead used for spawning or surplus to spawning needs would be sold commercially under WDG and WDF policies or disposed of in an approved landfill. These procedures, as required by Federal law, would preclude impacts to the water quality of the Wynoochee River. All domestic wastes from the hatchery and residences would be treated by a septic tank system. The powerhouse would not need to have its own septic tank due to its proximity to the existing visitor center restrooms and septic tank. Water uses downstream of the project are fish spawning and rearing, irrigation withdrawals, and industrial water withdrawal by the city of Aberdeen. No municipal water withdrawals are presently in existence or planned.

(3) Mineral Resources. The tentatively selected plan would have no significant impact on any known mineral resources. According to the Bureau of Mines, the general location of the hatchery suggests that the site may contain placer gold. This possibility would be investigated in advanced engineering and design studies and, should gold be found in econ mically valuable concentrations, its removal by private industry may be permitted prior to hatchery construction.

Local borrow sources would be utilized for construction of the tentatively selected plan and would not be significantly depleted. The fish hatchery site would serve as a source of concrete aggregate for the construction of the hydropower facility. Riprap for the area of the hatchery site subject to severe erosion (see plate 2) may be obtained from a nearby quarry 0.5 mile west of the Wynoochee Dam. Approximately 20,000 cubic yards of rock from excavation can be disposed of in the concrete aggregate borrow excavation and/or used for site grading at the fish hatchery site. To the extent possible, precast structures would be utilized in construction of the plan.

b. Biological/Ecological Impacts and Their Significance.

(1) Vegetation. The construction site for the underground powerhouse is under an existing visitors' parking lot for the Wynoochee Dam. Accordingly, construction of the powerhouse would result in negligible removal of natural vegetation. Construction of the surface switchyard would also result in negligible impact to vegetation. Should temporary staging and stockpiling areas result in removal or disturbance of natural vegetation, the areas would be planted after use with native plant species.

The 22-mile buried power transmission line would be placed within the existing power right-of-way adjacent to Donkey Creek Road from Wynoochee Dam to the Promised Land substation near U.S. Highway 101. Vegetation along the road is Olympic rain forest, large areas of which are managed forest lands and have been disturbed by logging practices. The buried transmission line would result in minor loss of vegetation and is considered the least environmentally damaging transmission line alternative. An aerial line designed to minimize vegetation losses to the extent possible would require clearing of an approximate 12 to 15-foot corridor along Donkey Creek Road and topping or selective removal of adjacent danger trees. Preliminary estimates are that a maximum of 25 percent of the 22-mile route from the dam to the substation would be located away from the road. Using a design to minimize vegetation losses, it is estimated that an 83-foot corridor or approximately 99 acres of forest would be cleared. Measures to reduce the impacts of this lost habitat could include planting within the corridor to accelerate habitat restoration. The USFS values the timber resource losses associated with taking forest land out of production as approximately $28,000 per mile per year. Refer to the EIS summary and paragraph 2.02(2) of the draft EIS for additional information regarding the transmission line.

Construction of the hatchery and appurtenant facilities (e.g., residences) would result in the loss of approximately 55 acres (50 acres at the hatchery site; 5 acres along the pipeline corridor) of Olympic rain forest vegetation consisting of two primary vegetation associations: (1) bigleaf maple (Acer macrophylum)/western hemlock (Tsuga heterophylla) and (2) bigleaf maple/sword fern (Polystichum munitum). Due to selective logging of the area in the past, the hatchery site provides a more diverse habitat than a typical mature western rain forest in which the screening effect of hemlocks and bigleaf maples effectively prevents sunlight from reaching the forest floor and thus prevents the growth of a diverse understory. The hatchery would be constructed adjacent to the Wynoochee River on a low elevation bench forested predominantly by deciduous bottomland species. Away from the river at higher elevations next to the hatchery location, vegetation is principally mature coniferous forest. The USFS has classified the area of the hatchery location as old growth forest.1/ The project associated loss of habitat at the hatchery site would adversely impact the local wildlife community as well as the migratory big game which utilize the hatchery site as winter range.

To the extent possible, hatchery plans would be designed to reduce the loss of vegetation, including use of the existing access road to the site. Further, the construction contractor would be required to replace vegetation losses in temporary construction easements. Hatchery grounds would be seeded with native grass species and the area would be landscaped with native plant species, providing limited wildlife value. The 2,400-foot pipeline from the powerhouse to the hatchery would be buried, minimizing its permanent impact on vegetation. Following construction, the pipeline corridor would be seeded with native grass species to aid in the natural reestablishment of vegetation. The two satellite fish stations would require approximately 10 acres for their construction. The specific impact of this construction on vegetation would be assessed during advanced engineering and design when the exact locations of the stations are determined.

Wetland areas occur within the hatchery site and vicinity. Construction of some of the hatchery ponds would result in the loss of a 2-acre sedge marsh or 0.2 percent of the total acreage of wetlands estimated in the Wynoochee drainage. The impacts resulting from this loss are not considered to be significant. The ponds and other hatchery facilities, including the satellite fish stations, would be sited to avoid wetland areas to the extent possible.

1/Old growth forest is defined by USFS (Shelton Ranger District) as a stand of trees dominated by coniferous trees which are an average age of 334 years old. Stands will usually contain a multi-layered canopy and trees of several age classes.

The aquatic benthic community in the Wynoochee River near the hatchery effluent outlet would be expected to change as a result of increased aquatic productivity (refer to paragraph 4.02a(2) of the draft EIS). This impact may be beneficial because the aquatic productivity in the river is rather low naturally. Impacts of hatchery effluent on surface waters and aquatic vegetation would be monitored as previously discussed. During low flow periods, aquatic habitat in the 6,800-foot reach between the existing overflow weir and the hatchery outlet would be reduced. In terms of the total productivity of the system, this would not result in significant impacts.

(2) Wildlife. Project-related impacts to wildlife would result from temporary disruption during construction of the powerhouse, switchyard, transmission line, pipeline, satellite fish stations, hatchery, and associated facilities and from long-term permanent changes in habitat. Wildlife usage at the underground powerhouse and switchyard sites is negligible and any impacts from construction would be negligible. Impacts to wildlife from construction of the buried transmission line would not be significant. Both beneficial and adverse wildlife impacts would occur from an aerial transmission line. Adverse impacts would result from the loss of habitat associated with clearing for the transmission corridor with subsequent impacts on local wildlife populations. Beneficial impacts would result from opening up the forest canopy and providing increased forage for big game mammals, such as deer and elk. Reestablishment of some vegetation could be accelerated by planting within the corridor. Adverse impacts to big game could result from attraction of these animals to the corridor along the Donkey Creek Road with a potential for an increase in road kills.

During construction, the removal of vegetation and other activities would drive away most resident wildlife species at the hatchery site and within the pipeline corridor. Losses of habitat at the hatchery site would total approximately 50 acres of rain forest, including 7 acres of sedge marsh. Five acres of habitat would be lost due to construction of the water supply pipeline; however, the pipeline would be buried and the corridor reseeded, and habitat would reestablish.

Usage of the hatchery site by big game mammals (i.e., deer and elk) would be lost with potential resulting decreases in numbers of both resident and migratory populations. The USFS has classified the area of the hatchery site as elk winter range and has expressed particular concern for the losses of elk habitat associated with construction of the fish hatchery. The elk population in the Shelton Ranger District is currently thought to be limited by the carrying capacity of the winter range below 1,500-foot elevation, which is further limited by the amount of old growth, the preferred winter habitat. A specific analysis was

performed to determine the extent of the impact to elk winter range from construction of the Wynoochee hydropower/fish hatchery plan. The significance of the impact was examined on a local (Wynoochee drainage[1/]) as well as a Shelton Ranger District-wide[2/] basis. For the purposes of this analysis, an estimate of 50 percent of the hatchery site or 25 acres has been considered old growth, or critical elk winter range. Two to three small bands of elk (approximately 10 elk total) are estimated to utilize the area of the hatchery site as part of their winter range, although no specific population studies have been performed. The loss of 50 acres of elk winter range represents 0.3 percent and 0.1 percent of the estimated winter range in the Wynoochee drainage basin and Shelton Ranger District, respectively. The loss of 25 acres of old growth represents 0.4 percent and 0.2 percent of the critical winter range in the Wynoochee drainage basin and Shelton Ranger District, respectively. The loss of winter range would eliminate elk use of the hatchery site.

According to the USFS, an additional 100 acres of winter range would be secondarily impacted by the increased human and vehicular disturbance associated with the hatchery complex. The impact would be an expected reduction in use of the area by elk. Under the existing condition, the hatchery site lies within areas of secondary impact as a result of the Wynoochee Lake project, the existing hatchery site access road, and the recreational use of the site. The construction of the hatchery would contribute to the reduced availability of the habitat surrounding the hatchery site to some unknown extent. Secondary impacts could be minimized by a vegetative buffer zone around the hatchery complex and by leaving stands of trees in wind-firm areas.

Considering both primary and secondary impacts, the total elk impact area associated with hatchery construction would be 150 acres or 0.1 percent and 0.3 percent of the total winter range in the Wynoochee drainage basin and Shelton Ranger District, respectively. In the context of the overall carrying capacity of the Shelton Ranger District and the Wynoochee drainage basin, impacts to elk winter range are not considered to be significant. In the future, as logging of winter range continues over the next 10 years in the Shelton Ranger District and the availability of critical winter range becomes greatly reduced, the impact to elk of losing the hatchery site may increase. However, in view of the small acreage involved at the site relative to the magnitude of planned logging, the large range requirements of elk, and the predicted future condition of limited summer range within the Shelton Ranger District, the future of the elk population in the Shelton Ranger District is not expected to be significantly different with or without the hatchery. For additional detail regarding the elk impacts, refer to section 4 of appendix H.

1/Total Wynoochee drainage includes 37,649 acres.
2/Shelton Ranger District of the Olympic National Forest includes 112,874 acres administered by the USFS and consists of the Wynoochee and Skokomish River Basins.

Some wildlife usage (e.g., songbirds, small mammals) would return at the hatchery site following construction; however, the total habitat provided would be reduced, and to some unknown extent, the resident wildlife populations would be decreased. Additionally, increased human disturbance due to residences, project operation, and traffic would permanently affect the use of the hatchery site by wildlife. Although local wildlife populations would be reduced due to the project, the continued existence of the impacted species in the plan area would not be jeopardized by these losses.

Wildlife usage in the 250-foot reach of the Wynoochee River from the dam to the existing weir is negligible, thus direct impacts to wildlife as a result of the potential ponding of this reach due to implementation of the hydropower/fish hatchery project would not be significant. Project-related low flows in the 6,800-foot reach of the Wynoochee River between the existing overflow weir and the hatchery outlet would adversely impact small mammal and waterfowl populations directly through a reduction in available aquatic habitat and indirectly through a reduction in the food supply of those wildlife species that rely on aquatic organisms for their sustenance. The overall impact to wildlife populations within the plan area would not be significant. Big game mammals would not be expected to be impacted by the potential low flow condition. Fur harvest, upland-game hunting, and waterfowl hunting in the project area are minor and would not be significantly impacted by any impacts to wildlife populations as a result of low instream flow in this reach. For additional information, refer to section 2 of appendix H.

Unavoidable wildlife and habitat losses associated with the tentatively selected plan are considered acceptable tradeoffs in view of the plan's overall net positive benefits to the environment. As discussed in paragraph 4.02b(1) of the draft EIS, to the extent possible, habitat losses associated with the project would be reduced through project design, landscaping, and native seed planting to accelerate natural revegetation.

(3) Fish. The tentatively selected plan would result in a major enhancement of the anadromous fishery in the Grays Harbor area, Chehalis River Basin and other Washington coastal rivers, and in the northern Pacific Ocean. It is estimated that the annual harvest from the hatchery would result in 79,000 spring chinook salmon adults and 50,000 steelhead adults. Grays Harbor appears to be a fertile estuary and salmonid runs are much reduced from historical levels. However, a rearing and release strategy involving broad planting in terms of time, space, and species would tend to minimize any potential for causing an overload on the salmonid-producing environment from too many fish at once. Many streams could be planted from the centrally located Wynoochee site with relatively short haul distances and thus several coastal rivers in Washington, such as the Hoh, Queets, Quinault, Humptulips, Satsop, and Chehalis Rivers, could be enhanced as well as the Wynoochee River. These rivers are currently operating below their production

potential. The tentatively selected plan includes provision for two satellite fish stations which include adult collection and attraction systems, holding facilities and acclimation ponds for the rearing and imprinting of juveniles as discussed in paragraph 4.09j of the draft feasibility report. Adults would be collected at the stations and held until transport to the Wynoochee hatchery for spawning. Progeny of these fish would then be returned to the satellite fish stations for rearing and imprinting and eventually would be released as smolts into their native streams. Some smolts could also be outplanted through a simple release program into other coastal rivers. The siting and final design of these facilities would be determined in advanced engineering and design by the Federal and state fish agencies in coordination with the Indian tribes.

If properly planned, the release of hatchery fish could have minimal adverse impact on existing fish stocks and fisheries. Possible adverse impacts include predation by hatchery fish on native fry, competition by hatchery fish for food and/or space needed by native runs, the introduction of non-endemic diseases, and the promotion of overharvest if hatchery and nonhatchery runs overlap and are indistinguishable in the terminal (river, bay) fisheries. Because the Wynoochee hatchery is proposed as a regional facility for extensive outplantings throughout Grays Harbor and coastal Washington, unnaturally large releases of yearling fish and potentially severe predation would tend to be avoided. Release strategies can also be designed to minimize predation. Competition with native, stream-rearing salmonids can also be avoided by planting at proper times and places. For example, by planting in the late spring when the yearlings are fully smoltified, outmigration to the ocean should occur quickly.

The degree of run timing conflicts of hatchery released fish with native stocks would depend upon choice of stocks. Spring chinook and summer steelhead are the two species with minimum potential for this type of conflict. Native runs for both are so low that harvest management could effectively be designed for targeting on hatchery stocks with high terminal rates of harvest. The hatchery site is above the traditional fishing areas in the basin, thus permitting maximum harvest of the fishery. Further, the site is especially adaptable to rearing of spring chinook salmon, a highly desirable species to the fisheries agencies because production of this species would not impact management of the natural wild salmon stocks. Early winter steelhead overlap in timing with late coho and chum, and could cause some potential sport-commercial conflict. However, if late winter steelhead are to be introduced, harvest management and outplanting strategy would have to proceed cautiously to assure maintenance of the remaining native fish. Local stocks for both steelhead and salmon would be utilized in each river as much as practical to best assure maintenance of natural production of these stocks.

Specific programming of the hatchery in terms of numbers and stocks would be the responsibility of the hatchery owner and operators. Currently, the state manages the Grays Harbor runs on a wild stock basis and expects the same philosophy to prevail in management of the Wynoochee hatchery. Final species selection would be made as a coordinated effort during advanced engineering and design. In general, selection of stocks should include consideration of the following concerns: (1) the need to restrict harvest rates on natural stocks to biologically optimal rates for such stocks; (2) the desire to rebuild native stocks; (3) the maintenance of genetic integrity of wild stocks, and (4) the avoidance of the spread of disease through inter-regional stock transfers. A conceptual plan for management of the Chehalis River Basin fishery should Wynoochee hatchery be constructed has been developed with input from the state and Federal resource agencies and Indian tribes. A summary of the recommendations resulting from the conceptual plan is presented in section 3 of appendix H. The details of such a plan would be formulated during advanced engineering and design to insure maximum efficiency of the hatchery with minimal impacts on native fish stocks. Assessment of the plan's effectiveness would be part of the post-construction monitoring program.

Potential disease problems are an important consideration in development of the hatchery management strategies and would play a critical role in the development of the hatchery design, including species/stock selection, siting of the satellite fish stations, and development of the outplanting program in advanced engineering and design studies and throughout hatchery operation. Prophylactic measures could be implemented such as disease-free certification of stocks brought to the hatchery and use of well-cooked fish food, as well as the appropriate control measures should a disease be contracted. In addition, the hatchery should employ a pathologist. The U.S. Fish and Wildlife Service (FWS) has recommended that baseline disease studies on any river proposed for outplanting be accomplished during advanced engineering and design studies.

With implementation of the Wynoochee hydropower/fish hatchery plan, the Wynoochee Lake project mitigation program of transporting adult salmon and steelhead above Wynoochee Dam would be discontinued, resulting in the loss of the remaining natural production of salmon and steelhead upstream of the dam. As discussed in paragraph 2.02b(3) of the draft EIS and paragraph 4.13 of the draft feasibility report, mitigation for that loss as well as the mitigation obligation of WDG for steelhead under the existing Wynoochee Lake project would be part of the hatchery production. Since the mitigation for steelhead and salmon losses associated with the existing Wynoochee Lake project has not been successful, the Wynoochee hatchery offers an opportunity to incorporate that mitigation into the fish enhancement program.

The overall resident fishery in Wynoochee Lake and River system upstream of the reservoir should improve by implementation of the tentatively selected plan due to elimination of competition between resident fish

and juvenile salmon and steelhead. Under existing conditions, some resident fish (largely cutthroat trout) pass through Wynoochee Dam to the river below. With the project, some fish would be expected to pass also through the turbines of the powerhouse and, of the fish that pass through the reservoir to the downstream Wynoochee River, fewer survivals would result than under the current conditions.

As described in paragraph 4.02a(2) of the draft EIS, with operation of the hatchery, during certain times of the year, exceedingly low flows in the reach of the Wynoochee River between the dam and the hatchery outlet would result in the loss of fish habitat. Existing fish use of the reach consists of use by resident fish species and use as a transportation corridor by juvenile anadromous outmigrants which have passed through the sluiceway or through the existing multilevel outlets in Wynoochee Dam. The upstream limit of adult anadromous fish migration is the fish collection facility at R.M. 49.6 where adult fish are currently collected and then transported above the dam to spawn. Resident game fish in the reach between the Wynoochee Dam and hatchery outlet are rainbow and cutthroat trout, most of which are thought to have passed through Wynoochee Dam from the reservoir. Non-game species, such as suckers and squawfish, which are typical of those found in other Pacific Northwest streams, can be expected to occupy this reach of the Wynoochee River.

With implementation of the Wynoochee hydropower/fish hatchery plan, and subsequent termination of the anadromous fish runs above Wynoochee Dam, the reach between the dam and the hatchery outlet would no longer be utilized as a transportation corridor for juvenile anadromous outmigrants. Other than use by juvenile outmigrants, fish use of the 250-foot reach of the Wynoochee River from the dam to the existing overflow weir is negligible. Thus impacts to fish as a result of ponding in this reach under low flow conditions associated with the tentatively selected plan would be negligible.

Under the worst case condition of no flow to the reach other than the 20 c.f.s. inflow from groundwater springs and seepage, reduced streamflow in the Wynoochee River between the existing overflow weir and the hatchery outlet would limit resident fish populations through a reduction in available aquatic habitat. Existing resident populations are thought to be small, and although they would be locally impacted by reduced flows, in terms of the resident fish populations of the Wynoochee River as a whole, impacts would not be significant. Fishing in this reach of the Wynoochee River is currently closed to the public and would remain closed with implementation of the hydropower/fish hatchery plan. With provision of adequate flow, the potential exists for utilizing the reach between the existing overflow weir and the hatchery outlet for spawning and rearing of anadromous fish. This potential would be investigated during the determination of instream flows (refer to section 2 of appendix H).

Construction plans for the project include development of construction methods for the powerhouse intake structure to minimize the extent and duration of lake drawdown during construction and thus to reduce downstream effects on the fishery and aquatic ecosystem from low discharge during construction. Accordingly, the impact to the fishery and aquatic ecosystem would be minor. Use of cofferdams to construct the hydropower outlet/hatchery intake structure and for placement of the water supply pipeline where it crosses the Wynoochee River would have temporary impacts on resident fish. As discussed in paragraph 2.02b(2) of the draft EIS, the plan is designed to insure a failsafe water supply to the hatchery. The operation of the plan for hydropower would be subordinate to all project purposes, including fish production. For additional detail regarding construction and operation activities, refer to paragraphs 4.17 through 4.23 of the draft feasibility report.

(4) Threatened and Endangered Species. The only threatened and endangered species known to occur in the plan area is the American bald eagle, whose use of the area as a wintering habitat has been observed (refer to letter dated 23 January 1981 from FWS, appendix B). Operation of the tentatively selected plan could potentially affect the eagle in at least two ways: (1) discontinued use of the reach above the Wynoochee Dam for natural steelhead and salmon production would result in the loss of a potential food source (spawned-out fish) to the eagle, and (2) increasing the spawning run below the dam could result in increased use of this reach of the river by the eagle, as some hatchery fish would spawn in the river below the hatchery collection facility. The expected result is a redistribution of wintering eagle use from upstream to downstream areas below Wynoochee Dam. Any potential adverse impacts to eagles wintering in the plan area would be offset by the net enhancement of the eagle food resource as a result of the hatchery. A few potential perching trees would be lost to construction; bald eagle sightings have been recorded for one of those trees. No known nests or roosts would be directly impacted by the tentatively selected plan, although the food resource distribution of nesting or roosting birds would be altered. Pursuant to Section 7(c) of the Endangered Species Act, a biological assessment was performed by the Seattle District, Corps of Engineers, in the winter 1980, to verify eagle use of the Wynoochee area and to evaluate potential impacts on this species as a result of implementation of the tentatively selected plan. The biological assessment concluded that the Wynoochee hydropower/fish hatchery plan would not adversely impact the local, regional, or national bald eagle population and would not jeopardize its continued existence. In a letter dated 20 July 1981 (see appendix B), the FWS expressed their concurrence with the biological assessment. Within the letter, the FWS recommended that all efforts be made to preserve bankside standing timber for use as perch trees, human access be limited immediately below the dam and the collection facilities to reduce disturbance to feeding bald eagles during the fall-winter salmon runs, and the Corps continue monitoring bald eagle numbers and distribution in the plan area. Every effort would be made to preserve vegetation in the plan area, including maintenance of

the known bald eagle perch tree below Wynoochee Dam. Human access to the reach of the Wynoochee River between the dam and the collection facility is currently limited in much of the area due to topography, and public fishing is currently not permitted and would not be permitted with implementation of the tentatively selected plan. Fishing would also be prohibited in a designated zone below the collection facility. The determination of the actual limits of access would be the responsibility of the Federal owner of the hatchery and the State of Washington. The Corps currently has no plans to discontinue eagle counts as part of the existing Wynoochee Lake project. The USFS also maintains records of eagle sitings in the plan area.

Threatened and endangered species requirements for the the satellite fish stations would be accomplished during advanced engineering and design studies when the stations are sited. The results of any necessary biological assessments would be coordinated with the FWS.

c. Historic and Prehistoric Impacts and Their Significance. Implementation of the tentatively selected plan would have no significant impact on the cultural resources of the plan area. A cultural resources reconnaissance of the sites of the satellite fish stations would be accomplished in advanced engineering and design when the locations of the sites are determined. Depending upon the final location of the transmission line, some additional cultural resources reconnaissance may also be necessary along the transmission line corridor.

d. Socioeconomic Impacts and Their Significance.

(1) Energy and Fish Production. The principal beneficial socioeconomic impacts of the tentatively selected plan would be the contribution of the 10.2 MW of capacity and 37,400 MWH per year of energy to the Pacific Northwest power needs and approximately 79,000 adult spring chinook salmon and 50,000 adult steelhead to the annual anadromous fish harvest in the Grays Harbor area, Chehalis River Basin and other Washington coastal rivers, and in the northern Pacific Ocean. Energy from the project would be marketed by the Grays Harbor PUD. The anadromous fish enhancement from the project would constitute a major contribution to the commercial, Indian, and sport fisheries, the demands of which have exceeded the available depressed stocks in the State of Washington.

(2) Esthetics. Short-term esthetic impacts to the plan area would be realized during construction of the tentatively selected plan and attendant clearing, stripping, stockpiling, and staging. Long-term permanent esthetic impacts would be incurred by the transmission line, the powerhouse switchyard, the hatchery and associated facilities, and by hatchery operation during certain periods of the year resulting in low flows in the 6,800-foot reach of the river between the existing overflow weir and the hatchery outlet. The primary esthetic impact from the powerhouse would be from the powerlines leaving the switchyard. The impact would not be significant. The perimeter of the switchyard would

be landscaped to minimize its visual impact. The buried transmission line would be adjacent to the existing road and would have minimal esthetic impact. An aerial transmission line along the existing road would conflict with the USFS's special classification of the route from the Wynoochee Dam to the Promised Land Substation as a visual resource. On the first approximately 14 miles of the 22-mile route, the USFS has easements or use agreements with the private landowner along Donkey Creek Road. New easements and agreements would have to be arranged if an aerial line were located along this road. For the last 8 miles of the route, the USFS owns a 100-foot scenic corridor on both sides of Donkey Creek Road and, in keeping with their policy of buried lines on national forest land, would not permit placement of an aerial line within that corridor. The line would have to be placed away from the road with the tradeoff being a loss of productive timber land. These considerations would be a part of any future detailed transmission line studies.

Visual impacts due to the water supply pipeline would be minimized by burial of the pipeline and native grass seeding of the pipeline corridor to accelerate natural revegetation. The existing access road to the hatchery site would be utilized. Visual impacts of the hatchery itself and the satellite fish stations would be offset by landscape plantings. The hatchery area would be illuminated at night to provide for operation and to discourage vandalism. Lights would be shielded and would not create any significant esthetic problems; further, the hatchery location is several miles from any major thoroughfare. Long-term noise impacts of the tentatively selected plan would be minimal.

During low flow periods (potentially April-June) associated with operation of the Wynoochee hydropower/fish hatchery plan, visual esthetics in the reach of the Wynoochee River from the dam to the hatchery outlet would be altered from the existing condition of a flowing river. Water would be ponded in the 250-foot reach from the Wynoochee Dam to the existing overflow weir and a small stream with a wide gravel and rock streambed and possibly some pools formed in shallow holes would exist in the 6,800-foot reach from the existing overflow weir to the hatchery outlet. Some stranding of resident fish that utilize this reach can be expected during low flow periods. Access to river views are limited in this reach of the Wynoochee River and consist of views primarily from the hatchery site, the road on the left bank across from the hatchery site, the Wynoochee Dam, the Wynoochee Lake project visitor's center, and the USFS road bridge south of Wynoochee Dam. Under the worst case condition, views of the river from the hatchery site on the right bank, from the road above on the left bank, and from the USFS bridge would be that of an exposed rock and gravel streambed with a small stream resulting from approximately 20 c.f.s. due to groundwater springs and seepage. Adverse esthetics from nuisance algae and odors in pools that may form along the streambed are not expected to occur. The low flow period would not exist for the majority of the season of peak visitor use for the Wynoochee Lake project.

The 250-foot reach of the Wynoochee River between the dam and the existing overflow weir would only be visible from the dam itself and from the existing visitor's center. The esthetic impact would primarily be a change from a flowing to a ponded condition throughout most of the year and would not be significant. Refer to section 2 of appendix H for additional information.

(3) Recreation. The principal beneficial recreation impact of the tentatively selected plan would be the enhancement of the recreational anadromous fishery in the Grays Harbor area, Chehalis River Basin and other Washington coastal rivers, and in the northern Pacific Ocean. The increased fisheries would also result in an increased utilization of fishery support businesses and facilities in the area and an increased use pressure on existing day-use and overnight camping facilities in the Shelton Ranger District. One or more fisherman access sites could be provided below the hatchery. The plans and locations of these sites would be investigated in advanced engineering and design studies in coordination with Federal and state resource agencies.

The 50-acre hatchery site is owned and managed by the USFS and under their timber management plan is classified as "visual variety A" with the objective of maintaining a visually pleasing landscape. According to USFS estimates, the Wynoochee hatchery site is customarily used for dispersed recreation[1/] activities at an average rate of 300 visitor days per year.[2/] USFS personnel of the Shelton Ranger District estimate that the majority of users reside within a 100-mile radius, with many families and individuals customarily using a particular, or "favorite," site each visit. Implementation of the tentatively selected plan would permanently impact recreation use of the hatchery site. The nature of the impact would be a change in the recreational character of the site from that of an undeveloped camping and day-use site to an area dominated by the hatchery and its associated visitor facilities. Hunting, overnight camping, and water-related activities would be precluded by hatchery construction. Fishing in the area of Wynoochee River from the existing fish collection facility to Wynoochee Dam is currently not permitted and would continue to be prohibited with the hatchery. The hatchery complex would provide some day-use recreation opportunities such as sightseeing and would provide limited visitors' facilities. The area around the hatchery grounds would still be available for hiking and picnicking, and fishing opportunities in the Shelton Ranger District would be greatly enhanced by the hatchery and the expected increase in

1/Dispersed recreation activities include driving for pleasure, hiking, fishing, hunting, photography, rock collecting, berry picking, overnight camping outside of the developed campgrounds, picnicking, woodcutting, and water-related activities, such as wading, tubing, and swimming.

2/U.S. Forest Service treats a visitor day as a 12-hour period in which a visitor is engaged in a recreational pursuit. Twenty-four hours equal 2 visitor days.

resident recreational fishing in Wynoochee Lake. Visitors who currently utilize the hatchery site as a camping area may seek out new dispersed recreation areas in the vicinity or may be displaced to other customarily used dispersed recreation areas with resulting increased use pressure and secondary impacts to wildlife resources. The 300 visitor days use of the hatchery site represents 1/3 of 1 percent (0.353 percent) of the total dispersed recreation use in the Shelton Ranger District. The reduction in recreation use of the hatchery site as a result of hatchery construction and the loss and possible displacement of some of the existing dispersed recreation activities are not considered significant adverse impacts.

At the request of the Shelton Ranger District, an analysis was undertaken of replacing dispersed recreation use of the hatchery site at two alternate sites located about 1 mile downstream and is presented in section 5 of appendix H. As a result of that analysis, development of the two alternate dispersed recreation sites has not been recommended as part of the tentatively selected plan. Further, because dispersed recreation use at the hatchery site represents 1/3 of 1 percent of the total dispersed recreation use in the Shelton Ranger District, additional analysis of alternate sites to replace that portion of the use that would be lost due to construction of the fish hatchery was not considered justified.

Depending on the season, construction activities could inconvenience visitors to the Wynoochee Dam area due to curtailment of some activities (such as boating and swimming) during construction of the hydropower/fish hatchery intake system and from traffic congestion. These impacts would be minor and short term. During construction of the hydropower facility under the existing parking lot at the visitors' center for the Wynoochee Lake project, alternative visitors' parking would be provided. Other than minor short-term impacts associated with the powerhouse, buried transmission line, and switchyard construction, the hydropower facility would have no impacts on recreation. No impacts to recreation would result from the potential low flow condition due to operation of the hydropower/fish hatchery plan. Subject to the siting of the stations, no significant adverse impacts to recreation are expected as a result of construction of the satellite fish stations.

(4) Employment and Public Services. Associated with the tentatively selected plan are short-term construction and long-term project employment opportunities. Project design provides for six permanent residences to house personnel who would operate the hatchery (see plate 2). Domestic water supply to those residences would be from wells. Sewage would be handled by a septic tank system. The pressure line providing cold water to the adult hatchery ponds at the hatchery could also provide for fire protection and irrigation waters for the residential and hatchery grounds. Energy to the hatchery and residences would be provided by station power from the hydropower facility. Potential problems associated with a remote area, such as the Wynoochee plan

area, would be involved in the provision of public services (e.g., schools, shopping, snow removal, police and fire protection, and transportation) to the construction workers and project operation staff and families. For supplies, gas, and other services, current residents at the existing Wynoochee Lake project travel to and from Montesano, 35 miles away, the closest full service community. Three miles from the project is the logging community of Grisdale which has a public school and provides bus service for the children at the existing Wynoochee project. For high school students, the Quinault School District provides bus service to and from the high school in Montesano. Increased pressure on the limited services provided at the Wynoochee Lake project would undoubtedly occur with implementation of the tentatively selected plan. Currently, the road to the plan area serves Wynoochee Dam, and recreation and logging activities under a use agreement with the Simpson Timber Company. Potential use conflicts could occur as a result of the increased use of this road from the residences and the increased recreational fishery associated with the tentatively selected plan. Maintenance of this road is currently accomplished by Simpson Timber Company and could become a problem in the future as logging of the old growth is completed in the next ten years and Simpson Timber Company activities in the area are reduced. Coordination with the local community, USFS, and private landowners, including Simpson Timber Company and ITT Rayonier, would occur during advanced engineering and design studies to insure that adverse social impacts and future conflicts associated with the varying uses of the plan area are minimized.

e. Energy Impacts and Their Significance. The completed hydropower portion of the plan would have an installed capacity of 10.2 MW and produce 37,400 MWH of energy per year. Operation of the hatchery would involve energy demands for trucking fish from the collection facility to the hatchery, from hauling fish to and from the satellite fish stations, and from other routine operational procedures. Because of its unique topographic arrangement downstream of the existing dam, the Wynoochee hatchery would not require the high energy and expensive emergency generating facilities usually found necessary at modern hatcheries. At the Wynoochee site, energy needs would be minimized by use of a gravity feed system of providing water supply to the hatchery. Maintenance of the project would be accomplished primarily by hand labor and would involve cleaning trashracks at the intake and outlet structures, cleaning the raceways and rearing ponds of the hatchery, cleaning the facilities at the satellite fish stations and maintaining landscape plantings.

Energy would be used in project construction; however, through construction practices utilizing the most cost-effective methods, conservation measures would be incorporated. Construction activities involving energy usage would include hauling of materials from borrow sources; construction of the powerhouse and hatchery, associated facilities, and roads; and vegetation clearing. Materials utilized for construction are committed during the life of the project. Fuel resources are committed permanently. Indirectly, through construction practices utilizing the

most cost effective methods, conservation measures, such as high loading efficiency and maximum usage of onsite materials, would be incorporated. Materials would come from local borrow sources, minimizing haul distance, and, therefore, fuel consumption. Local sources of construction material are considered adequate and would not be significantly depleted by the demands of the project. Other conservation measures that could be utilized by the construction contractor are maximum usage of the local labor force and encouragement of carpooling.

f. Relationship of the Tentatively Selected Plan to Existing Land Use Plans, Policies, and Controls.

(1) Existing Land Use. Existing land use in the plan area consists of national forest, under the jurisdiction of the USFS; logging; and the Wynoochee Lake project, owned and operated by the Corps of Engineers. The proposed hatchery site is primarily Federal land managed by the USFS. The site is classified by the USFS as a visual resource and as such, the area is maintained on a 200-year timber rotation. Construction of a hatchery on that site would require a change in its land use and classification. A buried transmission line would have minimal impact on existing land use. An aerial line would conflict with the existing classification of the route as a visual resource and would impact existing timber resources. The tentatively selected plan would not constrain the operation of the existing Wynoochee project and its authorized purposes for industrial water supply to the city of Aberdeen, winter flood control, fisheries, and irrigation. The tentatively selected plan would not impact logging operations nor would it affect the Shelton Cooperative Sustained Yield Unit Agreement between the USFS and Simpson Timber Company. As discussed in paragraph 4.02d(4) of the draft EIS, coordination with the USFS, Simpson Timber Company, and ITT Rayonier would occur during advanced engineering and design studies to insure that any potential conflicts with the varying uses of the plan area lands and road easements are minimized. Additionally, a memorandum of understanding between the USFS and the Corps of Engineers regarding use of national forest land for development of the tentatively selected plan is necessary.

The tentatively selected plan would preclude passage of anadromous fish over the dam and thus would impact part of the existing mitigation program for the Wynoochee Lake project. This mitigation would be incorporated into the fish hatchery. Construction of the plan would also preclude the existing dispersed recreation use of the hatchery site and would increase use pressure on existing camping facilities as discussed in paragraph 4.02d(3) of the draft EIS.

(2) Land Use Plans, Policies, Studies, and Projects. The Seattle District, Corps of Engineers, and the Grays Harbor PUD have entered into a partnership for the development of hydropower facilities at Wynoochee Dam. The partnership would allow the PUD to market energy produced by the Wynoochee hydropower facility. Such an arrangement would require Congressional exemption from current Federal law which

requires that electricity generated at Corps projects be marketed by the BPA. The hydropower operation would be subordinate to all other purposes and the facility would operate as a run-of-river plant producing baseload energy from the reservoir releases. Reservoir releases would be made by the Corps of Engineers to meet the congressionally authorized purposes of the existing Wynoochee Lake project and the water quality and quantity needs of the fish hatchery.

The Grays Harbor PUD has conducted preliminary studies of the feasibility of hydropower development at the Oxbow damsite located 8 miles downstream of the hatchery site. At this time, development of hydropower at the Oxbow damsite is not economically feasible, although it is conceivable that it would be justified in the future. Coordination with the PUD has occurred regarding the compatibility of the tentatively selected plan with development of hydropower at Oxbow. There would be no conflict between the hydropower portion of the plan and a hydropower dam at the Oxbow damsite. The hatchery, as currently sited, would preclude construction of a dam and reservoir project at the Oxbow site which calls for a reservoir elevation of 635 feet. The conflict between the two projects could potentially be resolved by placement of the hatchery on the higher bench site, as discussed in appendix G, and collecting fish downstream of Oxbow Dam. If it is determined that the Oxbow site will be developed for hydropower, the Corps would consider the alternative fish hatchery site during advanced engineering and design studies.

Fish in the Wynoochee River Basin are currently managed by the State of Washington on a wild stock basis. As discussed in paragraph 4.02b(3) of the draft EIS, a conceptual plan for management of the Chehalis River Basin fishery should Wynoochee hatchery be constructed has been developed with input from the state and Federal resource agencies and Indian tribes. One of the objectives of the plan is to insure maximum efficiency of the hatchery while minimizing impacts on native fish stocks. The final details of such a plan would be developed during advanced engineering and design studies.

The Grays Harbor Fisheries Enhancement Task Force was formed in response to widespread concern by the Grays Harbor Regional Planning Commission to investigate methods of enhancing the depleted Grays Harbor anadromous fish runs. This task force is made up of representatives of Federal and state fish and wildlife agencies, local municipalities, Indian tribal councils, and sport and commercial fishing groups. The task force is supportive of the tentatively selected plan. The hydropower/fish hatchery proposal is consistent with the Grays Harbor Regional Comprehensive Plan and county comprehensive zoning ordinances.

The city of Aberdeen signed a contract with the Washington Public Power Supply System on 11 June 1980 for a water supply of 62 c.f.s. flow in the Wynoochee River. The tentatively selected plan would not impact this contract.

WDG is responsible for developing and operating hatchery facilities for mitigating the loss of 1,700 adult steelhead as a result of construction of the Wynoochee Lake project. Funds in the amount of $696,000 were provided for this purpose to the State of Washington under a Memorandum of Agreement dated 28 July 1977. To date, the WDG has implemented temporary rearing pens in Lake Aberdeen for rearing a portion of the steelhead necessary to mitigate for the dam. If the Wynoochee fish hatchery is authorized, a portion of the fish hatchery would be used by the State of Washington to fulfill its obligation.

As previously discussed under paragraph 4.02d.(2) of the draft EIS, the tentatively selected plan would impact the existing USFS classification of the hatchery site and, if an aerial transmission line is selected, would impact both timber resources and the existing classification of the transmission line route as a scenic corridor. A buried transmission line has been chosen by the Corps of Engineers and would be consistent with USFS policies (see paragraph 2.01b(2) of the EIS). A memorandum of understanding is necessary between the Corps and the USFS regarding use of the national forest land for plan implementation. The Corps has been working with the USFS to resolve their concerns relative to the Wynoochee plan, leading to the eventual development of the memorandum of understanding.

(3) Laws, Regulations, and Controls. The principal laws, controls, and regulations which apply to land and water use in the plan area are the Coastal Zone Management Act, Executive Orders 11988 and 11990, the Clean Water Act of 1977, and the Wild and Scenic Rivers Act. Under the Washington State Coastal Zone Management Program, established pursuant to the Coastal Zone Management Act, the shorelines of the Wynoochee River are designated "shorelines of statewide significance." Local management programs include regional and county plans, prepared by the Grays Harbor Regional Planning Commission and Grays Harbor County, respectively. Under the county program, the plan area is designated "conservancy." The tentatively selected plan is consistent with the shoreline designations of all of these programs.

Prior to project construction, the State Shoreline Management Program requires the obtaining of permits by the local sponsor. The WDE reviews all projects which require local shoreline permits and, therefore, would review the permits granted for the tentatively selected plan. The local sponsor would also be required to obtain a permit from WDE for any work in the designated flood zones and a State National Pollution Discharge Elimination System permit for the hatchery outflow. As agreed by the WDE, instream flows for the reach of the Wynoochee River between the dam and the hatchery outlet would be determined through coordination with the State of Washington during advanced engineering and design studies (refer to section 2 of appendix H).

Executive Order 11988 provides guidance regarding flood-plain management. The tentatively selected plan is located above the 100-year flood

plain. The satellite fish stations would have minor, if any, impact on the flood plain.

Executive Order 11990 directs Federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities. The tentatively selected plan would result in the unavoidable loss of 2 acres of sedge marsh. The satellite fish stations would be sited to avoid wetlands to the extent possible.

In compliance with the Clean Water Act of 1977, a Section 404(b)(1) evaluation of the impacts of instream fill activities associated with the tentatively selected plan has been accomplished and is presented in appendix A.

The transmission line would cross the West Fork of the Humptulips River which is listed in the nationwide inventory of potential Wild and Scenic Rivers. The Hoh River, also listed on the inventory, is a potential river for placement of one of the satellite fish station. Neither feature of the tentatively selected plan would be expected to adversely impact the environmental values for which these rivers were placed on the inventory.

g. Adverse Environmental Impacts Which Cannot Be Avoided. During planning, efforts have been made to avoid adverse environmental impacts where possible. Unavoidable adverse impacts resulting from the tentatively selected plan are summarized in table EIS-2.

h. Irreversible and Irretrievable Commitments of Resources which Would Be Involved in the Tentatively Selected Plan Should It Be Implemented. Labor, materials, energy, and capital used in preconstruction planning and project construction would be committed if the tentatively selected plan is implemented. The land area occupied by the hydropower facility, the switchyard, the transmission line, the hatchery, the water supply pipeline, the residences and the satellite fish stations would be committed for the life of the project, if not indefinitely. Timber resources would be lost on the 50-acre hatchery site; fish and wildlife displaced by the plan would be permanently committed. The change in habitat quality and quantity, the fish and wildlife which depend on the habitat resources, and the natural landscape quality of the plan area would be committed by implementation of the tentatively selected plan.

i. The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity. The tentatively selected plan involves the use of a renewable resource to produce energy and anadromous fish which would contribute to the enhancement of the long-term productivity of the Washington coastal rivers and the northern Pacific Ocean. The loss of the productivity of the hatchery site as a timber resource and for use by wildlife; the termination of the use of the Wynoochee River above the dam for anadromous fish production; and the reduction in the aquatic habitat of the 6,800-foot

TABLE EIS-2

ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED
WYNOOCHEE HYDROPOWER/FISH HATCHERY PLAN

Category	Impact	Measures to Avoid or Minimize Impact	Reference to EIS
Air Quality, Noise and Traffic	Short-term increases in noise and exhaust emission levels during project construction. Long-term increases in noise, traffic, and exhaust emissions due to operation activities, residences, and increased recreational fishery.	Dust would be minimized by sprinkling haul roads and construction areas with water as necessary. Landscaping around hatchery would act as noise buffer in addition to the surrounding rain forest. Continued coordination with USFS and Simpson Timber Company regarding road easements and use standards should minimize traffic impacts.	Paragraph 4.02 a(1)
Water Quality and Supply	Short-term increases in turbidity during construction. Long-term impacts due to low flows in 6,800-foot reach between existing overflow weir and critical hatchery outlet during periods of the year (April-June). Long-term impacts in 250-foot reach of Wynoochee River between the dam and the existing overflow weir. When reservoir releases are no greater than the quantity of water diverted to the powerhouse, this reach would be ponded. Long-term impacts associated with hatchery effluent.	Construction contractor would be required to utilize methods that minimize turbidity. Instream flow requirements would be determined during AE&D through continued coordination with State of Washington. 20 c.f.s. from groundwater springs and seepage would provide some flow in the reach at all times. Seepage from the reservoir would provide some flow in the ponded area. Area would be flushed when reservoir releases exceed 1,200 c.f.s. (powerhouse capacity) or when powerhouse is shut down for maintenance. Increased aquatic productivity and an alteration in the aquatic benthic community in the area near the effluent outlet may be beneficial as aquatic productivity in the Wynoochee River is rather low naturally. Hatchery would be operated to meet effluent limitations. A pollution abatement pond would be constructed for treatment of the water from raceways and rearing ponds during cleaning and when chemotherapeutics are used in large doses. Domestic wastes would be treated by septic tanks. Carcasses of returning adult salmon and steelhead used for spawning or surplus to spawning needs would be sold commercially or disposed of in an approved land fill.	Paragraph 4.02 a(2)
Vegetation	Construction of the hatchery and associated facilities would result in the permanent loss of approximately 50 acres of Olympic rain forest, 25 acres of which are considered old growth. Additionally, 2 acres of sedge marsh would be lost due to hatchery construction. Approximately 10 additional acres of of vegetation would be lost due to construction of two satellite fish stations. During low flow periods, aquatic habitat in the 6,800-foot reach between the existing overflow weir and the hatchery outlet would be reduced.	Impacts would be minimized by burial of transmission line and water supply pipeline and reseeding of the pipeline corridor. Hatchery would be designed to reduce loss of vegetation; grounds would be seeded and landscaped. Hatchery facilities, including the satellite fish stations, would be sited to avoid wetland areas to the extent possible. Instream flow requirements would be determined during AE&D through continued coordination with State of Washington.	Paragraph 4.02 b(1)

TABLE EIS-2 (con.)

Category	Impact	Measures to Avoid or Minimize Impact	Reference to EIS
Wildlife	Use of the hatchery site by big game mammals (elk and deer) would be lost. Construction of the hatchery and associated facilities would result in the loss of 50 acres of elk winter range, 25 acres of which are being considered old growth or critical winter range. The critical range habitat loss represents 0.4 percent and 0.2 percent of the critical range in the Wynoochee Drainage and Shelton Ranger District, respectively. Use in the area around the site would be reduced due to increased human disturbance. Some wildlife usage (e.g., song birds, small mammals) would return to the hatchery site following construction; however, the total habitat available would be reduced, and, to some unknown extent, the resident wildlife populations would be reduced. Some minor impact to wildlife would result due to low flows in the 6,800-foot reach of the Wynoochee River between the existing overflow weir and the hatchery outlet during critical periods of the year (April-June). Construction of the satellite fish stations would impact wildlife due to loss of approximately 10 acres of habitat and increased human disturbances.	To extent possible, habitat losses associated with the project would be reduced through project design, landscaping, and native seed planting to accelerate natural revegetation. Native vegetation would be retained where possible to form a natural buffer zone around the hatchery and satellite stations.	Paragraph 4.02 b(2)
Fish	Anadromous fish runs above Wynoochee Dam would be terminated. Potential adverse impacts on resident fish in the 6,800-foot reach of the Wynoochee River between the overflow weir and the hatchery outlet during critical low flow periods (April-June). Potential adverse impacts on existing native fish stocks due to the release of hatchery fish.	Mitigation for the lost runs would be incorporated into the hatchery production. Instream flow requirements would be determined with the State of Washington in AE&D. 20 c.f.s. from groundwater springs and seepage would provide some flow in the reach at all times. With the provision of adequate flow, the potential exists for utilizing the reach between the existing overflow weir and the hatchery outlet for spawning and rearing of anadromous fish. This potential would be investigated during the determination of instream flows. Adverse impacts can be minimized by proper management strategies. A management plan for the hatchery would be developed during AE&D as final species selection and hatchery design are formulated in coordination with Federal and State resource agencies and Indian tribes.	Paragraph 4.02 b(3)
Esthetics	Short-term effects during construction. Long-term effects due to change in hatchery site esthetics from natural rain forest character to hatchery and associated facilities. Long-term impacts from the satellite fish stations associated with the hatchery and the switchyard and transmission line associated with the powerhouse. Long-term impacts associated with project operation result in low flows in 6,800-foot	Terrestrial esthetic impacts would be reduced by native grass seeding and landscape plantings. Transmission line and water supply pipeline would be buried. 20-c.f.s. from groundwater springs and seepage would provide some flow in the reach between the hatchery outlet and existing overflow weir. Instream flow requirements would be determined in AE&D. Seepage from the dam would provide some dilution of ponded water. Ponded	Paragraph 4.02 d(2)

TABLE EIS-2 (con.)

Category	Impact	Measures to Avoid or Minimize Impact	Reference to EIS
	reach between existing overflow weir and hatchery outlet and ponding in 250-foot reach between dam and existing overflow weir.	reach would be flushed when reservoir discharge exceeds 1,200 c.f.s. or when powerhouse is shut down for maintenance.	
Recreation	Short-term disruption to area recreational activities during project construction.	Coordination would occur among Simpson Timber, USFS, and Corps to minimize traffic congestion due to construction.	Paragraph 4.02 d(3)
	Hunting use of hatchery site would be lost. Overnight camping and water-related use of the site would be lost. Recreation use of the site represents 1/3 of 1 percent of the total estimated dispersed recreation use in the Shelton Ranger District.	Some recreational activities, such as hatchery visitation, limited picnicking, and hiking, would be available. The plan would result in a major increase in the area recreational fishery.	
Public Services	Implementation of the plan would result in increased pressure on the limited public services in the immediate plan area. Nearest full service community is Montesano, 35 miles from the Wynoochee Lake project.	Energy to the immediate plan area would be provided by station power from the hydropower facility. Bus service is currently provided to public schools. Full service community of Montesano is 35 miles away. Coordination among Corps, various land owners, and local community would occur during AE&D to insure that adverse social impacts and conflicts associated with the various uses of the plan area are minimized.	Paragraph 4.02 d(4)
Land Use	Construction of fish hatchery would result in a change in land-use classification of the hatchery site from its current designation of "visual variety "A" under the USFS timber management plan.	Timber removed from hatchery site would be made available for sale. Project design and landscaping would minimize impacts to wildlife values to the extent practicable. Fish values of the area would be enhanced by the plan. The Corps and the USFS would enter into a Memorandum of Understanding regarding implementation of the plan on national forest land.	Paragraph 4.02 f(1) and (2)

reach of the river between the existing weir and the hatchery outlet are tradeoffs involved in plan implementation. The loss of old growth timber associated with the hydropower/fish hatchery plan represents 0.2 percent of the old growth (critical elk winter range) in the Shelton Ranger District and is not considered a significant loss. The existing anadromous fish mitigation program associated with Wynoochee Dam has not been successful and the state agencies have accepted termination of the runs above the dam and incorporation into the hatchery of mitigation for that lost production. Fish use of the 6,800-foot reach of the river between the existing overflow weir and the hatchery outlet site consists largely of use by juvenile outmigrants and by resident cutthroat and rainbow trout that pass through the dam from Wynoochee Lake. With implementation of the tentatively selected plan, use of the reach by anadromous juvenile outmigrants would essentially be eliminated; however, with the provision of adequate flow, the potential exists for utilizing the reach between the existing overflow weir and the hatchery outlet for spawning and rearing of anadromous fish. This potential would be investigated during the determination of instream flows in advanced engineering and design studies.

SECTION 5. STUDY COORDINATION AND PUBLIC INVOLVEMENT

5.01 Study Coordination and Public Involvement. The study coordination and public involvement framework for this study is presented in section 5 of the draft feasibility report and in appendix B.

5.02 Remaining Coordination. Coordination will be ongoing with the interested public, including fisheries user groups and the Indian tribes, and with Federal, state, and local agencies, including the National Marine Fisheries Service (NMFS), FWS, EPA, USFS, WDF, WDG, WDE, city of Aberdeen, Grays Harbor PUD, and Grays Harbor Regional Planning Commission. The Fish and Wildlife Coordination Act (FWCA) report has been prepared and is presented in appendix D. The final design of the hatchery and satellite fish stations; the final species selection, management plans, and monitoring program; and determination of the instream flows would be accomplished through detailed coordination with the Federal and state fish agencies during advanced engineering and design studies. Hatchery planning would also be coordinated with the Indian tribes and other interested public. The Corps of Engineers will continue to work with the USFS in development of a memorandum of understanding for implementation of the tentatively selected plan within the Olympic National Forest. Close coordination will continue with the Grays Harbor PUD in formulation of the partnership for hydropower development and in further analysis of the transmission line alternatives. The city of Aberdeen will be consulted in all matters affecting their water rights and contractural agreement for water supply from Wynoochee Dam. A final public meeting will be held on 15 December 1981. Further coordination, as necessary, will be accomplished during preparation of the final feasibility report and final EIS. Should the project be authorized, additional coordination with resource agencies and interested public will take place during advanced engineering and design studies, preparation of plans and specifications, and construction.

5.03 Statement Recipients. The draft Wynoochee hydropower/fish hatchery feasibility report and EIS have been distributed to the public for a 45-day review. Comments on the draft EIS will be responded to in a final EIS and revisions will be incorporated into the final feasibility report where appropriate. A list of persons, groups, and agencies who have received the report is presented in appendix B.

5.04 Public Views and Responses. As presented in section 5 of the draft feasibility report and in appendix B, throughout the study various Federal, state, and local agencies and groups have expressed strong support for the development of hydropower and fish enhancement facilities at Wynoochee Dam. Among these supporters are the NMFS, FWS, State of Washington, Grays Harbor PUD, city of Aberdeen, Grays Harbor Regional Planning Commission, Grays Harbor Fisheries Enhancement Task Force, Grays Harbor County Chapter of Trout Unlimited, Northwest Steelhead and Salmon Council of Trout Unlimited, Northwest Steelheaders, Grays Harbor Poggie Club, and Washington Environmental Council. The tentatively selected plan satisfies both the desires of the local community and the Federal and state agencies by providing the greatest economic benefit with a net environmental gain.

INDEX

Subject	Study Documentation: Draft EIS	Draft Feasibility Report	Appendixes
Abstract	pp i		
Adverse Impacts which Cannot be Avoided	para 4.02g		
Affected Environment	Sec. 3		
Air Quality	para 4.02a(1)		
Alternatives	Sec. 2	Sec. 3	
Alternatives Eliminated from Further Study	para 2.01	para 3.02	
Areas of Controversy	pp EIS-iii		
Benefits	para 2.02b(5)	para 4.25	C
Benefit/Cost Ratio	para 2.02b(5)	para 4.25	C
Biological/Ecological Features	para 3.06b		
Biological/Ecological Impacts	para 4.02b		
Coastal Zone Management	para 4.02f(3) EIS summary	Table 5	
Comparative Impacts of Alternative Plans	para 2.03	Table 1	
Conclusions (Preliminary)		para 6.01	
Construction Schedule		para 4.17 figure 4	
Coordination	Sec. 5	Sec. 5	B, C, D
Cost of Tentatively Selected Plan	para 2.02b(5)	para 4.25, Table 3	E
Cost Sharing	para 2.02b(4) and (5)	para 4.29 Table 6	C

INDEX (Con.)

Subject	Study Documentation: Draft EIS	Draft Feasibility Report	Appendixes
Cover Sheet	pp i		
Ecological Environment	3.06b		
Ecological Impacts	4.02b		
Economics	para 2.02b(5)	para 4.25 Table 4	C
Energy		para 1.07a	C
Energy Impacts	para 4.02d(1) para 4.02e		
Environmental Impacts of Final Alternative Plans	Sec. 4	para 4.26 para 4.30 para 4.31	
Environmental Quality Criteria			para 2.03c
Esthetics	para 3.06d		
Esthetics Impacts	para 4.02d(2)		
Executive Summary		pp i	
Federal Responsibilities	para 2.02b(4)	para 4.29	
Final Alternatives (Plans)	para 2.02	para 3.03 para 3.04 para 3.05	
Fish	para 3.06b	para 1.06b	H (sec 2 and 3)
Fish Impacts	para 4.02b(3)		H (sec 2 and 3)
Fish Production, Hatchery	para 4.02d(1)	para 4.09h	C
Fish and Wildife Coordination Act, Final Report	para 5.02	para 5.03c	D

INDEX (Con.)

Subject	Study Documentation: Draft EIS	Draft Feasibility Report	Appendixes
Historic and Prehistoric Features	para 3.06c	para 4.14	
Historic and Prehistoric Impacts	para 4.02c	para 4.14	
Irreversible and Irretrievable Commitment of Resources	para 4.02h		
Land Use, Policies and Controls	para 4.02f		
List of Preparers	pp EIS-54		
Management	para 2.02b(4)	para 4.19	H (section 3)
Mineral Resources	para 4.02a(3)		
Mitigation, Tentatively Selected Plan	para 2.02b(3)	para 4.13	
Mitigation, Wynoochee Lake Project	para 3.06b	para 1.06	
Monitoring	para 2.02b(4)	para 4.19	
National Economic Development Criteria		para 2.02b	
Need for and Objectives of Action	Sec. 1	para 1.07	
No Action Plan	para 2.02a para 4.01	para 3.02c para 3.04	
Operation and Maintenance	para 2.02b(4)	para 4.19	
Other Social Effects Criteria		para 2.03e	
Physical Features	para 3.06a		
Physical Impacts	para 4.02a		

INDEX (Con.)

Subject	Study Documentation		
	Draft EIS	Draft Feasibility Report	Appendixes
Plan Area	para 3.01		
Plan Formulation	section 2	section 3	G
Planning Criteria		para 2.03	
Planning Objectives	para 1.02	para 2.01	
Plans of Others	para 4.02f	para 3.06	
Public Involvement	Sec. 5	Sec. 5	B
Recommendations (Preliminary)		Sec. 6, para 6.02	
Recreation Features	para 3.06d	para 4.15	
Recreation Impacts	para 4.02d(3)	para 4.20	H (section 5)
Regional Development Criteria		para 2.03d	
Relationship between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity	para 4.02i		
Relationship to Environmental Requirements	EIS Summary	Table 5	
Section 404(b)(1) Evaluation			A
Significant Resources	para 3.06		
Socioeconomic Features	para 3.06d		
Socioeconomic Impacts	para 4.02d		
Statement of Recipients	para 5.03		B
Study Area	para 3.01	para 1.03	

INDEX (Con.)

Subject	Study Documentation: Draft EIS	Draft Feasibility Report	Appendixes
Study Authority	para 1.01	para 1.01	
Study Participants	para 5.02	para 5.03	B
Summary	p EIS-ii	p i	
Table of Contents	p EIS-vii	p iii	
Threatened and Endangered Species	para 3.06b para 4.02b(4)		
Tentatively Selected Plan	para 2.02b para 4.02	para 3.05 Sec. 4	
Unresolved Issues	EIS Summary		
Vegetation	para 3.06b		
Vegetation Impacts	para 4.02b(1)		
Water Supply	para 3.06b		H (section 2)
Water Supply Impacts	para 4.02a(2)		H (section 2)
Water Quality	para 3.06a	para 4.05	H (section 1)
Water Quality Impacts	para 4.02a(2)		A, H (section 2)
Wetlands	para 3.06b		A
Wetland Impacts	para 4.02b(1)		A
Without Conditions	para 2.02a	para 3.04	
Wildlife Features	para 3.06b		H (section 4)
Wildlife Impacts	para 4.02b(2)		H (section 4)
Wynoochee Lake Project	para 3.03 para 3.06a	para 1.04 para 4.04	

LIST OF PREPARERS

The following people were primarily responsible for preparing this Environmental Impact Statement:

Name	Discipline/ Expertise	Experience	Role in Preparing EIS
Principal Authors			
Karen S. Northup, M.S.	Biologist/ Environmental Planning	Environmental Planner/Coordinator, Corps of Engineers, 8 years; Research Biologist, Illinois State Natural History Survey, 2 years	Environmental Coordinator, Effects on Environmental Resources, Formulation of Alternatives, Needs Assessment, Public and Agency Coordination
Ronald M. Bush, Ph.C.	Biologist/ Aquatic Biology	Program Manager Biologist, Corps of Engineers, 8 years; Aquatic Biologist, University of Washington, 6 years	Study Oversight, Formulation of Alternatives, Needs Assessment, Agency Coordination
John S. Thompson	Fisheries	Program Manager, Fisheries Biologist, Corps of Engineers, 11 years; Fisheries Biologist, State of Washington, 15 years	Effects on Fishery Resources, Formulation of Alternatives, Needs Assessment, Public and Agency Coordination
Contributing			
James O. Waller, Ph.D.	Water Resources Planning/ Geohydrologist	Study Manager, Corps of Engineers, 9 years; Water Resources Specialist, State of Virginia, 2 years	Study Manager, Formulation of Alternatives, Needs Assessment, Economic Evaluation, Public and Agency Coordination

Kenneth Brunner	Wildlife Biology	Wildlife Biologist, Corps of Engineers, 6 years	Effects on Wildlife Resources; Threatened and Endangered Species Biological Assessment
James I. Newman	Community Planner	Environmental Coordinator, Corps of Engineers, 5 years; Study Manager, Corps of Engineers, 3 years	Effects on Recreation Resources
Patricia Cirone-Storm Ph.D.	Biologist/ Water Quality	Water Quality Specialist, Corps of Engineers, 2 years; Aquatic Biologist, New York University, 10 years	Effects on Water Quality
Lawr Salo	Archeology	Archeologist, Corps of Engineers, 5 years; Archeologist, University of Washington, 3 years; Archeologist, Washington State University, 3 years	Effects on Cultural Resources

BIBLIOGRAPHY

Beckstead, M., 1981. Personal communication, U.S. Forest Service, Olympia, Washington.

Davis, J., 1980. Letter to U.S. Army Corps of Engineers, dated 24 July 1980. Shelton Ranger District, U.S. Forest Service, Shelton, Washington.

Eldredge, K., 1981. Personal communication. U.S. Forest Service, Olympic National Forest, Olympia, Washington.

Lyon, L. J., 1979. Habitat Effectiveness for Elk as Influenced by Roads and Cover. Journal of Forestry (October).

Mathews, S. B., 1981. Biological Report for Wynoochee Hatchery Management Planning. University of Washington, Seattle, Washington. Prepared under contract with the U.S. Army Corps of Engineers, Seattle District.

Pacific Northwest Utilities Conference Committee, 1981. Northwest Regional Forecast of Lands and Resources. Portland, Oregon.

Public Utility District No. 1, Grays Harbor County, 1981. Wynoochee Dam Hydroelectric Project, Pre-draft SEPA EIS Consultation Packet of Information. Aberdeen, Washington.

Shelton Ranger District, U.S. Forest Service, 1981. Information provided from data files. Shelton, Washington.

Smith, J., 1980. Washington Department of Game. Cited in: Wynoochee Hydropower and Hatchery Projects, Fish and Wildlife Coordination Act Report, July 1981. U.S. Fish and Wildlife Service, Olympia, Washington.

Taber, R. D. and K. J. Raedeke, 1980. Status Report, Roosevelt Elk of the Olympic National Forest. Prepared for Olympic National Forest, U.S. Forest Service, Olympia, Washington, Contract No. R6-79-237.

U.S. Army Corps of Engineers, Seattle District, 1967. Wynoochee Reservoir, Wynoochee River, Washington, Design Memorandum 9, Fish and Wildlife, Seattle, Washington.

U.S. Army Corps of Engineers, Seattle District, 1967. Wynoochee Reservoir, Wynoochee River, Washington, Supplement 1 to Design Memorandum 9, Facilities for Upstream Fish Passage. Seattle, Washington.

U.S. Army Corps of Engineers, Seattle District, 1975. Wynoochee Reservoir, Wynoochee River, Washington, Supplement 2 to Design Memorandum 9, Fish and Wildlife (Wildlife Land Mitigation). Seattle, Washington.

U.S. Army Corps of Engineers, Seattle District, 1981. Biological Assessment (Bald Eagle) for the Wynoochee Hydropower/Fish Hatchery Study, Grays Harbor County, Washington. Seattle, Washington.

U.S. Department of Agriculture, U.S. Forest Service, Olympic National Forest, 1978. Final Environmental Statement, Timber Resource Management Plan, Shelton Cooperative Sustained Yield Unit. Olympia, Washington.

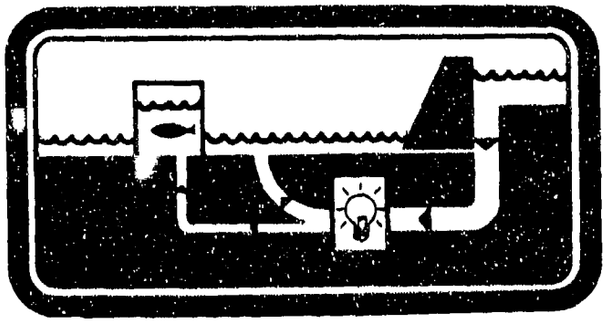
U.S. Department of Agriculture, U.S. Forest Service, 1981. Draft Environmental Impact Statement for Standards and Guidelines, Pacific Northwest Region Plan. Portland, Oregon.

U.S. Department of Agriculture, U.S. Forest Service, undated. Viewshed Plan, Skokomish Corridor and Wynoochee Corridor, Olympic National Forest. Olympia, Washington.

U.S. Department of Interior, U.S. Fish and Wildlife Service, 1981. Wynoochee Hydropower and Hatchery Projects, Final Fish and Wildlife Coordination Act Report. Olympia, Washington.

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery

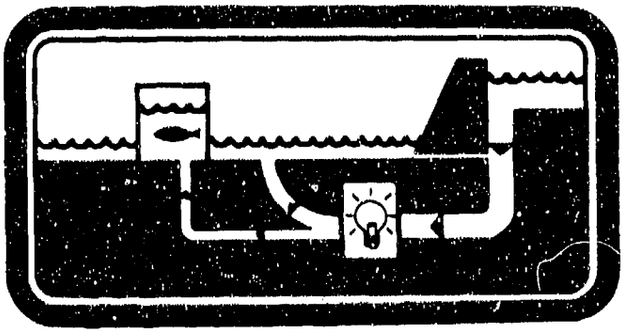


PHOTOGRAPHS

(Photographs will be included in the final feasibility report.)

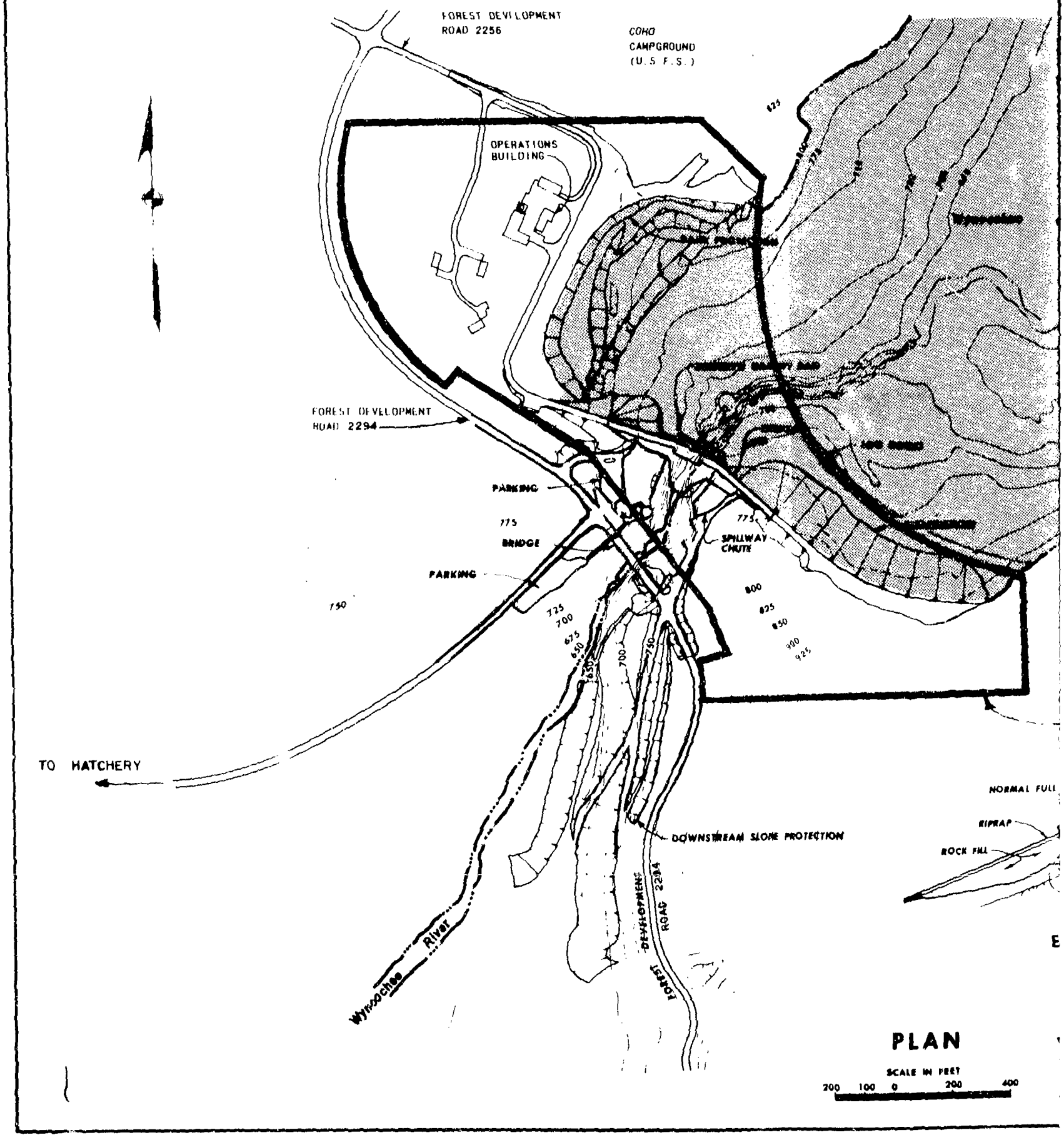
FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

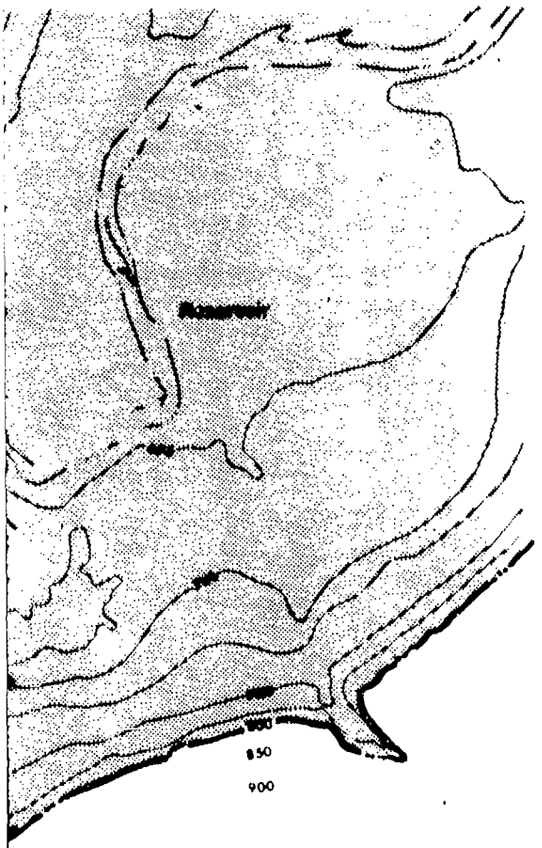
WYNOOCHEE
Hydropower/Fish Hatchery



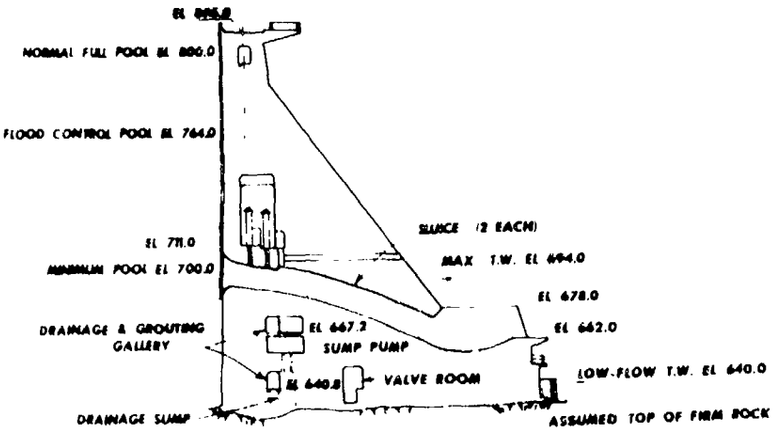
PLATES

CORPS OF ENGINEERS



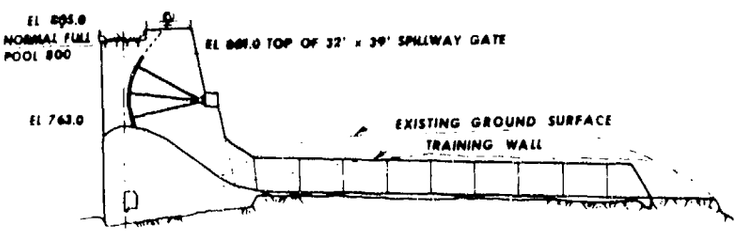


925



DAM SECTION

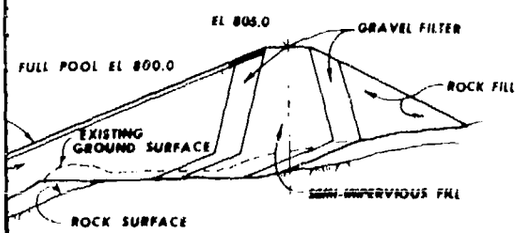
SCALE IN FEET
40 20 0 40 80



SPILLWAY SECTION

SCALE IN FEET
40 20 0 40 80

— EXISTING PROJECT BOUNDARY



EMBANKMENT SECTION

SCALE IN FEET
40 20 0 40 80

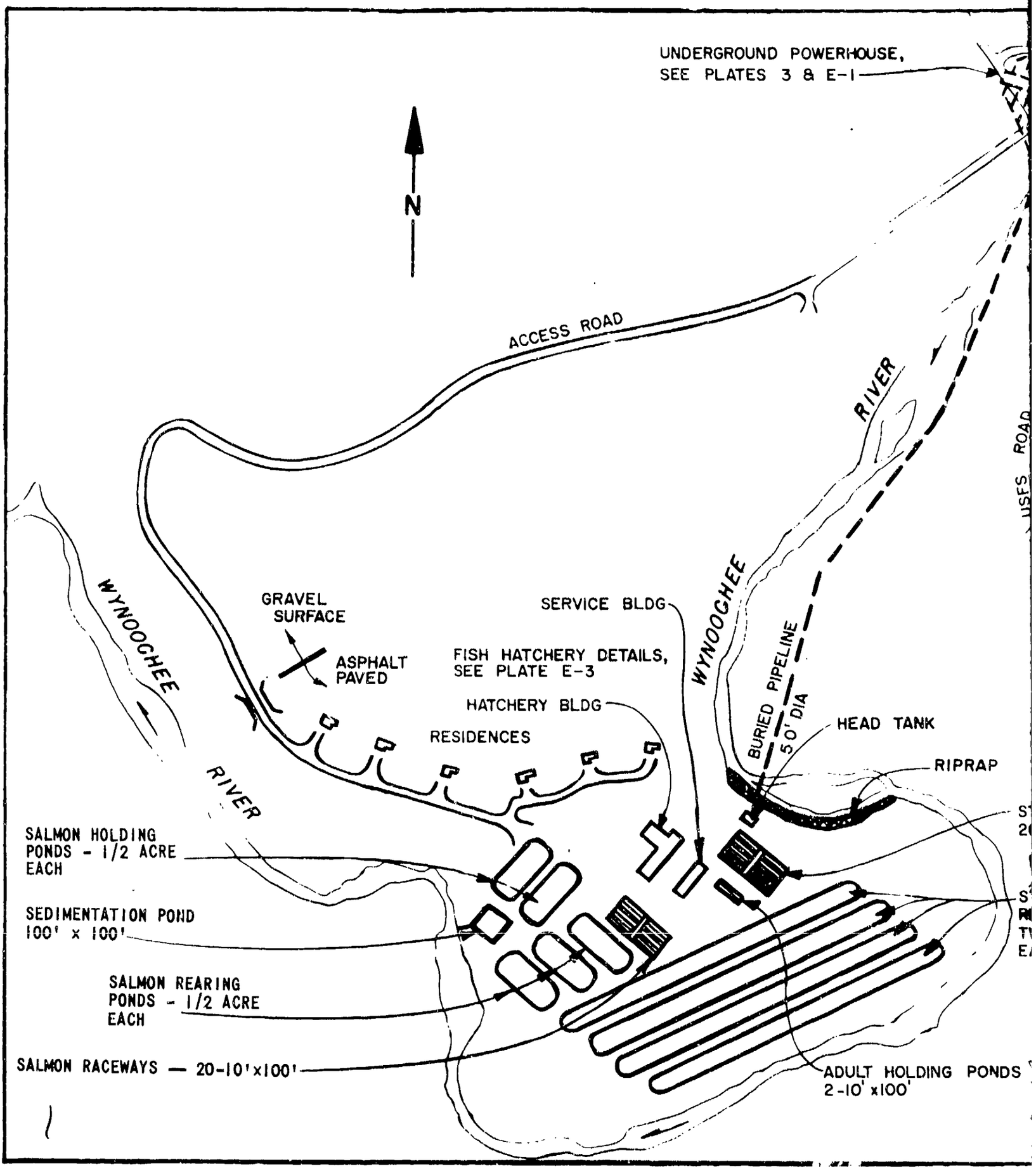
2

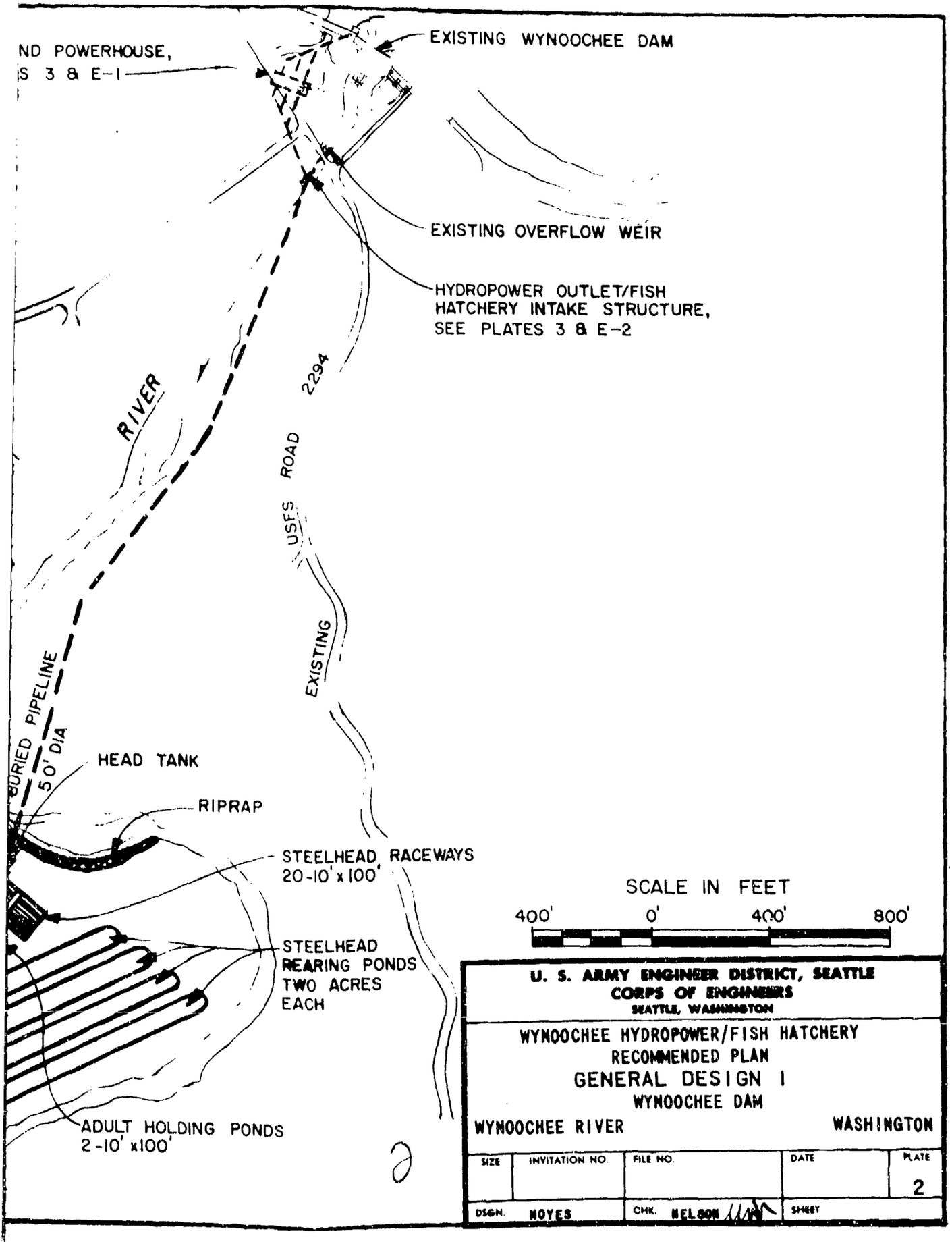
U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

WYNOOCHEE HYDROPOWER/FISH HATCHERY
WYNOOCHEE LAKE PROJECT
(AS BUILT)
REVISED SEPTEMBER 1979

WYNOOCHEE RIVER — WASHINGTON

SIZE	INVITATION NO.	FILE NO	DATE	PLATE
				1
DSGN NOYES		CHK NELSON		SHEET

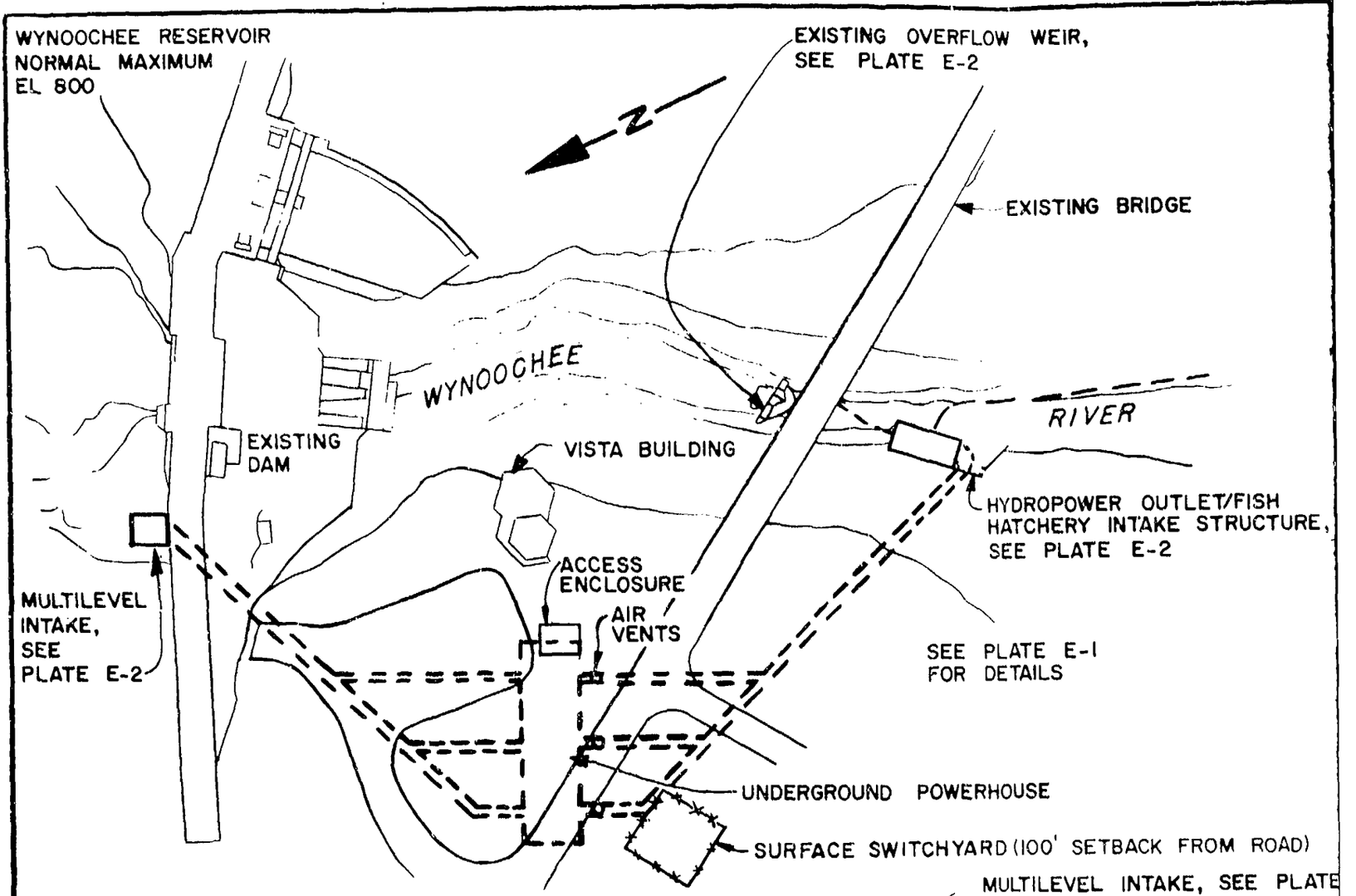

UNDERGROUND POWERHOUSE,
SEE PLATES 3 & E-1
N
ACCESS ROAD
RIVER
WYNOOCHEE
GRAVEL SURFACE
ASPHALT PAVED
SERVICE BLDG
FISH HATCHERY DETAILS,
SEE PLATE E-3
HATCHERY BLDG
RESIDENCES
WYNOOCHEE
BURIED PIPELINE
5'0" DIA
HEAD TANK
RIPRAP
RIVER
SALMON HOLDING
PONDS - 1/2 ACRE
EACH
SEDIMENTATION POND
100' x 100'
SALMON REARING
PONDS - 1/2 ACRE
EACH
SALMON RACEWAYS — 20-10'x100'
ADULT HOLDING PONDS
2-10' x100'



U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

WYNOOCHEE HYDROPOWER/FISH HATCHERY
RECOMMENDED PLAN
GENERAL DESIGN I
WYNOOCHEE DAM
WYNOOCHEE RIVER WASHINGTON

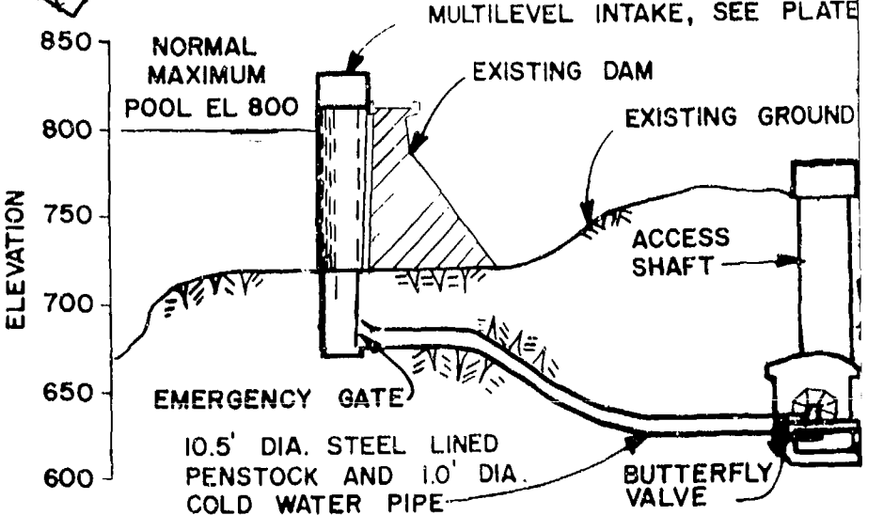
SIZE	INVITATION NO.	FILE NO.	DATE	PLATE
				2
DSGN. NOYES	CHK. NELSON		SHEET	



DAM AND POWERHOUSE PLAN

SCALE: 1" = 100'

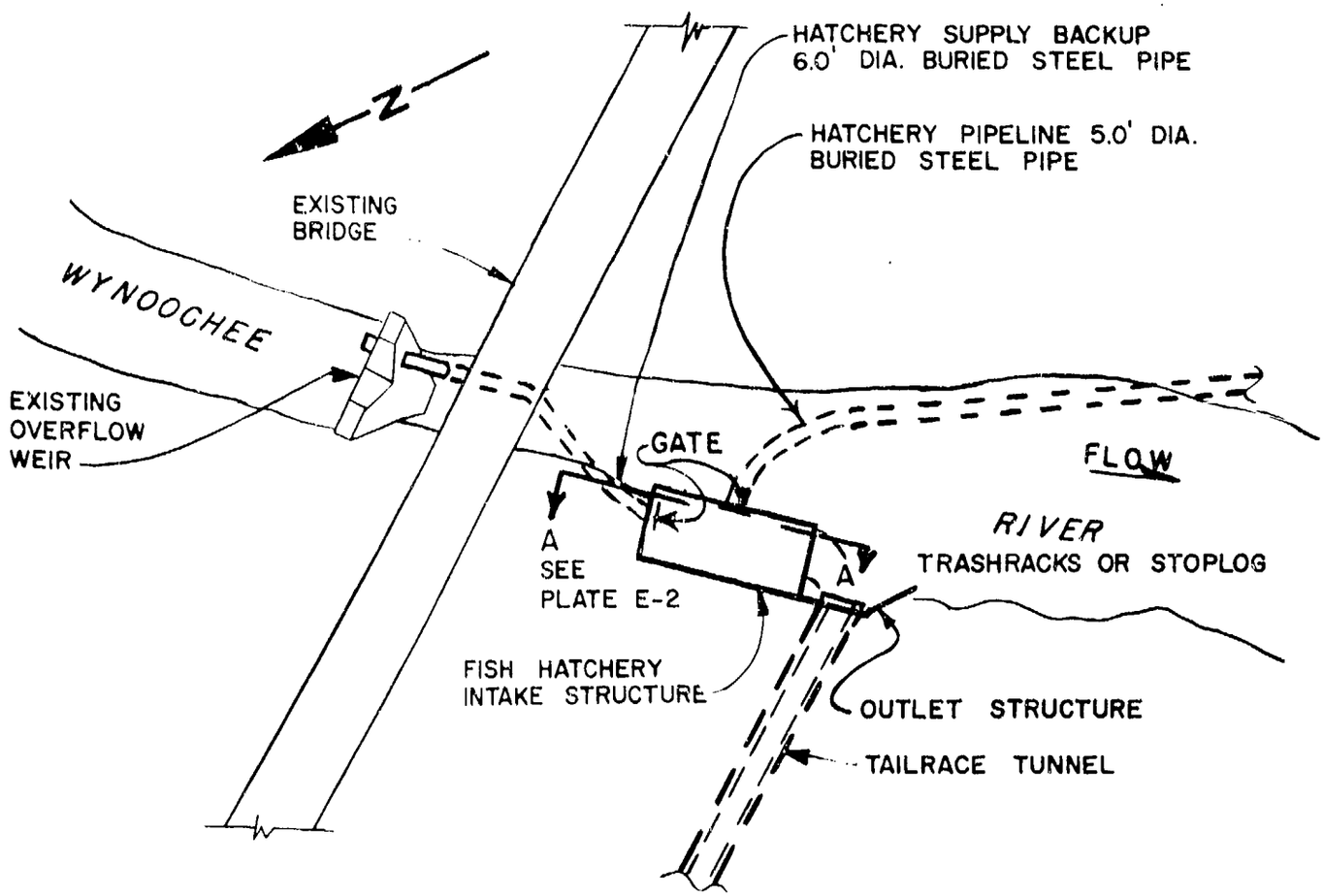
100' 50' 0' 100'



DAM AND POWERHOUSE SECTI

SCALE: 1" = 100'

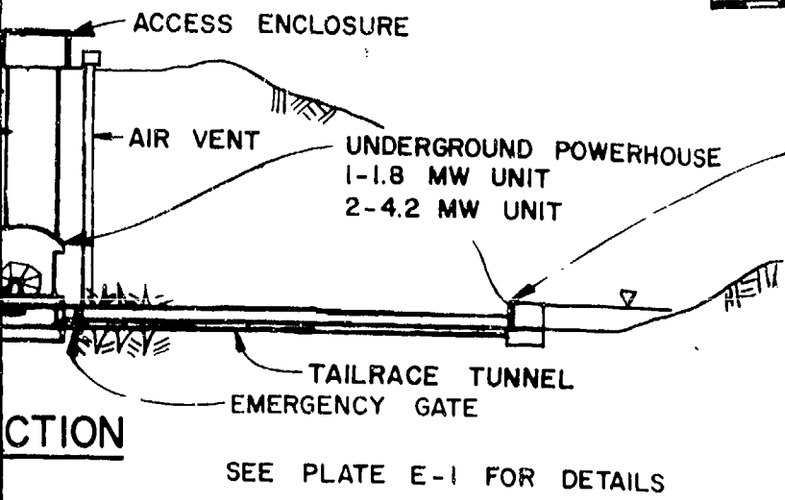
100' 50' 0' 100'



HYDROPOWER OUTLET/FISH HATCHERY INTAKE STRUCTURE

SCALE: 1" = 50'

50' 0 50'



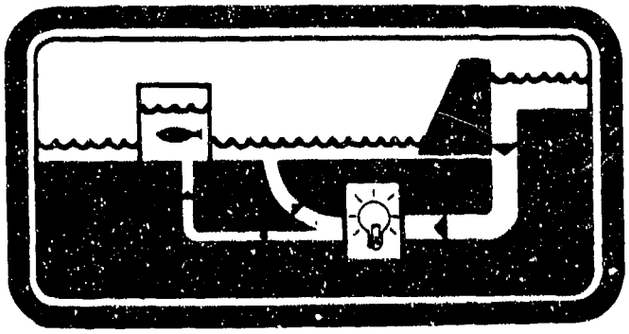
SEE PLATE E-1 FOR DETAILS

U. S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON				
WYNOOCHEE HYDROPOWER/FISH HATCHERY RECOMMENDED PLAN GENERAL DESIGN II WYNOOCHEE DAM WYNOOCHEE RIVER WASHINGTON				
SIZE	INVITATION NO.	FILE NO.	DATE:	PLATE 3
DSGN. NOYES		CHK. NELSON	SHEET	

2

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX A

APPENDIX A

PRELIMINARY SECTION 404(b)(1) EVALUATION

Paragraph		Page
1	Purpose	A-1
2	Plan Description	A-1
	a. Description of the Proposed Discharge of Dredged or Fill Material	A-1
	b. Description of the Proposed Disposal Sites for Dredged or Fill Material	A-2
3	Physical Effects	A-3
	a. Potential Destruction of Wetlands	A-3
	b. Impact on Water Column	A-4
	c. Covering of Benthic Communities	A-5
	d. Other Effects	A-5
4	Chemical-Biological Interactive Effects	A-5
	a. Does the Material Meet the Exclusion Criteria?	A-5
	b. Water Column Effects of Chemical Constituents	A-6
	c. Effects of Chemical Constituents on Benthos	A-6
5	Description of Site Comparison	A-6
	a. Total Sediment Analysis	A-6
	b. Biological Community Structure Analysis	A-6
6	Review Applicable Water Quality Standards	A-6
	a. Compare Constituent Concentration	A-6
	b. Consider Mixing Zone	A-6
	c. Will Disposal Operation be in Conformance with Applicable Standards?	A-6
7	Selection of Disposal Sites for Dredged or Fill Material	A-6
	a. Need for the Proposed Activity	A-6
	b. Alternatives Considered	A-6
	c. Objectives to be Considered in Discharge Determination	A-6
	d. Impact on Water Uses at Proposed Disposal Sites	A-7
	e. Considerations to Minimize Harmful Effects	A-8
8	Statement as to Contamination of Fill Material if from Land Source	A-9
9	Determine Mixing Zone	A-9
10	Conclusions and Determinations	A-9
11	Findings	A-9

PRELIMINARY SECTION 404(b)(1) EVALUATION
FOR PLACEMENT OF FILL MATERIAL INTO THE WATERS OF
THE WYNOOCHEE RIVER AND WYNOOCHEE LAKE AS PART OF THE
HYDROPOWER AND ENHANCEMENT FISH HATCHERY PLAN,
GRAYS HARBOR COUNTY, WASHINGTON

1. Purpose. The purpose of this preliminary evaluation is to display results of an analysis of the effects of placement of fill material into waters of the United States (specifically Wynoochee River and Wynoochee Lake) using guidelines promulgated pursuant to Section 404(b)(1) of the Clean Water Act. The factors, considerations, and analyses contained in the Section 404(b)(1) Guidelines (40 CRF 230), dated 4 September 1975, are presented herein and evaluated.

2. Plan Description. The description of the proposed hydropower and enhancement fish hatchery plan, for which this 404 action is part, is presented in section 4 of the feasibility report. Aspects of the tentatively selected plan that result in placement of fill material into the waters of the United States or adjacent wetlands include seven elements: (1) construction of the intake structure in the forebay of Wynoochee Reservoir (Wynoochee Lake), (2) construction of the hydropower outlet/fish hatchery intake structure in the Wynoochee River, (3) construction of the hatchery supply backup pipeline in Wynoochee River, (4) construction of two water supply pipeline crossings to the enhancement fish hatchery in the Wynoochee River, (5) construction of the hatchery outflow channel in the Wynoochee River, (6) the placing of riprap along the Wynoochee River upstream of the hatchery site, and (7) the filling of a wetland area with the construction of hatchery ponds. Any necessary Section 404 actions required for construction of the satellite fish stations will be accomplished during advanced engineering and design studies when siting and detailed design of such stations are determined.

a. Description of the Proposed Discharge of Dredged or Fill Material.

(1) General Characteristics of Material.

(a) In construction of the intake structure, approximately 400 cubic yards of reservoir bottom material at the site of the structure would be placed into adjoining areas. Approximately 100 cubic yards of concrete would be poured for the foundation of the intake structure. The intake structure would be precast and placed on the foundation.

(b) In construction of the hydropower outlet/fish hatchery intake structure, riverbed material would be moved to upland areas and approximately 50 cubic yards of concrete would be poured into forms and the forms removed.

(c) In construction of the hatchery supply backup pipeline (5-foot-diameter steel pipe), the pipe would be placed in a channel

excavated in the river. Approximately 75 cubic yards of concrete would be poured over the pipe and about 20 cubic yards of the excavated river material would be placed over the concrete encased pipeline.

(d) In construction of the hatchery supply pipeline, a channel would be dug at two river crossings for placement of the 5-foot-diameter steel water supply pipe. Approximately 50 cubic yards of concrete would be poured over the pipeline and about 25 cubic yards of the excavated river material would be placed over the concrete encased pipeline at each of the river crossings.

(e) In construction of the concrete hatchery outflow channel, river material would be excavated for the forms, about 10 cubic yards of concrete poured for the channel, and about 10 cubic yards of site material would be used for backfill.

(f) Approximately 3,000 cubic yards of riprap would be placed on a 700-foot reach of the right bank of Wynoochee River to protect the riverbank upstream of the hatchery site from erosion.

(g) The hatchery ponds sited in the wetland area would be constructed of asphalt (approximately 100 cubic yards) with clean crushed rock (approximately 1,000 cubic yards) and site material (approximately 2,000 cubic yards) used for foundation, berms, and backfill.

(2) Quantity of Material Proposed for Discharge. See a(1) above for material quantities.

(3) Source of Material. The riprap and crushed rock would be obtained from a nearby borrow site and material removed from construction of the underground powerhouse. Concrete and asphalt would be obtained from nearby supplies. The remaining materials would be obtained from excavation at the site of construction.

b. Description of the Proposed Disposal Sites for Dredged or Fill Material.

(1) Location. The proposed fill sites would be located in Wynoochee Lake, Wynoochee River, and a wetland area on the right bank of the Wynoochee River. The intake structure site would be in the forebay of the Wynoochee Reservoir on the right bank. The river sites would include the hydropower outlet/fish hatchery intake structure site approximately 500 feet downstream of Wynoochee Dam; the hatchery water supply backup pipeline site between the fish hatchery intake structure site upstream to the existing weir; two hatchery water supply pipeline crossing sites, a 200-foot crossing approximately 600 feet downstream of the dam and a 100-foot crossing approximately 3,000 feet downstream of the dam; the hatchery outflow channel site approximately 7,000 feet downstream of the dam; and the site for placement of riprap along a

700-foot reach of the river located approximately 3,000 feet downstream of the dam. The wetland area in which the hatchery ponds would be constructed is on a low level meander bench located approximately 5,000 feet downstream of the dam on the right bank of the river (see plates 2 and 3 in the feasibility report).

(2) Type of Disposal Sites. The proposed fill sites would include the forebay of Wynoochee Reservoir, the Wynoochee River downstream of Wynoochee Dam, and a wetland area on the right bank of the Wynoochee River.

(3) Method of Discharge. The lake would be drawn down for dry construction of the intake structure. Cofferdams would be used for construction of the other concrete structures in the dry. Material would be placed using standard construction equipment and methodology.

(4) When Disposal Will Occur. Construction time of the hydropower fish hatchery project would be approximately 2 years. The general timing of each fill activity is presented in figure 4 of the feasibility report. The specific timing of such to avoid impacts to fish and wildlife resources would be coordinated with the resource agencies during advanced engineering and design studies.

(5) Projected Life of Disposal Sites. The economic life of the hydropower and fish hatchery facilities would be 100 years; the physical life of both would be longer.

(6) Bathymetry (if Open-Water Disposal). Not applicable.

3. Physical Effects (40 CFR 230.4-1(a)).

a. Potential Destruction of Wetlands - Effects on (40 CFR 230.4-1(a)(1) (i-vi)). Construction of the hatchery ponds and outflow channel would require the loss of approximately 2 acres of wetland. The hydropower intake site, the hydropower outlet/hatchery intake site, sites for placement of hatchery water supply pipeline, and the site for riprap placement would not be located in a wetland area.

(1) Food Chain Production. The placement of fill material would eliminate approximately 2 acres of productive wetlands. This loss would have a negligible impact on the total food chain production of the river.

(2) General Habitat. Approximately 2 acres of wetland would be lost for aquatic and terrestrial flora and fauna. This would have an insignificant impact on the habitat in general.

(3) Nesting, Spawning, and Resting Sites for Aquatic or Land Species. The 2 acres of wetland would be lost to those species which

now utilize this area as habitat. However, the acreage to be lost would be insignificant in comparison to the general habitat available for use.

(4) Sites Set Aside for Aquatic Environment Study, Sanctuaries, or Refuges. There are no especially preserved sites within the plan area.

(5) Natural Drainage Characteristics. Filling of the approximate 2 acres of wetland would have only short-term, localized impacts on drainage. The creek which flows through the hatchery pond construction site would be relocated adjacent to the site.

(6) Sedimentation Patterns. No impact.

(7) Salinity Distribution. Not applicable.

(8) Flushing Characteristics. Flushing would be altered in the wetland area that is disturbed by the construction of the hatchery ponds. The flow in the small creek in the wetland area of the hatchery pond site would be diverted around the construction site.

(9) Current Patterns. No measurable impact.

(10) Wave Action, Erosion, or Storm Damage Protection. No measurable impacts.

(11) Storage Areas for Storm and Floodwaters. No measurable impacts.

(12) Prime Natural Recharge Areas. The wetlands that would be impacted are not considered to be prime natural recharge areas.

b. Impact on Water Column (40 CFR 230.4-1(a)(2)).

(1) Reduction in Light Transmission. Localized turbidity would be generated by project construction. The turbidity would cause a temporary reduction in light transmission immediately adjacent to the project site.

(2) Esthetic Values. The esthetics of the dam and powerhouse area would not be altered by the placement of fill. Degradation of esthetics due to hatchery rearing pond construction and placement of riprap along a 700-foot reach of the river would occur. Landscaping and vegetative restoration would be features of the project to minimize adverse esthetic impacts.

(3) Direct Destructive Effects on Nektonic and Planktonic Populations. The effects of the fill activities on phytoplankton and zooplankton would be negligible. No change in productivity would be expected.

c. Covering of Benthic Communities (40 CFR 230.4-1(a)(3)).

(1) Actual Covering of Benthic Communities. Project activities would result in the covering and destruction of benthic plants and animals existing in the construction sites; the impact to the river ecosystem would be insignificant.

(2) Changes in Community Structure or Function. At the fill sites, the substrate would be altered and colonization by different aquatic organisms would result in a localized change in community structure. This change would be insignificant.

d. Other Effects (40 CFR 230.4-1(a)).

(1) Changes in Bottom Geometry and Substrate Composition. Permanent change in the reservoir bottom would occur from construction of the intake structure, in the river bottom from construction of the hydropower outlet/hatchery intake and hatchery outflow channel, and in approximately 700 feet of the river from the placement of the rock riprap. After placement of the hatchery supply pipeline in the river, the river bottom would be graded to preproject contours.

(2) Water Circulation. No significant effect.

(3) Salinity Gradients. No effect.

(4) Exchange of Constituents Between Sediments and Overlying Water with Alterations of Biological Communities. No measurable effect.

4. Chemical-Biological Interactive Effects (40 CFR 230.4-1(b)).

a. Does the Material Meet the Exclusion Criteria? (If so, state the rationale.)* Material would meet the exclusion criteria in that:

(1) Other than the crushed rock, riprap, concrete, and asphalt, the material proposed to be placed into waters of the United States would be material from the site of discharge. The riprap and crushed rock would basically be free of particle size smaller than silt.

(2) The presence of contaminants in amounts believed to be toxic to aquatic wetland communities has not been identified nor suspected in the riprap, crushed rock, or site material. The source of the material would be sufficiently removed from sources of pollution to provide reasonable assurance that the material would not be contaminated. The concrete and asphalt would be cured prior to coming in contact with the lake, river, or wetland waters.

*Note that if the material meets the exclusion criteria, no further testing under 40 CFR 230.4-1(b)(2) and (3) is required.

b. Water Column Effects of Chemical Constituents (elutriate test optional but recommended). The impact on water quality would essentially be the direct physical effects from increased turbidity during construction.

c. Effects of Chemical Constituents on Benthos (40 CFR 230.4-1(b)(3)). No effect.

5. Description of Site Comparison (40 CFR 230.4-1(c)).

a. Total Sediment Analysis (40 CFR 230.4-1(c)(1)). Not applicable.

b. Biological Community Structure Analysis (40 CFR 230.4-1(c)(2)). Not applicable.

6. Review Applicable Water Quality Standards.

a. Compare Constituent Concentration. Not applicable.

b. Consider Mixing Zone. No mixing zone determinations were made.

c. Based on a and b Above, Will Disposal Operation Be in Conformance with Applicable Standards? During construction, the turbidity standard may be exceeded for short time periods in the river and lake adjacent to the construction sites.

7. Selection of Disposal Sites (40 CFR 230.5) for Dredged or Fill Material.

a. Need for the Proposed Activity. The hydropower/fish hatchery project would be water dependent and its construction requires some instream fill activity.

b. Alternatives Considered. The proposed actions would best meet the project needs and minimize fill activity.

c. Objectives to Be Considered in Discharge Determination (40 CFR 230.5(a)).

(1) Impacts on Chemical, Physical, and Biological Integrity of Aquatic Ecosystem (40 CFR 230.5(a)(1)). Only insignificant impacts to the aquatic ecosystem are expected.

(2) Impact on Food Chain. Impacts to the food chain would be insignificant.

(3) Impact on Diversity of Plant and Animal Species. Insignificant impact.

(4) Impact on Movement Into and Out of Feeding, Spawning, Breeding, and Nursery Areas. The proposed fill actions would not significantly impact the existing fish and wildlife and their movement.

(5) Impact on Wetland Areas Having Significant Functions of Water Quality Maintenance. The approximate 2 acres of wetland area that would be filled for the construction of the hatchery contribute insignificantly to water quality maintenance.

(6) Impact on Areas That Serve to Retain Natural High Waters or Flood Waters. No impact.

(7) Methods to Minimize Turbidity. Construction of the hydropower facility and fish hatchery would employ procedures to minimize turbidity in the water. These procedures would include dry construction via lake drawdown and cofferdams and use of settlement ponds for runoff from the construction site.

(8) Methods to Minimize Degradation of Esthetic, Recreational, and Economic Values. Where applicable, landscaping and vegetative restoration would be features of the project. The intake structure would be constructed of precast forms to minimize time of lake drawdown and effects on lake recreation. The most economic construction methodology would be utilized.

(9) Threatened or Endangered Species. The proposed fill actions would not jeopardize the continued existence of any threatened or endangered species or modify or destroy critical habitat of those species.

(10) Investigate Other Measures That Avoid Degradation of Esthetic, Recreation, and Economic Values of Navigable Waters. No significant degradation anticipated.

d. Impact on Water Uses at Proposed Disposal Sites (40 CFR 230.5(b)(1-10)).

(1) Municipal Water Supply Intakes. No impact anticipated.

(2) Shellfish. The proposed fill activity would not take place in an area of concentrated shellfish production.

(3) Fisheries. The subject fill actions would not affect fisheries production.

(4) Wildlife. No discernable impact from the proposed fill.

(5) Recreational Activities. No impact.

(6) Threatened and Endangered Species. See 6c(9) above.

(7) Benthic Life. No significant impact.

(8) Wetlands. Approximately 2 acres of wetlands would be filled for hatchery pond construction.

(9) Submerged Vegetation. No significant impact.

(10) Size of Disposal Sites.

(a) Construction of the intake structure would involve a site of approximately 360 square feet.

(b) Construction of the hydropower outlet/fish hatchery intake structure would involve a site of approximately 800 square feet.

(c) Construction of the hatchery water supply backup pipeline would involve a site of approximately 1,000 square feet.

(d) Construction of the hatchery water supply pipeline crossings would involve two sites of approximately 1,000 and 500 square feet, respectively.

(e) Construction of the hatchery outflow channel would involve a site of approximately 100 square feet.

(f) The site for placement of riprap would involve approximately 21,000 square feet.

(g) Construction of the hatchery ponds would involve a wetland site of approximately 2 acres.

(11) Coastal Zone Management Programs (40 CFR 230.3(e)). The proposed action would conform with existing state and local shoreline management programs.

e. Considerations to Minimize Harmful Effects (40 CFR 230.5(c)(1-7)).

(1) Water Quality Criteria. Water quality was considered in project planning.

(2) Investigate Alternatives to Open-Water Disposal. Not applicable.

(3) Investigate Physical Characteristics of Alternative Disposal Sites. Not applicable.

(4) Ocean Dumping. Not applicable.

(5) Where Possible, Investigate Covering Contaminated Dredged Material with Cleaner Material. Not applicable.

(6) Investigate Methods to Minimize Effect of Runoff From Confined Areas on the Aquatic Environment. Not applicable.

(7) Coordinate Potential Monitoring Activities at Disposal Sites with Environmental Protection Agency (EPA). Construction activity would be monitored and coordinated with EPA and the State of Washington resources agencies.

8. Statement as to Contamination of Fill Material if From Land Source (40 CFR 230.5(d)). The presence of contaminants in amounts that could be toxic to the aquatic community has not been identified nor suspected in the fill material.

9. Determine Mixing Zone. A determination of mixing zone was not made due to projected minimal impacts to water quality from the fill activity.

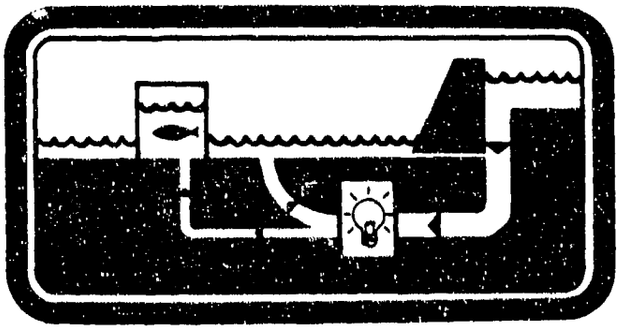
10. Conclusions and Determinations. The proposed work was evaluated in accordance with the objectives of the EPA's guidelines on the discharge of fill material into waters of the United States. All considerations and objectives were examined with respect to the proposed action. We have concluded that the project would conform with these objectives by minimizing or avoiding impacts on the environmental considerations and not significantly affecting fish and wildlife, water quality, and the ecology of the area.

11. Findings. I find the proposed work complies to the maximum extent practicable with state and local laws, regulations, and codes. There are no identified major adverse environmental effects. The work is consistent with national policy, statutes, and administrative directives. The total public interest would best be served by performance of the work. I have determined that the subject placement of fill material into waters of the Wynoochee River and Wynoochee Lake has been specified through the application of the Section 404(b)(1) guidelines.

NORMAN C. HINTZ
Colonel, Corps of Engineers
District Engineer

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX B

APPENDIX B

STUDY COORDINATION AND PUBLIC INVOLVEMENT

	Page
Key Coordination Letters	B-1
Grays Harbor Fisheries Enhancement Task Force, 19 May 1980	B-1
Washington Office of Archeology and Historic Preservation, 20 June 1980	B-2
U.S. Fish and Wildlife Service, 23 January 1981	B-3
Washington Environmental Council, 24 January 1981	B-5
Westport Charter Association, 26 May 1981	B-6
U.S. Fish and Wildlife Service, 20 July 1981	B-7
Washington Department of Ecology, 28 October 1981	B-9
Resolution of Grays Harbor County Board of Commissioners, 9 February 1981	B-10
Corps of Engineers Statement at Grays Harbor PUD Public Meeting on Wynoochee Hydropower, 6 March 1980	B-11
Newspaper Articles	B-12
Study Announcement, July 1980	B-31
Public Information Meeting, 18 May 1981 Announcement/Study Brochure	B-36
Final Public Meeting, 15 December 1981 Announcement/Study Brochure	B-45
List of Recipients of Draft Feasibility Report and Environmental Impact Statement (Study Mailing List)	B-56
Comments and Responses to Draft Feasibility Report and Environmental Impact Statement	

(This appendix will be completed following agency and public review of the draft feasibility report and environmental impact statement.)

GRAYS HARBOR FISHERIES ENHANCEMENT TASK FORCE

2109 Simpson Avenue, Suite 202
Aberdeen, Washington 98520

May 19, 1980

Colonel Leon K. Moraski
P.O. Box C-3755
Seattle, WA 98124

Dear Colonel Moraski:

Because of grave concerns over the apparent decline of the fisheries resource in the Grays Harbor area, the Grays Harbor Regional Planning Commission appointed the Grays Harbor Fisheries Enhancement Task Force in February 1980. This Task Force is broadly representative of the various user groups--industry, commercial, sports, and government. Since February we have studied, in depth, current enhancement efforts, water quality, and short and long range proposals to enhance fisheries. One such proposal discussed in detail was the possibility of a salmon and steelhead hatchery below Wynoochee Dam.

The Task Force is aware the Corps is currently undertaking studies on Wynoochee Dam hydropower, and it would appear that studies could be undertaken concurrently on a fish hatchery which could use the gravity flow supply of good quality water from the Wynoochee reservoir after it first generates hydroelectric power.

At our meeting of May 15, the Grays Harbor Fisheries Task Force unanimously urged that feasibility studies be undertaken for a salmon and steelhead hatchery at this site as this could provide an opportunity to reverse the declining fisheries in the Chehalis River Basin and Grays Harbor area. We believe that this project will substantially benefit our area.

Sincerely,

Jake Medcalf

JR:dc

cc: Grays Harbor Regional
Planning Commission

Exhibit 2

STATE OF WASHINGTON

Dixy Lee Ray
Governor

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION

111 West Twenty First Avenue, Olympia, Washington 98501 (206) 753-4011

Date: June 20, 1980
In reply refer to:

Steven F. Dice, Chief
Environmental Resources Section
P. O. Box C-3755
Seattle, WA 98124

Re: Wynoochee Fish Hatchery Study

Dear Applicant:

We have reviewed the project materials forwarded to us for the above project and would like to make the following comments:

__ *Insufficient information:* We will need: __a detailed narrative of the project elements; __a vicinity map; __a map of the project site and surrounding area showing topography, drainage, specific project boundaries, and indicating County, Section, Township, and Range; __line drawings of the project; __photographs of structures to be renovated or demolished.

XX *No resources known:* No properties are listed in the National or State Registers of Historic Places or the State Inventory of Historic Places which may be impacted by the project. Properties include archaeological and historic resources.

__ *Project area* __has/__has not been surveyed for cultural resources.

__ *Potential effects on unidentified resources:* There is reasonable probability that cultural resources exist in the project areas. __A cultural resources survey/ __monitoring of the project area is recommended as part of project construction

__ *Resources present:* __no effect/__effect uncertain; see below for comment.

__ *No adverse effect/__Adverse effect* on National Register property. See below for comment.

XX In the event that cultural materials are disclosed during construction, work in the immediate vicinity should be discontinued and this office notified.

Sincerely,

Jeanne M. Welch, Deputy State
Historic Preservation Officer

md
Comments:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Area Office
2625 Parkmont Lane S.W.
Olympia, WA 98502

January 23, 1981

Mr. Sidney Knutson, P.E.
Assistant Chief, Engineering Division
Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Mr. Knutson:

Your letter of June 17, 1980 requested a list of endangered and threatened species which may be present within the area of the proposed Fish Hatchery Enhancement and Hydroelectric Generating Facilities at Wynoochee Dam, Grays Harbor County, Washington. Our response of August 22, 1980 indicated no known endangered or threatened species were present in the area including the river reach upstream of the dam. This conclusion was determined after coordinating the request with the Washington Department of Game (WDG), Non-Game Program and WDG - Regional Office personnel in Aberdeen in addition to review of our own maps and data files.

Subsequent to those reviews we have been informed by members of your staff that confirmed records of bald eagle sitings (listed as threatened in Washington State) are available. Therefore we are supplying this new species list (Attachment A) as required by Section 7 (c) of the Endangered Species Act of 1973, as amended. Your requirements as outlined by the Act are listed in Attachment B.

Should your biological assessment determine that a listed species is likely to be affected (adversely or beneficially) by the project, your agency should request formal Section 7 consultation through this office.

Even if your biological assessment shows a "no affect" situation, we would appreciate receiving a copy of your assessment for our information. If you have any additional questions regarding your responsibilities under the Act, please contact Mr. Jim Bottorff, Endangered Species Team Leader, (206) 753-9440, FTS 434-9440 at the following address:

U. S. Fish and Wildlife Service
Endangered Species Team
2625 Parkmont Lane S.W., Bldg. B-3
Olympia, WA 98502

Your interest in endangered species is appreciated.

Sincerely,

Margaret J. Kolar

for Joseph R. Blum
Area Manager

Attachments
cc: Regional Director, Portland, OR (AFA-SE)
ES, Olympia
Washington Department of Game, Non-Game Program

LISTED AND PROPOSED ENDANGERED AND THREATENED
SPECIES, AND CANDIDATE SPECIES THAT MAY OCCUR
WITHIN THE AREA OF THE PROPOSED
ENHANCEMENT FISH HATCHERY AND
HYDROELECTRIC GENERATING FACILITIES
ASSOCIATED WITH WYNOOCHEE DAM IN
GRAYS HARBOR COUNTY, WA
Number 1-3-81-SP-10

LISTED

Bald Eagle (*Haliaeetus leucocephalus*)

PROPOSED

none

CANDIDATE

none

AD in 2 EIS

Washington Environmental Council

107 South Main Street
Seattle, Washington 98104
206-623-1483

January 24, 1981

Jerry L. Foy, Mayor
City of Aberdeen
200 East Market
City Hall
Aberdeen, WA 98520

Re: Development of hydropower on Wynoochee Dam

Dear Mayor Foy,

The Washington Environmental Council is concerned with the depressed condition of the anadromous fisheries on the Wynoochee River, due in part to the recent construction of the Wynoochee Dam. Now, three agencies, including the City of Aberdeen, have proposals for adding hydropower facilities to that dam.

The Army Corps of Engineers proposal includes a large fish hatchery, designed in cooperation with all concerned fisheries management agencies and user groups. We strongly support this proposal. We will oppose any further development on the Wynoochee River which does not consider the fisheries resources.

We urge you to cooperate with the Corps of Engineers; you could build the powerhouse with design features allowing the hatchery to be built at the same time by the Corps. We will urge the Federal Energy Regulatory Commission to include requirements for such design features in any license issued for a Wynoochee Dam project.

Sincerely,

Roger Leed, President
Washington Environmental Council

cc: U.S. Army Corps of Engineers
Federal Energy Regulatory Commission

Westport Charter Association
WCA
P.O. Box 654
Westport, Washington 98595

May 26, 1981

Col. Moraski
District Engineer
Seattle District, Corps Of Engineers
Box 03755
Seattle, Wash. 98124

Re: Wynoochee Hydropower/Fish Hatchery

Dear Col. Moraski;

Please accept this correspondence as a request that continue with the feasibility study on the Wynoochee Hydropower/Fish Hatchery feasibility study. Our organization is completely in favor of the project. We also suggest the following:

1) That early run Coho Salmon also be designed for in addition to Steelhead and Spring Chinook. They would be of much more benefit to the general public that uses the services of charter boats.

2) That you solicit the support of the National Marine Fisheries Service and the Dept. of Commerce rather than U.S. Fish and Wildlife and the Dept. of Interior. Interior has shown an excessive amount of bias toward Indian tribal points of view in the past decade to the detriment of all other users of the resource.

If we can be of any more assistance please contact us.

Thank you,

Mark Cedergreen, Commodore

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Area Office
2625 Parkmont Lane S.W.
Olympia, WA 98502

July 20, 1981

Refer to: 1-3-81-I-201

Colonel Leon K. Moraski
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Moraski:

This is in response to your letter of July 6, 1981, that transmitted your biological assessment of the effects of the proposed Wynoochee Hydropower/Fish Hatchery (HP/FP) on the threatened bald eagle (Haliaeetus leucocephalus). You concluded that this project would not significantly impact this species.

It was stated in the assessment that the declining run of coho salmon above Wynoochee Lake will be eliminated with the project. Coho salmon (as well as steelhead trout) are presently collected at the fish collection facility downstream of the dam and trucked to the upstream release site. This remnant run has occasionally been supplemented with hatchery-reared fish. A small population (maximum of 6) of bald eagles have occasionally fed on spawned-out salmon carcasses associated with this run. As was pointed out in the assessment, eagles utilizing this seasonal food supply would be displaced. The premise was offered that increased salmon production with the hatchery in operation coupled with increased trout production in Wynoochee Reservoir due to decreased competition would offset the loss of the eagle's food supply upstream.

We take exception with the theory that lessened competition for food sources in the lake will increase available trout stocks that could be utilized by eagles. Competition between trout and salmon in Wynoochee Lake has not been identified as a limiting factor for trout production. The premise that more salmon carcasses will be available downstream appears to be valid. The majority of spawning will occur in the hatchery where the carcasses will be disposed of. However, as presently occurs, some spawning salmon stack up below the re-regulating dam and are not drawn into the fish collection facility. Larger runs of salmon due to hatchery production should create a larger source of in-river salmon carcasses downstream of the dam. Redistribution of eagles, according to available food resources, as occurs on the Skagit River, can be expected. Further credibility can be attached to this assumption through analysis of eagle sighting locations. The majority of recorded sightings in the Wynoochee Basin since construction of the dam have occurred downstream of the reservoir.

In consideration of these circumstances, we concur with the "no effect" conclusion of your biological assessment. No formal consultation, as described in Section 7(c) of the Endangered Species Act of 1973, 16 U.S.C. 1531, et seq., is required at this time. Should new information or project features arise that change the conclusions of your assessment or this letter of concurrence, then formal consultation should be considered.

In furtherance of Sections 2(c) and 7(a)(1) of the Act which mandates Federal agencies to utilize their authorities to carry out programs for the conservation of listed species, we recommend that:

1. All possible efforts be made to preserve bankside standing timber for use as perch trees. This should include the known perch tree immediately below the dam and known and potential sites near the fish collection facility. This should be reflected in the final project plans as a project feature.

2. Human access should be limited immediately below both Wynoochee Dam and the collection facilities to reduce disturbance to feeding bald eagles during the fall-winter salmon runs.

3. Eagles may extend their feeding area downstream of the collection facility due to upstream displacement and a larger supply of available salmon carcasses. Therefore, your agency should continue monitoring bald eagle numbers and distribution in the project area. This Service should be notified for assistance in developing a protection plan should any population shifts or increases in unprotected areas be observed.

We greatly appreciate your concern for endangered species and the coordination and efforts of your staff on this project.

Sincerely,

Margaret J. Kolar

for Joseph R. Blum
Area Manager

Attachments

cc: RO (AFA-SE)
ES, Olympia, WA
WDG, Non-Game Program
WNHP

JOHN SPELLMAN
Governor

DONALD W. MOOS
Director

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504 • (206) 753-2800

October 28, 1981

Ms. Karen S. Northup
Environmental Resources Section
Seattle District Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Ms. Northup:

We have reviewed the draft language for the Wynoochee hydropower/hatchery project concerning instream resources impacts and minimum flow determination in post authorization studies. Generally, we find the language to be acceptable. Specific language modification suggestions are included in the enclosed draft.

You should consider including a statement that the explanation of impacts is for a "worse case" situation. These worse case impacts would occur if no minimum flow was maintained in the bypass reach, other than the 20 cfs inflow, during those periods when releases from the dam are only sufficient to supply the hatchery. If higher minimum flows are determined to be appropriate in post authorization studies, then the impacts on instream resources should be less than those stated for the worse case situation.

The language regarding deferral of minimum flow determination until post authorization studies is in line with our verbal agreement at the meeting of August 19, 1981.

Thank you for the opportunity to provide these comments at this early draft stage. We look forward to receiving the draft EIS. Contact Ken Slattery (459-6116) if you have any questions regarding our comments.

Sincerely,

Michael Hambrock, Supervisor
Water Resources Policy
Development Section

MH:tf

RESOLUTION NO. 81-16

WHEREAS, several entities are studying the possibility of building a power facility on the Wynooche River, and

WHEREAS, the construction of the original Wynooche Dam diminished the salmon and steelhead runs by flooding prime spawning grounds and blocking access to the upper river, and

WHEREAS, the Grays Harbor County Commissioners believe that the fish should be given equal consideration with power generation prior to construction of any facility, and

WHEREAS, construction of a power facility on the existing dam appears to be less of an impact to the environment than a new dam in a downstream location;

NOW, THEREFORE, BE IT RESOLVED, that the Grays Harbor County Commissioners encourage all entities of government to cooperate in a plan that would utilize the existing dam for power production and provide for a salmon/steelhead rearing facility located below the existing dam.

ADOPTED: _____, 1981.

BOARD OF COUNTY COMMISSIONERS
FOR GRAYS HARBOR COUNTY

Chairman

Commissioner

Commissioner

ATTEST:

County Auditor and Ex-Officio
Clerk of the Board

STATEMENT BY CORPS OF ENGINEERS
GRAYS HARBOR PUBLIC UTILITY DISTRICT (PUD) PUBLIC MEETING
ON WYNOOCHEE HYDROPOWER STUDY
6 MARCH 1980

The Seattle District, Corps of Engineers, believes, if hydropower development is feasible at Wynoochee Dam and will meet a need in the Pacific Northwest power system, development should be rapid and by whomever can complete the job most expeditiously. The Corps does, however, have some public trusts to protect and must consider the following, whoever plans, designs, and builds the project:

a. Physical compatibility of the proposed hydropower addition with the existing dam.

b. Preservation of the operational integrity of the dam for its authorized project purposes - flood control, water supply, fish and wildlife, and irrigation.

c. Adequate public compensation for the advantages offered to power interests by the public investment in the existing dam.

d. Optimization of the public benefits for all potential project uses, including any proposed changes in the project and its operation.

Parallelism in our study efforts is not duplication because much of the Corps' work would be required to prepare the Corps' recommendations to the Federal Energy Regulatory Commission on an application for construction by the PUD at the Corps' project. By cooperating in our study efforts, we can jointly insure a minimum of duplication and save time in the review process. We can also keep our options open as to who can best and most expeditiously develop the resource once all of the facts are known.

To this end, we would be willing to explore with the PUD and its consultant this cooperative arrangement. We could share in the work to be done and strive to avoid duplication of effort to the advantage of both parties. This arrangement should insure a short study time, maximum utilization of expertise and funds, a shorter review time, full consideration of all public interests, optimization of public benefits for all potential project uses, as well as an acceptable power design and operation, thereby resulting in power on line as soon as possible.

PUD encouraged to proceed with Wynooche hydro plans

The Daily World, Aberdeen, Washington, Tuesday, February 26, 1980

By MARGARET CERVENKA
World Staff Writer

Federal officials and congressional representatives have encouraged the Grays Harbor Public Utility District to apply for a preliminary permit to add power generation facilities to the Wynooche Dam, PUD general manager Ferris Gilkey said Monday.

A preliminary permit, he said, would "hold" the dam site for the district while detailed studies are made and until, and if, the district decides to apply for a construction license.

Gilkey and Commissioners Arne Holm and Jack VanDerbeek visited the Washington, D.C., for three days last week to discuss the proposed Wynooche Dam hydroelectric power project.

The PUD is now planning to schedule a public meeting within the next few weeks to sample local reation to the hydroelectric power project. Gilkey said that the district will proceed with its preliminary permit application after the meeting if the public's reaction to the proposal is favorable.

THE PUD board came under some fire at its Monday meeting from Aberdeen auto dealer Stan Trohimovich for taking what he called a "junket" to Washington, D.C.

"I object to this loose use of public funds," Trohimovich said. "I think you could have gotten the same information with a few letters and some judicious phone calls before 8 (a.m.)."

Gilkey and Commissioners Jack Welch and Holm said, however, that the cost of the trip was minuscule compared to what the district may have saved in the ultimate cost of the proposed hydroelectric power project.

Gilkey said the project's estimated cost is $20 million. With a hypothetical 10 percent annual escalation rate, he said, the cost of the project would increase $2 million a year or approximately $150,000 a month.

"So if you can save a week," he said, "that more than pays for the trip."

GILKEY said the group met last week with representatives from the offices of Sens. Warren Magnuson and Henry Jackson and Rep. Don Bonker, and with officials from the Federal Energy Regulatory Commission.

He said the PUD representatives received copies of hydroelectric power project licenses that will give them an idea of the kind of agreement the district may enter into with the U.S. Army Corps of Engineers if the PUD proceeds with construction.

Gilkey explained that because the dam is a Corps project, if the district adds generation facilities it must receive Corps approval of the design. The PUD would also have to reach an agreement with the federal agency on how the generation would "fit" with other dam uses, such as fisheries and flood control, he said.

GILKEY SAID the district officials also wanted to find out whether the Corps' decision in October to conduct its own study of the economic feasibility of the hydroelectric power project would affect the PUD's plans for the dam.

Although they did not receive a specific answer to that question, Gilkey said the federal officials "encouraged" the district to apply for a preliminary permit for the project. He said the question of whether individual utilities or the federal government develops generation facilities is addressed in final license applications.

Gilkey said the district will arrange for a public meeting within the next few weeks between interested persons and consultants from R.W. Beck, and Associates, the consulting firm that determined in a study conducted for the PUD that the addition of an electrical generating system at the dam would be economically feasible.

Gilkey said that unless "real local opposition" appears during the public meeting or shortly afterward, the consulting firm will proceed with the preliminary permit application, which Gilkey said could be completed within two months.

According to the Beck study, two generators in a powerhouse about 800 feet south of the dam would produce 4.9 megawatts of power annually, enough to serve about 2,000 homes. The consultants said the electricity produced by the dam would cost slightly less than power generated from the twin Satsop nuclear power plants.

Corps urges PUD to push Wynooche power

Aberdeen Daily World March 7, 1980

By MARGARET CERVENKA
World Staff Writer

An Army Corps of Engineers representative said Thursday that generating facilities at the Wynooche Dam should be developed "as rapidly as possible," and offered to work with the Grays Harbor Public Utility District to speed up the required studies and license review.

Dr. Jim Waller of the Seattle District Corps office said the federal agency "really believes the project is feasible and there is a need for it."

Waller made his comments at a public hearing sponsored by the PUD to determine whether there was any substantial local opposition to the addition of an electrical generating system at the Wynooche Dam.

Almost all of the opinions expressed at the meeting, attended by about 50 persons, favored the project, and PUD general manager Ferris Gilkey said he would recommend that the PUD commissioners proceed with a preliminary permit application.

A PRELIMINARY permit would reserve the right of the district to develop power at the dam for up to three years while further studies are made and until district officials decide whether to proceed with construction.

Don Bowes, an R.W. Beck and Associates consultant who headed a feasibility study of the project, said that if the district sticks with the project and all goes according to schedule, the generators could be completed and "on line" by mid-1986.

After a presentation of the Beck study, which found a 10 megawatt generating system on the Wynooche Dam economically feasible, the consultants and Gilkey fielded questions from the audience about the mitigation of lost fish runs and the effects of the project on Aberdeen's dam debt and the PUD's nuclear power commitments.

MOST OF the audience, dominated by members of the Grays Harbor Regional Planning Fisheries Enhancement Task Force, wanted to know if and how the PUD proposed to mitigate the fish runs lost due to the addition of generating turbines at the dam.

Gilkey said that the runs of coho, steelhead and cutthroat that had spawned upstream from the dam before its construction have been declining or eliminated since the dam was built, and said it would be "a bit unfair" to expect the PUD to assume responsibility for all the losses.

"But if generation is installed, and it continues to reduce the runs above the dam, then at least what is going up there now should be mitigated."

He said it's too early to say how the district will make up for the lost runs, but suggested one possibility would be to participate in a hatchery operation on the Wynooche River with other local, state and federal agencies.

Bowes said the district or Corps, whichever builds the dam, could also consider adding a system that would control the temperature of water released from the dam for the benefit of downstream fish runs.

IN ANSWER to another question, Gilkey said the proposed hydro project would help "alleviate" the City of Aberdeen's debt on the dam, since the Federal Energy Regulatory Commission would require the district to pay for use of the dam.

The city faces a $1 million per year repayment on the dam beginning in 1983.

As for the district's nuclear power commitments, Gilkey said the proposed hydro project would not displace much of the PUD's need for new power from nuclear plants, but could save the district some money if power from the dam proves cheaper than power from Washington Public Power Supply System projects 4 and 5. Project 4 is at Hanford, while No. 5 is at Satsop.

He explained that the district plans to sell the portion of its share of the power from 4 and 5 that it doesn't need from the time the projects come on line until 1992.

If the dam power is cheaper than the power from 4 and 5, the district would take in less and sell more of the nuclear power, he said.

But he noted that the amount of generation expected from the proposed hydro facility — 4.9 megawatts annually — probably would not supply the district's load growth for one year.

PORT MANAGER Henry Soike and Aberdeen Mayor Jerry Foy expressed support for the project and encouraged the district to proceed with its plans.

Ex-mayor Walt Failor, however, voiced some reservations about spending $20 million of ratepayers' money on the project, noting that when the addition of generation facilities to the dam was first considered years ago it was found economically unfeasible.

Gilkey, however, said that the skyrocketing costs of nuclear power and other new generation have made power planners take another look at projects previously considered unfeasible.

Fish study urged

THE DAILY WORLD MAY 14, 1980

Gov. Dixy Lee Ray has asked the U.S. Army Corps of Engineers to begin studies for a fish hatchery to be located below the Wynooche Dam north of Montesano.

In a letter to Col. Leon Moraski of the corps, the governor noted the proposed hatchery has been under consideration by the state Department of Fisheries, as well as the Grays Harbor Fishery Enhancement Task Force.

"The salmon and steelhead fisheries have been declining for several years in some areas of the State of Washington," Gov. Ray wrote in an April 23 letter.

"Opportunities to reverse this trend and enhance the development of the fisheries should be fully considered at all levels of government with full involvement by the public," she said.

A study of the possibility of hydroelectric power from the Wynooche Dam is already underway. The governor said a fish hatchery could use the water after it runs through electric turbines.

The project would benefit from "an abundant gravity-flow supply of good quality water in the Wynooche reservoir, and would not require large amounts of power for pumping water," Gov. Ray said.

"The unique opportunity this combined hydropower and fish hatchery development offers should be vigorously pursued," the governor wrote.

She noted that a preliminary design for the hatchery has been prepared by the state, which plans to act as as the local sponsor for the project.

New Wynooche hatchery tops list from task force

Aberdeen Daily World July 9, 1980

By ROB FEUERSTEIN
World Staff Writer

A new fish hatchery for the Wynooche River tops the list of long-term improvements proposed by Grays Harbor's fisheries enhancement task force.

The new hatchery is one of 10 short- and long-term programs suggested by the task force, which was formed in January under the sponsorship of the Grays Harbor Regional Planning Commission.

And right off the bat, regional planning will have $25,000 to start implementing the programs.

PROPOSALS include a rearing pond at Westport, a trapping area for steelhead, a summer-run steelhead project and an aquaculture program at Grays Harbor College.

At the urging of the Port of Grays Harbor, regional planning gathered representatives of sport and commercial fishing groups, municipalities and regulatory agencies to come up with ways to improve the Harbor's sagging fishing industry.

The Port pledged $25,000 to get the program under way. Initially, the money was to go for preliminaries—getting the agencies together, conducting whatever studies would be necessary and publishing a report.

But the task force's initial report was issued this week, and not a penny of the $25,000 has been spent.

Pat Dugan, director of the regional planning commission, said money to do the preliminary work was collected by "hook and crook"—combining other grant funds already available to the commission.

TUESDAY afternoon, the Port commissioners decided regional planning could use the $25,000 to start work on the projects.

"I think we should tell regional planning to begin the work as quickly as possible," said Port Commissioner John Stevens.

Commissioner Bob Aiken said the Port should ensure regional planning keeps an accurate account of how the money is spent.

Stevens replied, "They realize they're accountable to us."

Before any work is done, however, the fisheries task force will put its preliminary report into final form. A meeting has been called for 7:30 p.m. July 17 at the County Multi-Services Center to discuss the initial findings.

DUGAN INDICATED the $25,000 will go a long way toward starting the projects. Some of the suggestions will cost $1,000 to $3,000, and others are to be paid by separate agencies.

The Wynooche hatchery project, for example, would be funded by the U.S. Army Corps of Engineers, which is now conducting a study on its feasibility. Present plans call for a gravity-fed hatchery to be located just below the proposed hydroelectric plant at the Wynooche Dam.

In their report, task force members recommend that the Corps keep them posted on the progress of the hatchery study. They also suggest the Corps select an advisory committee comprised of fishermen, along with representatives of local governments and the departments of fisheries and game.

The second long-term proposal, a rearing station at Westport, would be similar to a program now under way there. The Port has supplied space where some 30,000 fish are held, fed and released when they are 6 to 7 inches long.

SHORT-TERM proposals include:

- ☐ **A rearing pond at Westport** sponsored by the Westport Charter Association. The pen could raise 10,000 to 30,000 fish.
- ☐ **A trapping area at VanWinkle Creek** for Wynooche, Humptulips and Satsop winter-run steelhead. Eggs would be obtained and smolts raised in Lake Aberdeen.
- ☐ **An expansion of a summer-run steelhead project**, which now raises 30,000 fish. The program could be expanded by another 10,000, the report indicates.
- ☐ **An aquaculture project, sponsored by Grays Harbor College.** The plan would include construction of a new concrete building at Alder Creek on the GHC campus. The project would raise salmon for release as a part of the college's Fisheries and Wildlife Technician curriculum.

Aberdeen might develop hydropower on its own

Aberdeen Daily World October 2, 1982

By BRYN BEORSE
World Staff Writer

The Grays Harbor Public Utility District has filed for a preliminary permit to build a five to 10 megawatt hydroelectric generating station at the Wynooche Dam. But now the PUD has competition.

The City of Aberdeen went out on a limb to finance the dam, and the city council voted Wednesday night to file its own application for a preliminary permit to build the proposed power station.

"The PUD has started applying for a preliminary permit for the exclusive right to develop the hydroelectric facility. We have applied on the same grounds," said Councilman Jack Durney. "We've got quite a debt (from the construction of the dam). It's the city's obligation (to find new sources of revenue to help pay it off)."

The city must pay 78 percent of the construction costs, plus maintenance and operation costs of the dam. The total is about $1 million a year for 50 years, beginning in 1983.

A substantial part of the debt, however, has already been provided for in contracts to supply water to the Washington Public Power Supply System and local industry.

In May, the city had written a letter to the PUD, asking for negotiations on the sale of city water for hydroelectric use, but was told the PUD would not be ready to negotiate for another year or two.

The letter from Mayor Jerry Foy said, "We believe that the PUD and the City of Aberdeen should enter into a contract prior to the submission of application for a license from the Federal Energy Regulatory Commission."

Once a license is granted, the entity receiving it gains exclusive development rights for a period of time.

PUD Manager Ferris Gilkey pointed out today that the move by the city is very preliminary.

The letter from the city last spring expressed the hope that cooperation between the two municipalities would lead to development of power from the dam.

City officials said there would be advantages to the two entities working together, since cheaper financing is available to the city.

Or the city would be capable of financing the project itself, they said.

It was reported that councilmen were dissatisfied with the PUD's response to the offer to negotiate and the move to seek a city permit may be a maneuver to prompt action from the PUD.

The resolution passed by the city council last night ratified a recent action by Mayor Foy in filing a notice of intention to file an application with the Federal Energy Regulatory Commission. Action had to be taken quickly to meet a deadline, Durney said.

It authorized hiring the Seattle law firm of Roberts, Shefelman, Lawrence, Gay & Moch and the Seattle engineering firm of Schuchart and Associates to prepare and file an application for a preliminary permit.

The money for the legal work will come from a maintenance and operation account established by the city for the Wynooche Dam.

The mayor and City Engineer Rudy Balgaroo were authorized to travel to Washington, D.C., to meet with the staff of the federal agency.

At a May meeting of the PUD board, Gilkey said negotiations were premature because an actual cost-benefit analysis of the proposed project would not be completed for one to two years. At that time, "the PUD managers and consultants would have a better idea of what the district could afford to pay the city for use of the dam and the water."

Privately, however, councilmen expressed the opinion that the PUD has tried an "end run" around the city's concerns.

Gilkey said today that a real conflict over who should get the permit could delay the project.

Wynooche power old idea

Aberdeen Daily World 19 October 1980

By BRYN BEORSE
World Staff Writer

When Grays Harbor looked forward to becoming the paper manufacturing center of the nation, and to electric logging and hydroelectric developments across the Peninsula, Aberdeen voters once approved $2 million in bonds to develop hydroelectric power on the Wynooche River.

A bundle of old newspaper clippings supplied to *The Daily World* last week by Emery Stoy of Hoquiam, outlines the story.

Terrific controversy erupted in November 1923 when the city council passed a resolution supporting the matter, but a vote Dec. 1 in Aberdeen went 1092 to 992 in favor of the project.

"THIS ELECTION brought to a close one of the most briefly sensational campaigns in the political history of Grays Harbor County," said *The Grays Harbor Washingtonian* after the election. "When the polls closed at 8 o'clock the streets in the downtown sections were littered with handbills and special newspaper editions. Hundreds of automobiles were draped with huge banners bearing declarations for and against the project. It was impossible to pass along the streets without being accosted by delegates and urged to go to the polls."

But by January, state courts had held that "a bond issue for the purpose was illegal," canceling the project.

Other companies were quick to step in, the Grays Harbor Light and Power Company applying for development rights to practically the same site as the city had planned for on Jan. 7.

It hoped to develop a 10,000 horsepower plant at a cost of $1.7 million. The city planned a 27,000 hp plant.

In those days, the Lake Cushman hydroelectric project was under construction for Tacoma City Light, while the Seattle's utility was building the Skagit River project.

A city sponsored survey crew, sent up the Wynooche Valley in September, planned to take two weeks and packhorses to complete the journey.

BY FEB. 11, however, *The Washingtonian* of Hoquiam carried a story predicting that the Electric Park station of the Grays Harbor Railway & Light Co. would become the distribution center for a great power system that would supply Willapa Harbor cities and furnish electric current for logging operations throughout the Olympic Peninsula.

"Plans for power development in the Olympics have reached a point where actual construction work is imminent," said H.W. Crozier, hydroelectric engineer, who spoke to the Hoquiam Kiwanis Club.

He represented the Federal Power & Traction Co. of New York, parent organization of the Grays Harbor Railway & Light Co. The company had filed for rights to develop the Queets, Quinault and Hoh river valleys.

Crozier told the Kiwanians that a "revolution" in the logging industry was expected through electrification of logging engines.

"The western Olympic Peninsula is a great undeveloped empire heavily timbered and watered by many streams, some of them with important hydro-electric power resources.

"Its timber resources have been scratched a little at its borders,and its steams have been unmeasured except for the work during the 1924 season and its power only heretofore guessed at."

The challenge, said Crozier, was to develop the resources at a cost to compete with the burning of sawmill waste or long transmission from other sources.

A market to absorb the power in large blocks is needed, he said, and so a campaign had been underway all winter to introduce electric logging

"It is the electric logging donkey that will in a large measure be the key to unlock the hydro-electric power resources of the western Olympic Peninsula region," he said

He called the proposed Aberdeen project impractical because of the "continuous opposition," and disputes over disposal of 110 million board feet of timber worth $1,250,000 in those days

THESE DAYS, the City of Aberdeen and the Grays Harbor Public Utility District both have their eye on hydroelectric development of the Wynooche River, with the advantage that a dam is already in place. Aberdeen owes some money for the dam and would like to see electric power pay for it.

The electric logging donkey never did become popular, and Lake Cushman remains the only major hydroelectric development on the Peninsula.

Only the growing demand for hydroelectric energy from the Columbia River and the building of newfangled, expensive, nuclear plants and resulting increases in electric rates have made the Wynooche River appear to be an economically feasible site.

Dam hydropower permit finds city and PUD at odds

And the Corps is in the act, too

The Daily World, Aberdeen, Washington, Wednesday, November 19,1980

By MARGARET CERVENKA
World Staff Writer

The Grays Harbor Public Utility District will attempt to convince federal officials that the PUD's plans to add hydroelectric generators to the Wynooche Dam are better than the City of Aberdeen's.

But even if one of the two agencies receives a preliminary permit for the project, it may be that neither ends up building the powerhouse.

A third agency — the Army Corps of Engineers — has a design of its own for a proposed underground powerhouse at the dam and a fish hatchery 3,000 feet downstream.

PUD MANAGER Ferris Gilkey was told by the PUD commissioners Monday to "strongly object" to the City of Aberdeen's application for a preliminary permit to develop hydropower at the dam.

The city's just-prepared application is in direct competition with the PUD's preliminary permit application, which was submitted to the Federal Energy Regulatory Commission (FERC) last spring.

A preliminary permit would reserve for the holder the right to develop power at the dam for up to three years while further studies are made and until the permit-holder decides whether to proceed with construction.

THE CORPS doesn't need to apply for a preliminary permit from FERC, according to Dr. Jim Waller of the Seattle District Corps office. The Corps' recommendations on the dam will be submitted directly to Congress, which will decide whether the federal government or a non federal agency should develop the power facilities.

By granting a preliminary permit to the PUD or the City of Aberdeen, Waller said, "FERC will simply be deciding which one of the two gets to keep going. It has no bearing on us."

The decision on which agency ultimately develops the power will be made "36 months or so down the road" when an actual construction license is granted, he said.

IN THE meantime, that still leaves the two local agencies competing for the chance to "keep going" with further studies to determine whether the Wynooche hydropower project is ultimately feasible.

The PUD commissioners have already entered into a $390,000 contract with a Seattle consulting firm to conduct the studies and prepare an application for a construction license.

"I think we should point out to FERC that we made the application a long time ago," Commissioner Jack Welch said. "We've spent a hell of a lot of money on engineering, review and research, and they shouldn't even consider the Aberdeen application."

City officials hope electricity from a Wynooche powerhouse will help repay the federal government for the construction of the dam. The city is obligated to pay 78 percent of the dam's construction cost, in addition to maintenance and operation costs. The total is about $1 million a year for 50 years, beginning in 1983.

IN MAY, the city wrote a letter to the PUD, asking that the two agencies begin negotiations for the utility's use of the Wynooche Dam and water for the hydropower project. But PUD officials said it was premature to discuss actual figures because plans for the project were very preliminary.

There was speculation that the move to seek a permit for the city was a maneuver to prompt the PUD to negotiate. When asked about that speculation, Mayor Jerry Foy replied, "The city is very serious about the preliminary application and the development of the hydropower on its own. That's why we're going to Washington, D.C."

Gilkey said he couldn't say what specific comments the PUD would make to FERC about the city's preliminary permit application because he had just received a copy of the application and hadn't had a chance to review it. Under FERC rules, the PUD has 30 days to comment on the city's application.

"Hopefully we can make the argument that our proposal — for whatever the reasons are — is better than the application the city gave," he said.

GILKEY SAID he is in "no position to judge" which application has the better chance for approval. FERC rules give municipalities, such as cities and public utilities, preference in granting applications, he said, "but the rules don't seem to make the distinction between an operating utility (the PUD) and a non-operating utility (the city)."

He said he has some concerns about the delay the competing applications may cause in the actual construction of the facilities.

"Regardless of who builds the thing, everything we see says there's a need for additional energy all through the '80s," Gilkey said, "which means the faster anything can be brought on line, the better ...Every day of delay simply increases the cost."

Foy, however, said he "doesn't happen to believe it's going to cause any more delay than if we hadn't been there."

Gilkey said the PUD would prefer to build the facilities because "if we do it we know that it (the electricity produced) will come into our system."

Aberdeen may bow to PUD's Wynooche plan

The Daily World, Aberdeen, Washington, Thursday, February 5, 1981

By BRYN BEORSE
World Staff Writer

The City of Aberdeen may withdraw its application to develop a hydroelectric power station on the Wynooche River if negotiations now under way with the Grays Harbor Public Utility District are successful, according to Mayor Jerry Foy.

The city and PUD have been in competition for the right to develop the power potential at the Wynooche Dam since last summer.

At that time, city officials were told the PUD could not discuss payment for water to generate power at the city-financed dam until after the utility received the exclusive right to develop it.

Meanwhile, the city must repay millions of dollars in dam construction costs, and maintenance and operation bills.

The total is about $1 million a year for 50 years, beginning in 1983.

Frequent meetings have been scheduled in the negotiations to reach agreement by Feb. 20.

That's the deadline when the city must "fish or cut bait," Foy said, because that is the last day the city can withdraw its application.

"The city could become a co-applicant or support the PUD applications," he said.

Or if the city's concerns are not addressed, it may go ahead and try to convince the Federal Energy Regulatory Commission that its plans to add hydroelectric generators to the dam are better than the PUD's anyway, he added.

Foy said city negotiators are trying to make sure that taxpayers receive a fair return on their dam investment, that they share the benefits of the energy produced and that the cost of the power be reasonable.

PUD manager Ferris Gilkey has said that continued conflict in the application could delay the project. Foy, on the other hand, has said the city's entry into the proceedings won't mean a delay.

The Army Corps of Engineers added a joker to the deck in November when it submitted a design of its own for the proposed underground powerhouse.

A preliminary permit issued to any of the agencies would give an exclusive three-year right to develop a power plant at the dam. But the Corps doesn't have to go to FERC. It can ask Congress to decide whether a federal or non-federal agency should develop the power. FERC would simply decide if Aberdeen or the PUD gets to continue its application in competition with the Corps.

PUD and city officials met for several hours Wednesday. They will meet again this week and again early next week.

The city council Wednesday hired the firm of Foster and Marshall to act as financial consultants to the city in the negotiations, and allocated $1,500 from a special Wynooche Dam development fund to pay for it.

The two sides have exchanged proposals and are working on language, according to City Public Works Director Rudy Balgaroo.

Previously, Gilkey had said the PUD couldn't make arrangements with the city before more was known about the economics of the project, and Foy had said the city was "very serious" about developing power on its own on the Wynooche.

Commissioners want hatchery with hydro project

The Daily World, Aberdeen, Washington, Wednesday, February 11, 1981

By JOHN DODGE
World Staff Writ

MONTESANO — The Grays Harbor County commissioners have announced that the only hydroelectric dam project they can support on the Wynooche River is one that includes a fish hatchery.

"The fish should be given equal consideration with power generation prior to construction of any facility," the board's resolution said.

The commissioners Monday urged the City of Aberdeen, Grays Harbor County Public Utility District and Army Corps of Engineers to stop competing for control of the project and cooperate instead.

THE CITY, PUD and Corps have all started work on a hydroelectric plant design in connection with the Wynooche Dam.

The Corps plan is the one the county commissioners appear to favor, since it calls for a fish rearing pond downstream from the dam.

Ferris Gilkey, PUD manager, said the PUD project design being developed will accommodate a fish hatchery similar to the one conceived by the Corps.

The PUD is looking for new sources of power, while the city is more interested in finding a way to generate revenue to pay off its long term debt — about $1 million a year — on the city-financed dam, officials have said.

The county commissioners also oppose construction of a second dam downstream from the Wynooche Dam, something that the PUD has talked about.

IN OTHER business, the commissioners learned that the Washington Public Power Supply System wants to step up construction on the road to be used to carry nuclear reactors and steam generators to the Satsop site this spring.

WPPSS project manager Dale Dobson has asked the county to let its contractor, Capital Development Co., work Saturdays from 7 a.m. to 7 p.m.

WPPSS also wants authority to "totally block Minkler Road for extended periods of time." Dobson said emergency vehicles and residents will be provided passage at all times.

Dobson said the changes in its road use agreement with the county are necessary to make up lost time on the project.

WHEN THE road use agreement was signed in October, WPPSS officials assured the county that at least one lane of the road southeast of Montesano would remain open at all times during construction.

Commissioner Mike Murphy said Monday he doesn't know if he can support the request. He said he wants to talk to the road residents before making a recommendation to the other commissioners.

If the $6 million road project is delayed, it could force WPPSS to temporarily store the reactors and generators at its Chehalis River barge landing slip.

A delay in the road completion could also affect the power project schedule, since placement of the nuclear steam supply components this summer is central to keeping the $7.3 billion project on schedule.

Aberdeen OKs Wynooche hydro deal with PUD

The Daily World, Aberdeen, Washington, Thursday, February 26, 198

By BRYN BEORSE
& MARGARET CERVENKA
World Staff Writers

Three quarters of a million dollars up front is Aberdeen's price for supporting the Grays Harbor Public Utility District application to develop hydroelectric power on the Wynooche River.

If a power station is built, the PUD will pay another $125,000.

If not, the city returns the money and keeps half the interest it has earned, which in three years may add up to more than $250,000

The city council approved an agreement with those provisions Wednesday night. The PUD commissioners are expected to officially vote on it soon, though they already have supported the terms and indicated they would approve the agreement.

THE SETTLEMENT PROVIDES an "insurance policy" to adequately compensate the city for its investment in the Wynooche dam if the PUD is granted a preliminary permit to build a power station there, according to Mayor Jerry Foy

After the PUD applied to the Federal Energy Regulatory Commission in May for authority to build a powerhouse at Wynooche Dam, the city sought assurances that it would be compensated for its investment in the dam.

The construction debt and operation and maintenance costs of the dam must be paid by the city at about $1 million a year for 50 years, and the whole project covers a 100-year schedule that eventually will mean more money to be paid by the city.

AND HYDROELECTRIC POWER wouldn't be possible there without the dam, Mayor Jerry Foy said.

However, the PUD said it was too early to tell how much it could pay, and the city filed the competing application in the fall "to protect its interests," Foy said.

He said he is satisfied the settlement offers the best course, since FERC told city officials that permits normally are awarded to the first to apply, and the city could have been left without either a permit or an agreement.

THE PUD COMMISSIONERS informally agreed to the proposal after manager Ferris Gilkey presented it to them Tuesday afternoon.

"This seems to me to represent, I think, a reasonable solution and I think is a benefit to both the city and to us," Gilkey said.

Gilkey said the PUD officials recognized that construction of the 10-megawatt generating facilities wouldn't be financially feasible if the dam wasn't there. But, he said, PUD staff also had to be careful that the terms of the negotiated agreement didn't push the hydropower project cost beyond reach.

The PUD staff didn't go for an earlier city proposal, under which the PUD would have paid half the city's annual operation and maintenance costs for the first block of Wynooche water, Gilkey said.

That proposal would have cost the PUD $56.9 million in 50 years, or about 80 mills per kilowatt-hour of electricity produced by the dam generation, he said. (The average cost of power for Grays Harbor residential customers under today's rates is 14 mills)

THE COST OF THE PRESENT agreement, under a tentative PUD plan to borrow the money, would cost about 2 to 3 mills per

Continued

Wynooche agreement

Continued from A-1

kilowatt-hour annually, Gilkey said.

The $750,000 to be paid by the PUD will be invested in the "short term market," Foy said, and is expected to grow to about $1.3 million during three years if the PUD gets a preliminary permit — allowing it sole right to develop hydropower during a three-year period.

If the PUD does not develop a powerhouse, the $750,000 would be returned to the PUD and the remaining $550,000 would be split evenly between the two.

On the long term, even though the interest rates of the future are an unknown, the growth in the fund could take care of a "substantial portion" of the city's dam debt, Foy said. Interest charged by the Corps of Engineers on dam debts, between three and four percent, is much lower than anticipated market rates. Over decades, the difference would become very important, according to PUD officials.

Last year, the city was paid about $11 million by the Washington Public Power Supply System for water from the dam, with more to come, Foy said. It will take care of about a quarter century of the dam payments, depending on operation and maintenance costs.

Later, he said, a graph chart will be prepared showing the new financial situation in detail.

THE MAYOR SAID HE IS proud that so much progress has been made on paying for the dam during the past year.

"Our primary goal is to defuse the dam debt," he said. "We feel the development of hydropower is best placed in the hands of the PUD."

According to the new agreement, the money will be transferred within 30 days after it is signed and the city will testify in favor of the PUD application in Washington D.C. and withdraw its own application.

The mayor told the council and its audience that "people have been saying we are opposed to a fish hatchery" at the dam.

"We haven't taken any kind of a stand on fisheries," the mayor said.

The city, in filing an application, was simply trying to assure its debts are provided for, he said. "We were not looking at turbine design."

He said negotiations were "hard" but well conducted, and he said city staff and council and outside consultants performed well. Consultants told the city to accept the offer, he said.

The Daily World, Aberdeen, Washington, Tuesday, April 14, 1981

Public hearing set on Wynooche plans

By MARGARET CERVENKA
World Staff Writer

The Army Corps of Engineers has scheduled a public information meeting for May 18 on its plans for a fish hatchery and hydroelectric facilities at the Wynooche Dam.

Grays Harbor Public Utility District manager Ferris Gilkey told the PUD commissioners Monday that Corps officials and PUD staff will meet to talk about the project sometime before the public forum, which will be at the Aberdeen City Hall.

The PUD also has a preliminary design for the addition of hydroelectric generation to the dam.

THE CORPS design calls for a 10-megawatt underground generating station to be built at the dam and a fish hatchery to enhance spring chinook, salmon and steelhead about 3,000 feet downstream.

The PUD has applied for a preliminary permit to reserve the right to develop the power for up to three years while further studies are conducted.

The permit has no bearing on Corps plans for the dam, however. According to Corps officials, the decision on whether the federal agency or the PUD develops the hydropower facilities will be made when a construction license is granted two to three years from now.

IN OTHER business at the PUD meeting Monday, the commissioners:

• Authorized a $43,000 expenditure to complete a project to improve the voltage conditions, reliability and appearance of the distribution system in South Aberdeen and Cosmopolis.

• Heard Gilkey say he plans to "comment negatively" on a state Department of Energy proposal to ask the Bonneville Power Administration for a $2 million grant to finance low- or no-interest loans for small hydroelectric projects of 100 kilowatts capacity or less.

The proposal says nothing about how the power from such projects would be marketed, Gilkey noted, but said he assumed the PUD would be required to buy the power at the "avoided cost," according to the Public Utility Regulatory Policy Act.

If that is the case, he said, the PUD would be paying interest twice on the power it buys.

The "avoided cost" the PUD would be paying for the power would be set at the rate the utility would have to pay for power from another plant, which would include the interest on the financing for that plant, he said.

Gilkey said he wouldn't oppose the plan if the interest charged for the loans paid for the cost of the program.

Aberdeen Daily World May 9, 1981

Corps to present Wynooche hydro & hatchery study

A tentative proposal to build an integrated hydroelectric and fish enhancement project at the Wynooche Dam will be the topic for discussion at a public information meeting at 7:30 p.m. May 18 at the Aberdeen City Hall, 200 E. Market St.

The Army Corps of Engineers will present a status report on the Wynooche Hydropower-Fish Hatchery Feasibility Study to interested federal, state and local government agencies, groups and individuals.

Comments made at the meeting will be considered by the Corps before a final recommendation is made to Congress on development of a hydropower and fish hatchery project.

THE FEASIBILITY study is due to be completed this spring or early summer, according to James O. Waller, Corps study manager. After a public review of the draft feasibility report and environmental assessment and another public meeting in mid- or late-summer, he said; the study and its recommendations will be completed and submitted to Congress for consideration.

If the project receives Congressional approval and funding, Corps officials say construction could begin in the mid- to late-1980s.

The Grays Harbor Public Utility District also is interested in the development of hydroelectric facilities at the dam and has received a preliminary permit to study the project.

While the PUD would prefer to build the generation facilities so the electricity produced would stay on Grays Harbor, PUD manager Ferris Gilkey has said the utility would support construction of a fish hatchery by the Corps or other entity and would design the hydropower project to accommodate a hatchery.

THE TENTATIVE Corps proposal includes a 10.2-megawatt hydropower addition to the dam using an underground powerhouse with three turbine-generators The downstream fish hatchery could produce 396,000 pounds of salmon and steelhead trout smolts each year.

The hydropower project would be linked directly to the fish hatchery. Temperature-controlled water from Wynooche Lake would be piped to the hatchery after passing through the powerhouse.

Project officials say the combined project could produce 40,000 megawatt-hours of electricity annually and add an estimated 129,000 adult spring chinook salmon and steelhead trout to the annual commercial, sports and Indian fish harvest.

Cost of the combined facilities is estimated at $38.6 million, with the powerplant cost about $22.1 million and the hatchery cost about $16.5 million.

Gov. John Spellman this year informed the Corps of the state's intent to sponsor the fish hatchery project. Cost to the state would be $1.7 million, while federal costs for the hatchery would be $14.8 million.

$38.6 million Wynoochee Dam fish hatchery, power plant eyed

Seattle Daily Journal of Commerce May 12, 1981

A combined hydroelectric and migratory fish hatchery project on the Wynoochee River at Wynoochee River at Wynoochee Dam is being considered in a feasibility study nearing completion by the Corps of Engineers.

Representatives of the Corps' Seattle District will discuss preliminary information developed in the study during a public information meeting scheduled for May 18, in Aberdeen City Hall, 200 East Market Street. The meeting is slated to begin at 7:30 pm.

Interested individuals, groups and governmental agencies are invited to comment on the Wynoochee Hydropower/Fish Hatchery Feasibility Study at the meeting or by mail. Comments received will be used, along with those from another public meeting the Corps plans to schedule this summer, to prepare recommendations to Congress this fall on a plan for hydropower and fish enhancement development at the dam.

In the study, authorized by Congress, the Corps examined three alternatives. They included a no-action alternative, hydropower development at Wynoochee Dam and various fish enhancement measures in the vicinity of the dam.

"Based on engineering, economic and environmental studies, the Corps has tentatively selected a plan for development of an integrated hydroelectric power plant addition to Wynoochee Dam and an enhancement fish hatchery for salmon and steelhead trout," said James O. Waller, Corps study manager.

"In addition to a fish hatchery, the project would include a multilevel intake structure in the dam, an underground powerhouse with three turbine-generators, a 20-mile aerial transmission line, and a gravity-fed, temperature-controlled water supply to the hatchery," he said.

The tentatively selected plan would be capable of annually producing 40 million kilowatt-hours of electrical energy and 360,000 lbs. of juvenile salmon and steelhead. "The tentatively selected plan was chosen because it meets a portion of the region's needs for power and anadromous fisheries, and building the two projects as an integrated facility reduces costs for both," said Waller.

Study findings indicate the hydropower and fish hatchery project could generate energy at five cents per kilowatt-hour and yield $1.90 in average annual enhancement fish benefits for each $1 in average annual costs associated with the hatchery.

An estimated $38.6 million would be needed to construct the combined facilities. Federal cost for the power plant would be about $22.1 million. The fish hatchery would cost about $16.5 million. The state of Washington, sponsor for the hatchery, would pay $1.7 million. Federal costs for the hatchery would be $14.8 million.

The tentatively selected plan would operate as a fully integrated addition to Wynoochee Dam with no change in the operation of the existing project, which provides flood control, industrial and irrigation water and fish flows.

If Congress approves a hydropower and fish hatchery project for Wynoochee Dam and funds are provided, construction could begin in the mid- to late-1980's.

A Wynoochee Hydropower/Fish Hatchery Feasibility Study brochure is available from the Corps and at the meeting. The brochure provides information on the status and findings of the study to date.

Requests for copies of the brochure, questions about the study or comments on the findings and tentatively selected plan should be addressed to: James O. Waller, Corps Study Manager, Corps of Engineers, PO Box C-3755, Seattle, WA 98124; telephone (206) 764-3473.

Port proposes compromise plan on dam hatchery

Aberdeen Daily World May 19, 1981

By MARGARET CERVENKA
World Staff Writer

The Army Corps of Engineers is not likely to build a fish hatchery at the Wynooche Dam if the Grays Harbor Public Utility District alone develops hydroelectric generating facilities at the site, a Corps spokesman said here Monday night.

The Corps has the authority to study the feasibility of a fish hatchery because the addition of generating facilities, which the agency also is studying, would affect the Wynooche River fish runs, said Col. Leon Moraski, Seattle district engineer for the Corps. He spoke during a hearing at Aberdeen City Hall before about 65 persons.

"We couldn't look at Wynooche and say, 'All we want to do up there is build a hatchery,'" he said. "The door is opened because the (proposed hydropower) project has an impact on fish."

But a suggestion by Port manager Hank Soike that the PUD fund the project, then have the Corps design, construct and operate it, is "an interesting concept that is worthy of consideration," Moraski said.

And PUD Manager Ferris Gilkey, who explained that the utility wants to develop the generating facilities so the electricity would be controlled locally, said he would be willing to discuss a cooperative effort with Corps officials.

County Commissioner Mike Murphy indicated that if it came down to a choice between the two agencies, the county would support the one that could guarantee the fish hatchery.

"We would support the builder that can assure us and the people of Grays Harbor that the hatchery doesn't slip by the wayside," Murphy said.

THE CORPS' combined Wynooche Dam hydropower-fish hatchery proposal was the topic of the public information meeting. Almost all of the persons who spoke expressed wholehearted support for the project — the fish hatchery in particular.

Only Gene Carlson, a forester with the Olympic National Forest, expressed serious reservations about the Corps' tentative plans. Carlson said he "strongly opposes" the proposed choice for a fish hatchery site and "strongly disagrees" with the Corps' preliminary finding that the project would have no significant impact on the environment.

Under the Corps' tentative plans, an underground powerhouse would be built about 200 feet downstream of the dam underneath the present visitors' parking lot. Part of the water diverted to the powerhouse would be released into the river. At least 140 to 190 cubic feet of water per second — the minimum flow of the dam — would be transported through a pipe to a combination salmon and steelhead fish hatchery about 3,000 feet downstream of the dam, according to the Corps' study manager, Jim Waller.

The hydropower plant would be a "baseload" plant, which means the facilities would use energy produced by the natural river flow, Waller said, noting that water would not be released solely to produce electricity.

The generating facilities would produce enough electricity to serve about 2,000 homes annually, Waller said, while the fish hatchery would produce 396,000 pounds of salmon and steelhead smolts a year, adding about 129,000 adult fish to the annual fish harvest.

The $38.6 million estimated cost of the combined project would be shared by the federal government and the local sponsor, Waller said, adding that Gov. John Spellman has expressed the state's intent to be the local sponsor of the fish hatchery. The U. S. Fish and Wildlife Service has been asked to be federal sponsor, he said.

If Congress authorizes and funds federal construction, he said, advanced studies would be conducted and the project would be built in the mid- to late-1980s.

Under tentative PUD hydropower plans, the 10-megawatt generators would be on line in mid-1986.

Continued

Port Proposes
continued

THE CORPS' preliminary decision not to prepare an environmental impact statement for the project was attacked by Carlson, the national park forester.

The elimination of an existing, though depleted, wild stock of coho salmon would be one major impact of the combined project, Carlson said.

And, he said, the proposed 60-acre hatchery site is a part of only two "quality areas" of federal land left in the area. Persons seeking recreation are using the area more and more every year, Carlson said, while the alder and old-growth fir serve as a thermal cover for Wynooche Valley elk herds during the winter.

An additional request by Carlson that power lines from the area be placed underground to preserve timberland was met with gasps by local PUD officials, who say underground cable is much more expensive than overhead lines.

Carlson's opinions didn't sit well with members of local fishery groups who appeared in force to speak in favor of the hatchery.

Representatives of some fishing interests, however, expressed concerns about control of the hatchery and the species chosen for enhancement.

Mark Cedergreen, president of the Westport Charter Association, asked that the National Marine Fisheries Service, a branch of the Department of Commerce, be considered as a sponsor of the dam instead of the U. S. Fish and Wildlife Service, a branch of the Department of the Interior. Cedergreen charged that the Interior Department has been "the leading and sole voice of the Indian tribes" and has not supported non-Indian fisheries in disputes between the two groups.

And Tolmi Maki, president of the Grays Harbor Gillnetters, said his group opposes the idea that the hatchery would produce just spring salmon or chinook, since commercial fishermen and charter boats do not have a chance to harvest those fish. The gillnetters would support the project if chinook, coho and chum salmon also are enhanced at the hatchery, he said.

Corps' fisheries biologist Jack Thompson said the decision about what species to raise at the hatchery would be made much later by the agencies managing the project.

PUD and Corps join forces on dam power plant

Aberdeen Daily World

By JOHN DODGE
World Staff Writer

Competing parties in the development of a power plant at the Wynooche Dam turned into partners Monday, enhancing chances for a major fish hatchery on the Wynooche River.

If all the hurdles are cleared, the U.S. Army Corps of Engineers would build the hydroelectric plant at the dam and the Grays Harbor Public Utility District would pay for it and receive the power.

In addition, the Corps would build a fish hatchery near the dam — a hatchery that Corps project manager Jim Waller called "the world's largest."

For several months the Corps and PUD had competed for the right to build a 10-megawatt power plant at the Corps-constructed dam 35 miles north of Montesano.

But the Corps said it would not have authority to build a fish hatchery if the PUD built the power plant.

Sweeping public support of the fish hatchery led to the joint venture.

The PUD commissioners signed a letter of intent to the Corps Monday, agreeing to pay the cost of the power plant.

The Corps' latest cost estimate to attach a power plant to the dam is about $23 million, the project manager said.

Placing three turbines in a powerhouse at the dam would provide energy equal to about 2 percent of the current electricity load on the Harbor.

The Corps estimates the power from the hydroelectric plant would cost about 5 cents per kilowatt hour. PUD General Manager Ferris Gilkey said inflation and high interest rates could push the power cost to 11 cents per kwh.

The fish hatchery some 3,000 feet downstream of the dam would provide about 129,000 adult salmon and steelhead to the annual fish harvest in the Harbor area, the Corps estimates. The cost of the hatchery is set at about $17 million.

Waller said the fishery enhancement project would be a "mother hatchery for other Washington coastal rivers."

He said the 190 cubic feet per second of water flowing to the hatchery would make it the largest in the world.

The Corps and PUD must agree to a maintenance and operation plan at the hydroelectric plant if the joint venture is to work, Waller and Gilkey said Monday. Both parties want a say in how the plant is run.

The joint venture could fall apart if the cost of the hydroelectric power soars too high or if the PUD runs into trouble financing construction of the power plant.

The PUD would try to find a customer to pay the cost of the power plant and buy the electricity generated until it is needed on the Harbor, Gilkey said.

There are other hurdles to clear for the projects to move ahead. They include:

- The Corps would need an exemption from Congress allowing the PUD to market the power instead of the Bonneville Power Administration.
- State and federal financial support of the fish hatchery could be hindered by budget cuts.

The Corps study on the fish hatchery and power plant is supposed to be forwarded to Congress in January, Waller said.

The Corps built the Wynooche Dam between 1969 and 1972.

The 177-foot-high concrete and earthen dam was constructed to control flooding and provide industrial water.

Waller said that flood control and water supplies to industrial users would still have first priority at the dam, if the hydroelectric plant is built.

The power plant and fish hatchery would be built in the middle or late 1980s, if Congress approves the projects.

Aberdeen backs Wynooche fish hatchery

The Daily World, Aberdeen, Washington, Thursday, October 29, 1981

By BRYN BEORSE
World Staff Writer

Supporters of a big, new fish hatchery on the Wynooche River hooked and landed themselves some important moral support Wednesday, convincing the prime sponsor of the Wynooche Dam to go on record in favor of future fishing.

The City of Aberdeen, which pays most of the bills at Wynooche Dam, passed a resolution supporting the construction of a salmon hatchery that would be perhaps "the biggest hatchery in the world," according to Councilman George Irwin.

It would be constructed along with a hydroelectric power generation plant using Wynooche Dam water to produce power "much cheaper than what the nukes produce," Irwin said.

WATER WOULD flow into the hatchery from the power generators by gravity flow, saving huge quantities of energy and money usually employed to pump water from rivers into hatcheries.

A new concept at the hatchery is proposed joint management by the both the Fisheries dept. and the Washington Department of Game.

Such a hatchery was a No. 1 priority of the Grays Harbor Fisheries Management Task Force, according to Jake Medcalf, who served as chairman of the task force. He also writes the fishing column "Everything's Jake" in *The Daily World*.

The PUD and Army Corps of Engineers are working toward building the hydropower-fisheries project, but budget cuts have cast a shadow of uncertainty over their efforts.

The city's endorsement of the hatchery helps, and other endorsements are needed too, "as many as we can get," Medcalf said.

The thousands of extra salmon that would return to the Harbor from the ocean as a result of the hatchery would benefit all Grays Harbor through a healthier fishing and tourist industry, Irwin said

"THE MAYOR and city council believe that the city's investment in the Wynooche Dam can be of additional public benefit by the construction of a hydroelectric facility and fish hatchery..." the resolution said. "Hydro-electric generation on the Wynooche River is economically feasible and would provide an additional, non-controversial source of power."

Councilwoman Barbara Davies noted that the resolution was drafted in response to a "very eloquent" letter from Washington Northwest Steelheaders president Jerry Pavletich of Aberdeen. The letter sought support for the hatchery concept to do battle in Congress for the project.

Most of the cost of the hatchery would be paid by the federal government, Irwin indicated, adding that the PUD would probably contribute the most to the hydroelectric generating station.

Wynoochee Dam fish, hydro hearing Dec. 15

Seattle Daily Journal of Commerce November 20, 1981

ABERDEEN — The Seattle District Army Corps of Engineers will hold a public meeting in Aberdeen Tuesday Dec. 15 to discuss its study of a hydropower and fish hatchery project at Wychoochee Dam, Grays Harbor County.

The meeting is scheduled for 7:30 pm at Aberdeen City Hall, 200 E Market St.

The corps plans to discuss details of its preliminary recommendation for a $42.2 million hydropower/fish hatchery project. Corps specialists in hydropower planning and environmental resources will explain the recommendation. They are encouraging verbal comments at the meeting, and will receive written comments for 30 days following the meeting. These comments will be included in a final feasibility report and environmental impact statement. A draft report and EIS are near completion.

In early 1982, the final report and EIS will be sent to Corps reviewing offices in Portland and Washington, DC. After approval by Corps authorities, the documents will be submitted to Congress. If Congress authorizes and funds advanced, engineering and design studies and construction would be conducted by the corps. Construction could be completed in the late 1980's.

Since early 1980, the district has been studying an integrated power and fish enhancement project at the flood control and water supply dam on the Wynoochee River upstream of Montesano.

The tentatively-selected plan,based on study findings to date, calls for construction of a 10,200 kilowatt underground hydropower plant at the dam that could produce 37.4 million kilowatt-hours of electrical energy annually. The hatchery portion of the project includes a fish hatchery about 3000 feet downstream of the dam capable of adding 129,000 adult salmon and steelhead trout to the anadromous fish harvest each year.

This plan is similar to one the corps presented at a public information meeting in Aberdeen on May 18. "The major change in the plan is a hydropower partnership between the corps and the Grays Harbor Public Utility District," said corps study manager Dr. James O. Waller.

As proposed, the hydropower facility would be built by the corps and the PUD would act as local sponsor for the hydropower plant and pay 100% of the construction and annual operation and maintenance costs. Power from the project would be marketed by the PUD.

Current law, however, requires that the Bonneville Power Administration market electricity generated at federal projects in the Pacific Northwest. The corps would have to obtain a congressional exemption from the federal power marketing provisions of the 1944 Flood Control Act in order for the PUD to market the electricity.

The hatchery would use gravity-fed water from Wynoochee Lake after it passes through powerhouse turbines. Further study will determine which species of anadromous fish would be raised at the hatchery. The hatchery would be built by the corps with the National Marine Fisheries Service or US Fish and Wildlife Service acting as federal sponsor and the state of Washington the local sponsor. The state departments of fisheries and game would operate the hatchery under contract with the federal fish agency.

In addition to the hatchery, fish collection facilities could be installed in nearby rivers. Eggs from adult salmon and steelhead fish captured at the sites could be hatched and raised at the Wynoochee hatchery for several weeks and returned to the collection sites for rearing in holding ponds and eventual release as smolts into their native streams. The rivers would be selected after additional study.

The corps' draft feasibility report says the tentatively-selected plan would help meet a portion of the region's demand for power and anadromous fish. Federal construction costs for the combined project are estimated at $18.8 million.

Non-federal construction costs include $21.6 million in PUD expenses and $2 million in state costs. Waller said building the two projects as an integrated facility reduces costs for both. Annual operation and maintenance costs would also be shared.

Study findings indicate the hydropower facility would yield $1.20 in average annual power benefits for each $1 in average annual power costs and would generate energy at 5.3 cents per kilowatt-hour. The fish hatchery would yield $2.90 in average annual enhancement fish benefits for each $1 in average annual hatchery costs.

The project would cause no significant adverse environmental impacts, according to the draft EIS.

In early December, copies of the draft report and EIS will be mailed to individuals, groups and federal, state and local governmental agencies for review and comment. Copies will be available at libraries in Aberdeen, Hoquiam and Montesano and the Seattle main library.

An information brochure on the study has been prepared by the corps and sent to all names on the study mailing list. Copies will be available at the public meeting.

Requests for copies of the brochure, questions about the study or comments on the findings and preliminary recommendation should be addressed to Dr. James O. Waller, corps study manager, Corps of Engineers, Box C-3755, Seattle 98124; telephone (206) 764-3473.

July 1980

STUDY ANNOUNCEMENT

WYNOOCHEE HYDROPOWER STUDY
WYNOOCHEE FISH HATCHERY STUDY

The Seattle District, U.S. Army Corps of Engineers, is conducting studies to determine the feasibility of two related projects in the vicinity of the existing Corps of Engineers' Wynoochee Lake project. One study addresses the addition of a small-scale hydropower facility to the dam. The other study addresses an enhancement fish hatchery downstream of the dam. Maps showing the location of the existing project, hatchery, and hydropower facility are inclosed.

Wynoochee Dam is a 177-foot-high concrete and earthfill dam located on the Wynoochee River at river mile 51.8, 35 miles north of Montesano in Grays Harbor County, Washington. The dam creates a 70,000 acre-foot reservoir for the city of Aberdeen's industrial water supply, winter flood control, fisheries, and irrigation.

The hydropower potential of the site, approximately 12 megawatts of installed capacity and 40,000 megawatt-hours of energy per year, is being evaluated in a feasibility study under authority of Section 203, Public Law 87-874. Based on preliminary studies of alternative hydropower facilities at the site, an underground powerhouse in the vicinity of the visitors center parking lot has been selected for further study. The proposed hydropower project will not change the accomplishment of the existing project purposes.

At the request of Governor Dixy Lee Ray, a study is also being conducted to determine the feasibility of a 465,000-pound salmon and steelhead trout hatchery located on a river bench approximately 3,500 feet downstream of Wynoochee Dam. Fish raised in this hatchery would be used to enhance the commercial, Indian, and sport fisheries in the Chehalis River Basin and Grays Harbor area. The fish hatchery study is being conducted under authority of the Chehalis River Basin Congressional Study Resolution and the Fish and Wildlife Coordination Act of 1958, Public Law 85-264, as amended by Public Law 89-72.

This particular site on the Wynoochee River offers a unique opportunity for a fish hatchery, with an abundant supply of good quality water via a short gravity pipeline from the dam. A conceptual hatchery design has been provided to us by the Washington State Departments of Fisheries and Game. Minimum flows from Wynoochee Dam would be used as the fish hatchery water supply. Should the hydropower facility be constructed, the fish hatchery water supply could be taken from the tailrace of the hydropower facility instead of directly from the dam. Potential conflicting uses of the Wynoochee River water resources will also be evaluated.

The two studies are being conducted separately but concurrently. The studies are scheduled for completion in the fall of 1981. If plans are found to be feasible, recommendations will be made in the final feasibility reports, and the final feasibliity reports and appropriate environmental reports will be submitted to Congress for authorization and funding of detailed design studies. Throughout the studies, we will maintain close coordination with various Federal, state, and local officials and agencies. A public meeting will be held near the conclusion of the studies to discuss the results of the studies and to receive public and agency comments.

We would like to receive your ideas and comments on the potential development of a small-scale hydropower facility and an enhancement fish hatchery at Wynoochee Dam. A postage-paid return mailer is inclosed for your use. Also, we would appreciate it if you would indicate whether you want to remain on the mailing list and correct your name and address if necessary. Please add names and addresses of the other people or groups whom you believe would be interested in our Wynoochee studies. I encourage you to return the mailer because your ideas and comments will provide valuable input to our studies. If you have any further questions, please contact Dr. James O. Waller, Study Manager, at telephone (206) 764-3473.

Thank you for your interest in our Wynoochee studies.

3 Incl
As stated

LEON K. MORASRI
Colonel, Corps of Engineers
District Engineer

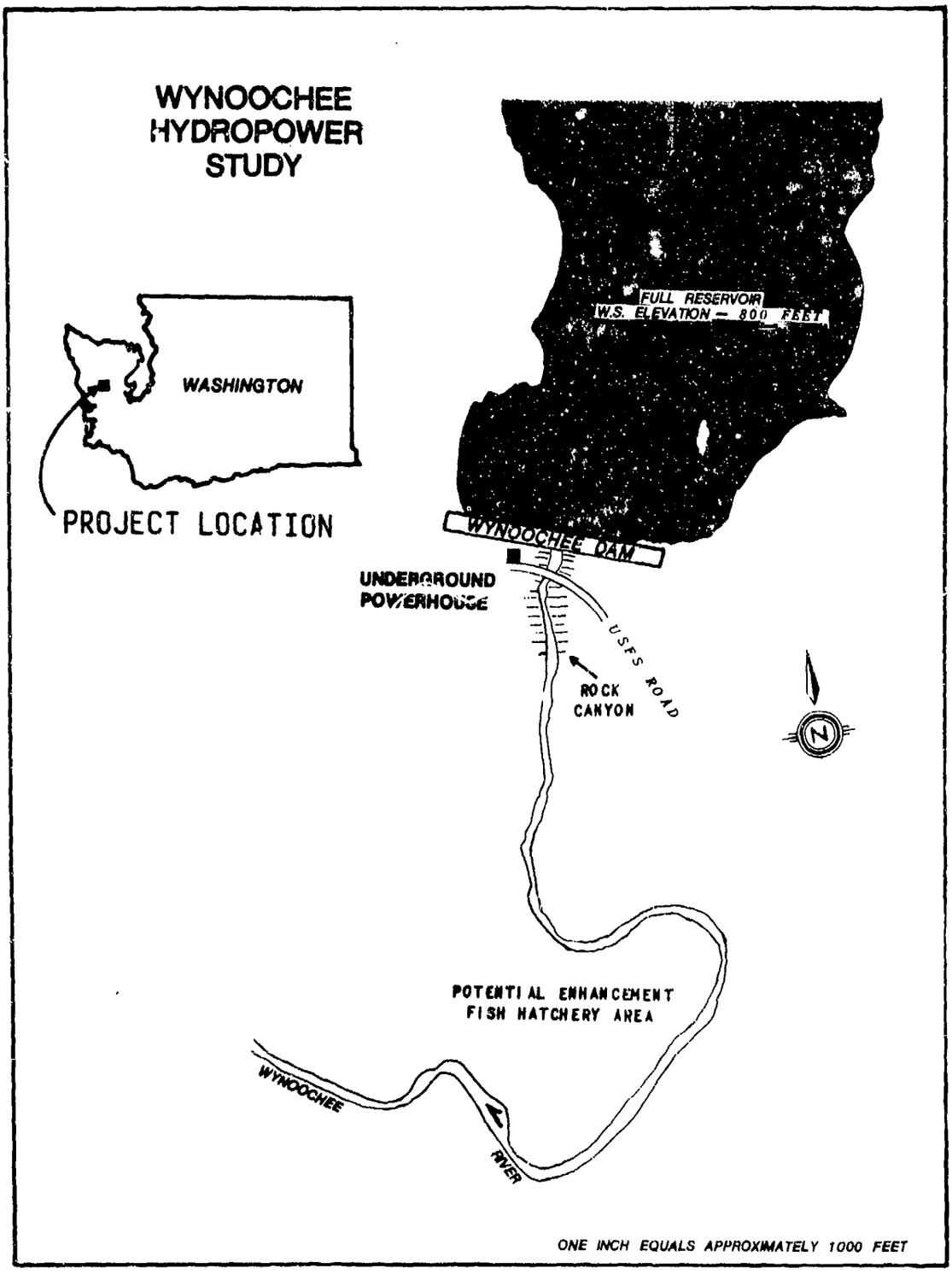

WYNOOCHEE
HYDROPOWER
STUDY
WASHINGTON
PROJECT LOCATION
FULL RESERVOIR
W.S. ELEVATION = 800 FEET
WYNOOCHEE DAM
UNDERGROUND
POWERHOUSE
USFS ROAD
ROCK
CANYON
N
POTENTIAL ENHANCEMENT
FISH HATCHERY AREA
WYNOOCHEE
RIVER
ONE INCH EQUALS APPROXIMATELY 1000 FEET

FIGURE 1

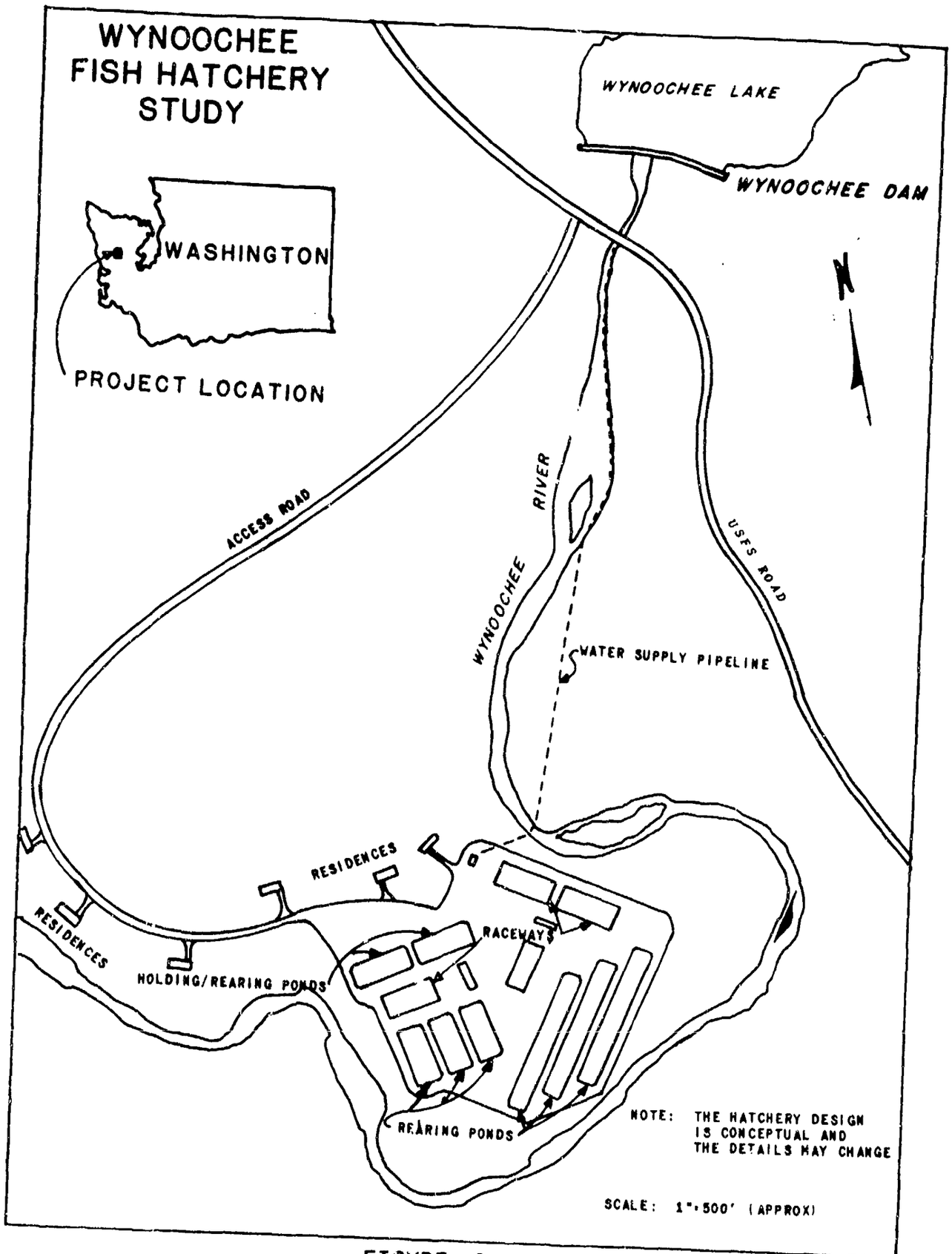

WYNOOCHEE
FISH HATCHERY
STUDY
WYNOOCHEE LAKE
WYNOOCHEE DAM
WASHINGTON
PROJECT LOCATION
N
ACCESS ROAD
WYNOOCHEE RIVER
USFS ROAD
WATER SUPPLY PIPELINE
RESIDENCES
RESIDENCES
RACEWAYS
HOLDING/REARING PONDS
REARING PONDS
NOTE: THE HATCHERY DESIGN IS CONCEPTUAL AND THE DETAILS MAY CHANGE
SCALE: 1"=500' (APPROX)

FIGURE 2

RETURN MAILER

Please continue to send me information on the Wynoochee Hydropower/Fish Hatchery studies:

YES ☐ NO ☐

Would you please correct your name and address if necessary and also help by giving us the names and address of any persons or organizations who you think may also be interested in the Wynoochee Hydropower/Fish Hatchery studies:

NAME AND ADDRESS

☐ CORRECTION ☐ NEW NAME AND ADDRESS

_____

_____

_____

COMMENTS

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Please fold this sheet so Corps address is on outside. Tape or staple edge closed. NO POSTAGE IS NECESSARY.

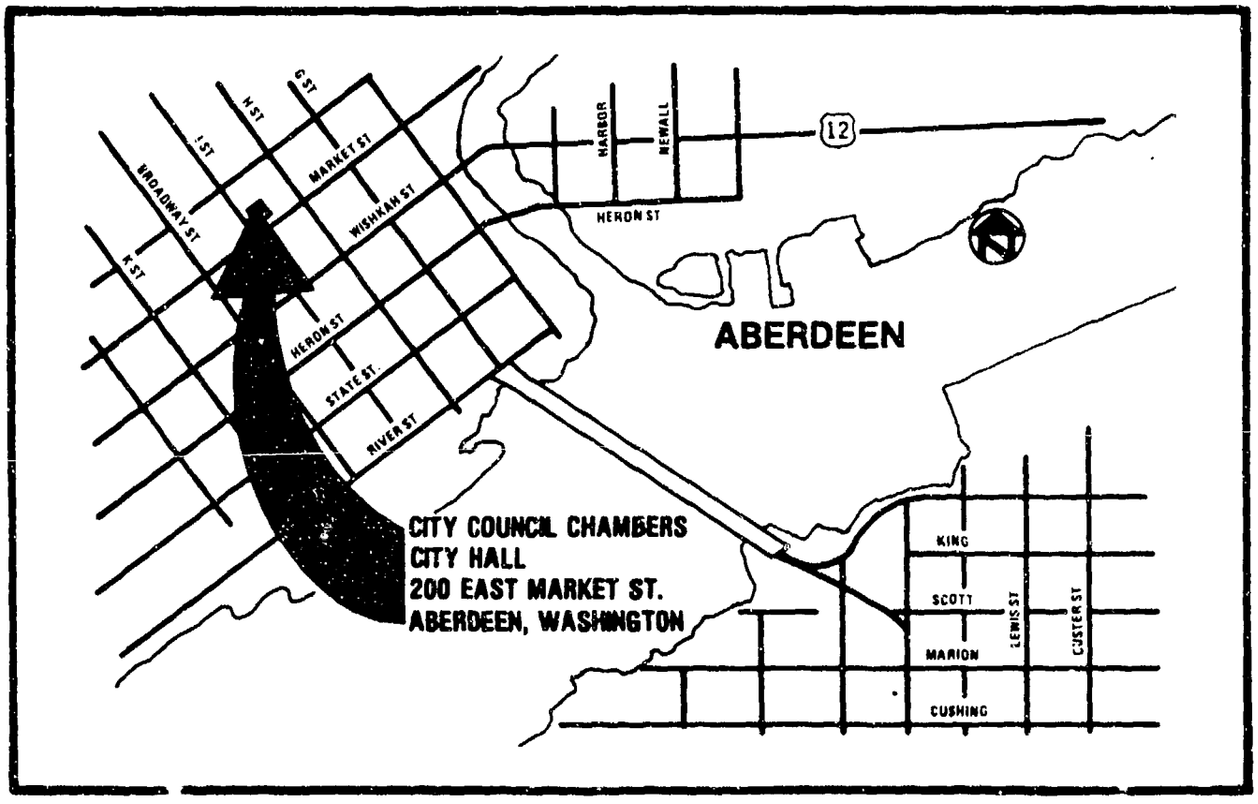
PUBLIC INFORMATION MEETING

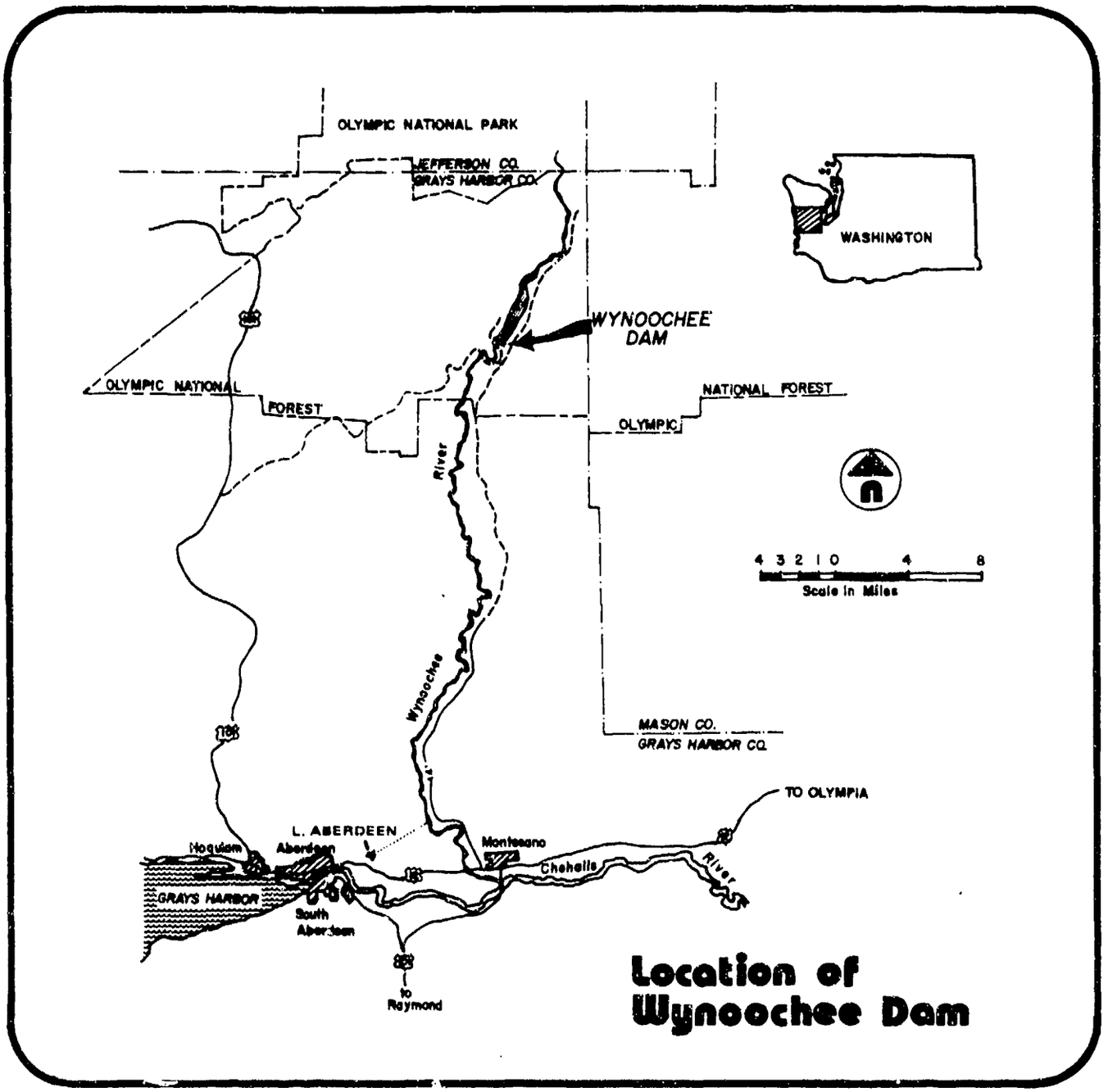
WYNOOCHEE HYDROPOWER/FISH HATCHERY

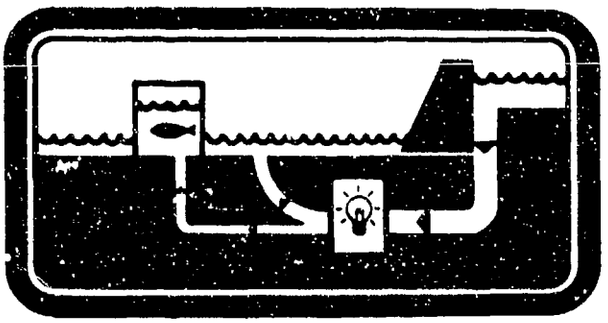
FEASIBILITY STUDY

LOCATION: CITY COUNCIL CHAMBERS
CITY HALL
200 EAST MARKET STREET
ABERDEEN, WASHINGTON

DATE: MONDAY
18 MAY 1981
7:30 p.m.




OLYMPIC NATIONAL PARK
JEFFERSON CO.
GRAYS HARBOR CO.
WASHINGTON
WYNOOCHEE DAM
OLYMPIC NATIONAL FOREST
NATIONAL FOREST
OLYMPIC
River
4 3 2 1 0 4 8
Scale in Miles
Wynoochee
MASON CO.
GRAYS HARBOR CO.
TO OLYMPIA
L. ABERDEEN
Hoquiam
Aberdeen
Montesano
Chehalis
River
GRAYS HARBOR
South Aberdeen
to Raymond
Location of Wynoochee Dam



Wynoochee Hydropower / Fish Hatchery Feasibility Study

Why this study?

The Wynoochee Lake Project, located on the Wynoochee River 35 road miles north of Montesano in Grays Harbor County, Washington, was constructed by the Corps of Engineers between 1969 and 1972. The concrete and earthfill dam is 177 feet high and its congressionally authorized project purposes are city of Aberdeen industrial water supply, winter flood control, fisheries, and irrigation.

Energy and anadromous fishery resource needs in the Pacific Northwest have increased considerably since Wynoochee Dam was built. The energy in the water released from the dam is now needed to produce electricity. In addition, a unique combination of factors at Wynoochee Dam presents an opportunity for development of fish enhancement facilities to meet a portion of the need for anadromous fish in the Chehalis River Basin and Grays Harbor area. In particular, the Governor of the State of Washington requested the Corps to study the feasibility of a fish hatchery in combination with hydropower development at Wynoochee Dam.

Under authorities provided by Congress, the Seattle District, Corps of Engineers, is conducting a study to determine the feasibility of developing the hydropower potential and fish enhancement opportunities at Wynoochee Dam. The study was started in 1980 and will be completed with a report for Congress late this fall.

What are the objectives of the Corps study?

- To meet a portion of the increasing electrical energy needs in the Pacific Northwest by development of the hydropower potential of Wynoochee Dam, Washington.
- To meet a portion of the increasing demand for anadromous fish in the Pacific Northwest by development of fish enhancement facilities at Wynoochee Dam, Washington.

What are the purposes of the public information meeting?

- To present information to the public on Corps' Wynoochee Hydropower/ Fish Hatchery Study.
- To receive comments from the public on the study and the tentatively selected plan.

What is the corps doing?

The Corps of Engineers has conducted engineering, economic, and environmental studies on the alternatives for meeting the two study objectives. The alternatives considered include hydropower at Wynoochee Dam, various fish enhancement measures at Wynoochee Dam, and no action.

Under the no-action plan, there would be no Federal hydropower or enhancement fish hatchery development at Wynoochee Dam. Non-Federal hydropower development at Wynoochee Dam is possible but not certain; there are no proposals for complete non-Federal development of an enhancement fish hatchery at Wynoochee Dam. The tentatively selected plan is an integrated underground hydropower and an enhancement fish hatchery plan. Extensive agency coordination and public involvement has been conducted throughout the study and will continue.

Two public meetings are planned this year - the public information meeting on 18 May 1981 and a final public meeting later this summer. Comments received from Federal, state, and local agencies, organizations and groups, and individuals will be used in selecting the final plan.

A draft feasibility report will include a detailed description of the selected plan and its alternatives and recommendations to Congress on who should develop the plan. A preliminary determination has been made that the tentatively selected plan will not have a significant impact on the human environment. Accordingly, an environmental impact statement has not been prepared. A Finding of No Significant Impact and environmental assessment will be included in the draft feasibility report. This report will be available for agency and public review before the final public meeting. Following agency and public review, a final determination will be made regarding whether or not to prepare an environmental impact statement.

After the final public meeting later this summer, the feasibility report will be finalized and sent to Corps reviewing offices in Portland, Oregon, and Washington, D.C. After approval, the report will be submitted to Congress for consideration. If Federal construction is recommended and Congress authorizes and funds Federal construction, advanced engineering and design studies would then be conducted by the Corps, leading to project construction in the mid- to late-1980's. In the event non-Federal hydropower development is approved, Congress may authorize Federal development of the enhancement fish hatchery.

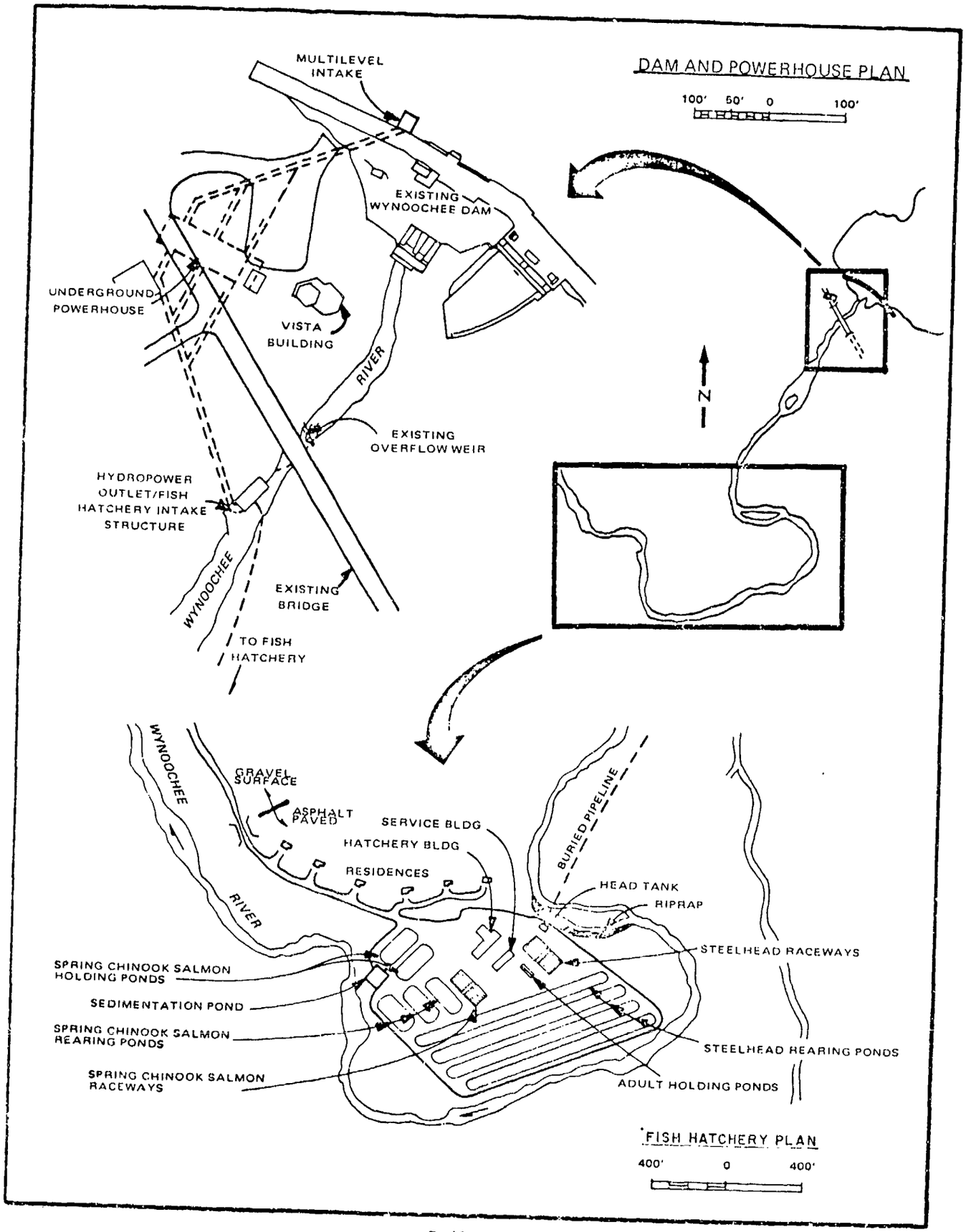
What is the tentatively selected plan?

The tentatively selected plan is an integrated 10.2 megawatt (nameplate) hydropower addition to Wynoochee Dam and a 396,000 pound enhancement hatchery for anadromous fish. The proposed project would produce 40,000 megawatt-hours of energy per year and add an estimated 129,000 adult spring chinook salmon and steelhead to the annual anadromous fish harvest in the Chehalis River Basin, Grays Harbor area, and northern Pacific Ocean.

The tentatively selected plan includes a multi-level intake structure to control the temperature of water taken from the reservoir, an underground powerhouse with three turbines, a 20-mile aerial transmission line, a fail-safe system to provide up to 190 cubic feet per second gravity-feed water supply to the fish hatchery, and a joint salmon and steelhead enhancement fish hatchery.

The tentatively selected plan would operate as a fully integrated addition to the existing dam with no change in the operation of the existing project. The hydropower operation would be subordinate to all other purposes and the hydropower facility would operate as a run-of-river plant producing baseload energy from the reservoir releases. The fish hatchery would utilize the minimum flows from Wynoochee Dam after they passed through the powerhouse and would include fish production to mitigate for previous fish losses associated with the existing dam as well as losses associated with the combined hydropower/fish hatchery project.

The fully integrated hydropower/fish hatchery project would produce marketable energy at five cents per kilowatt-hour and yield $1.90 in average annual enhancement fish benefits for every $1.00 in average annual costs associated with the fish hatchery. The tentatively selected plan would cost approximately 38.6 million dollars at October 1980 prices. The cost of the fish hatchery would be shared by the Federal Government and the local sponsor of the fish hatchery. Governor Spellman has expressed the State of Washington's intent to act as a local sponsor of the fish hatchery. The U.S. Fish and Wildlife Service has been requested to express its intent to act as Federal sponsor of the fish hatchery. Hydropower development is also being actively studied by a non-Federal interest, the Grays Harbor Public Utility District, who has applied to the Federal Energy Regulatory Commission for a preliminary permit.


DAM AND POWERHOUSE PLAN
100' 50' 0 100'
MULTILEVEL INTAKE
EXISTING WYNOOCHEE DAM
UNDERGROUND POWERHOUSE
VISTA BUILDING
RIVER
EXISTING OVERFLOW WEIR
HYDROPOWER OUTLET/FISH HATCHERY INTAKE STRUCTURE
WYNOOCHEE
EXISTING BRIDGE
TO FISH HATCHERY
N
WYNOOCHEE
GRAVEL SURFACE
ASPHALT PAVED
SERVICE BLDG
HATCHERY BLDG
RESIDENCES
RIVER
BURIED PIPELINE
HEAD TANK
RIPRAP
STEELHEAD RACEWAYS
SPRING CHINOOK SALMON HOLDING PONDS
SEDIMENTATION POND
SPRING CHINOOK SALMON REARING PONDS
SPRING CHINOOK SALMON RACEWAYS
STEELHEAD REARING PONDS
ADULT HOLDING PONDS
FISH HATCHERY PLAN
400' 0 400'

What can you do?

Public input to this study is needed to insure that the public's concerns have been addressed and that a plan the public wants and supports has been selected and recommended.

I invite you to participate in the public information meeting. The information presented in this brochure should help answer your questions on this study. Please come to the public information meeting to receive additional information and to ask any questions you may have.

Your comments on the Wynoochee Hydropower/Fish Hatchery Study and the tentatively selected plan are encouraged. Please provide your comments on the attached comments page; add additional pages if needed. You may turn in your comments at the public information meeting or return them to us by mail at any time. To mail your comments, please detach and fold the comments page so the Corps address is on the outside, tape or staple it closed, and put it in the mail; no postage is necessary.

If you have any questions on this study, please contact me by mail at Post Office Box C-3755, Seattle, Washington 98124, or by telephone at (206) 764-3473.

Please bring this announcement to the attention of anyone you know who may be interested in the Wynoochee Hydropower/Fish Hatchery Study.

James O. Waller

James O. Waller, Ph.D.
Hydropower Study Manager
Seattle District
U.S. Army Corps of Engineers

Your Comments

☐ I WANT TO CONTINUE RECEIVING INFORMATION ON THIS STUDY.
☐ PLEASE ADD MY NAME AND ADDRESS TO THE STUDY MAILING LIST.
☐ PLEASE REMOVE MY NAME AND ADDRESS FROM THE STUDY MAILING LIST.

NAME

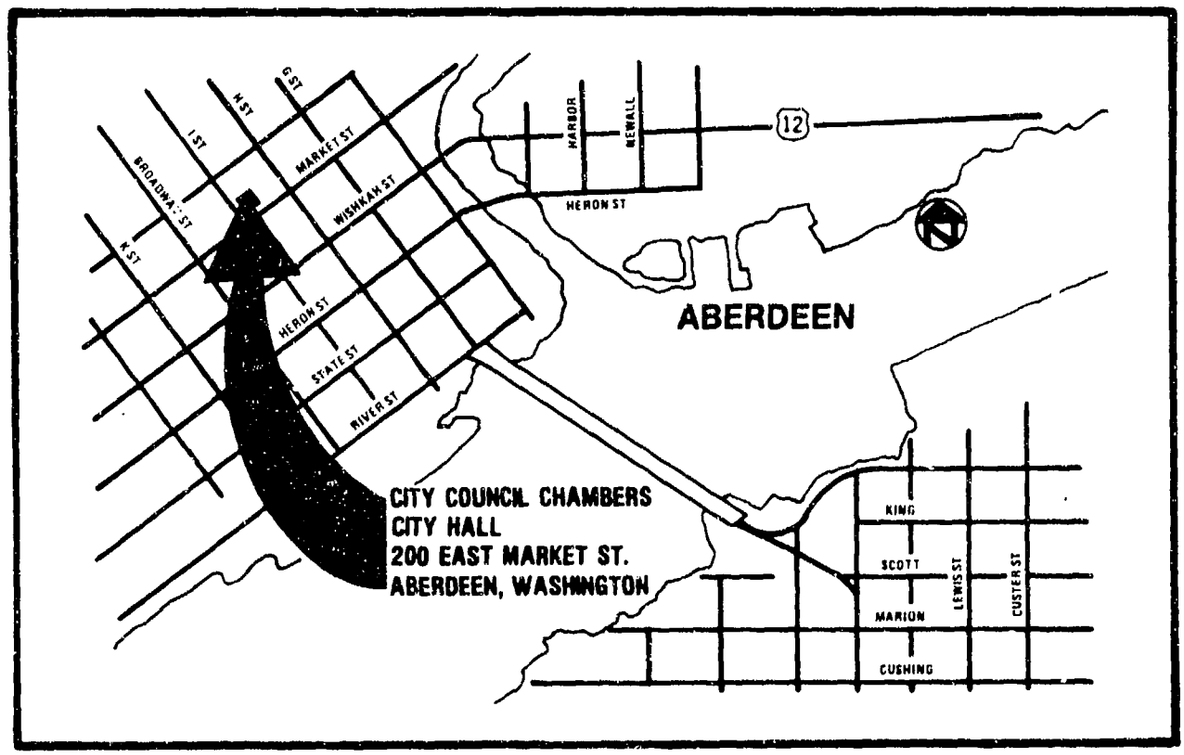
STREET

CITY STATE ZIP

US Army Corps
of Engineers
Seattle District

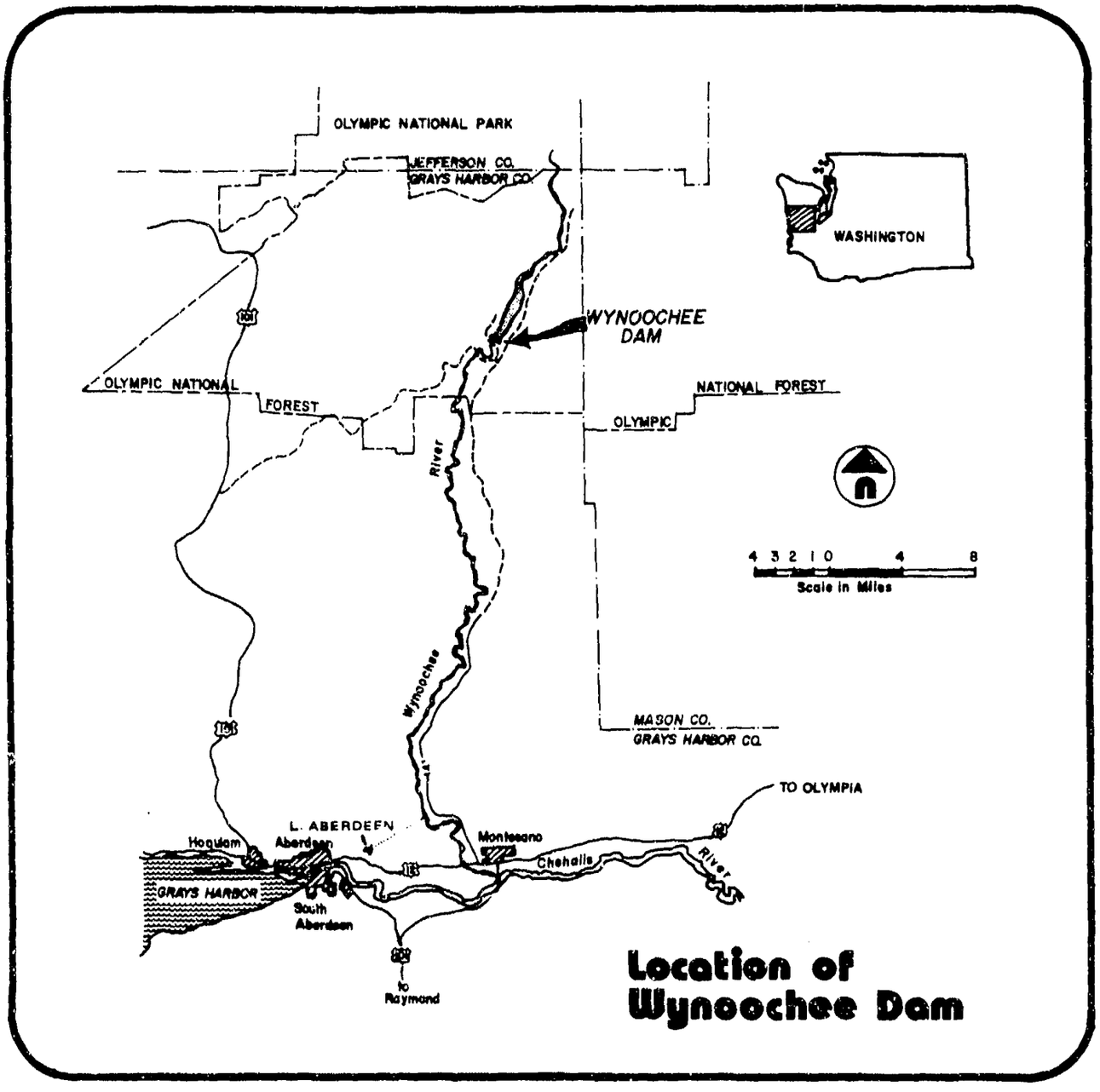
Final Public Meeting

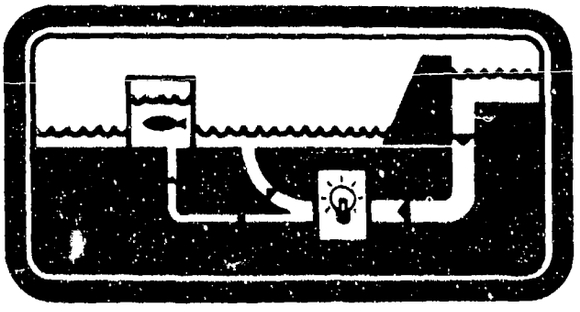
WYNOOCHEE HYDROPOWER/FISH HATCHERY FEASIBILITY STUDY



DATE: TUESDAY
15 DECEMBER 1981
7:30 p.m.

LOCATION: CITY COUNCIL CHAMBERS
CITY HALL
200 EAST MARKET STREET
ABERDEEN, WASHINGTON


OLYMPIC NATIONAL PARK
JEFFERSON CO.
GRAYS HARBOR CO.
WASHINGTON
WYNOOCHEE DAM
OLYMPIC NATIONAL FOREST
NATIONAL FOREST
OLYMPIC
River
4 3 2 1 0 4 8
Scale in Miles
Wynoochee
MASON CO.
GRAYS HARBOR CO.
TO OLYMPIA
L. ABERDEEN
Hoquiam
Aberdeen
Montesano
Chehalis
River
GRAYS HARBOR
South Aberdeen
to Raymond
Location of Wynoochee Dam



WYNOOCHEE HYDROPOWER/FISH HATCHERY

FEASIBILITY STUDY

WHAT IS THE WYNOOCHEE HYDROPOWER/FISH HATCHERY FEASIBILITY STUDY?

The Seattle District, U.S. Army Corps of Engineers, initiated the Wynoochee Hydropower/Fish Hatchery Study in 1980 to determine the feasibility of developing the hydropower potential and fish enhancement opportunities at Wynoochee Dam. The study is being conducted under authorities provided by Congress and will be completed with a report to Congress in early 1982.

The 177-foot-high concrete and earthfill dam is located on the Wynoochee River 35 miles north of Montesano in Grays Harbor County, Washington. The Wynoochee Dam and Lake project was completed in 1972 and the project's congressionally authorized purposes are; city of Aberdeen industrial water supply, winter flood control, fisheries, and irrigation.

The Corps of Engineers has been conducting engineering, economic, and environmental studies on the proposed project over the last 2 years. Extensive agency coordination and public involvement has occurred throughout the study, including a public information meeting in Aberdeen on 18 May 1981. The study is nearing completion and the draft feasibility report and environmental impact statement (EIS) is being prepared for public and agency review. The draft report and EIS will be distributed prior to the 15 December final public meeting. The report and EIS will be finalized in early 1982 to incorporate public and agency comments and then submitted to Congress for their action.

WHAT HAPPENED AT THE PUBLIC INFORMATION MEETING?

A public information meeting was held in Aberdeen on 18 May 1981. Approximately 60 people attended the meeting. The Corps of Engineers presented the tentatively selected plan, an integrated underground hydropower and enhancement fish hatchery project. Strong support for the integrated hydropower/fish hatchery project was expressed at the meeting. There was a desire stated that the power output of the project should be marketed in the local area by the Grays Harbor Public Utility District (PUD) instead of regionally by the Bonneville Power Administration (BPA) as required by law.

WHAT HAS THE CORPS BEEN DOING SINCE THE PUBLIC INFORMATION MEETING?

At the time of the public information meeting, the Corps of Engineers had sent copies of the preliminary draft feasibility report and environmental assessment to its higher authority offices in Portland and Washington, D.C., for review and comment. Since the public information meeting, the Corps of Engineers has:

o revised the draft feasibility report in accordance with higher authority comments,

o prepared a draft EIS,

o developed a hydropower partnership with the Grays Harbor PUD,

o expanded the scope of the fish hatchery into a Washington coastal fish enhancement facility,

o continued our public and agency coordination in an effort to resolve any conflicts,

o continued coordination with the State of Washington and the Federal fish agencies on plan development and sponsorship affirmation, and

o briefed the congressional delegation and a representative of President Reagan's administration on the proposed project.

WHAT ARE THE PURPOSES OF THE FINAL PUBLIC MEETING?

o To present the results and tentative recommendation of the Corps of Engineers' Wynoochee Hydropower/Fish Hatchery Study as presented in the draft feasibility report and EIS.

o To receive official public and agency comments on the draft feasibility report and EIS.

WHAT WILL HAPPEN AT THE FINAL PUBLIC MEETING?

Colonel Norman C. Hintz, new Corps of Engineers Seattle District Engineer, will conduct the meeting. Details of the Corps of Engineers tentatively selected plan will be presented, along with the preliminary conclusions and recommendation. Oral and written comments by the public and agencies will be welcomed. The meeting will be recorded and a transcript prepared.

WHAT COMES AFTER THAT?

The public meeting record will remain open for additional comments 30 days after the meeting. In early 1982, the draft feasibility report and EIS will be finalized and sent to Corps of Engineers reviewing offices in Portland and Washington, D.C. After approval, the report will be submitted to Congress for consideration. If Congress authorizes and funds Federal construction, advanced engineering and design studies would then be conducted by the Corps of Engineers, leading to project construction in the late 1980's.

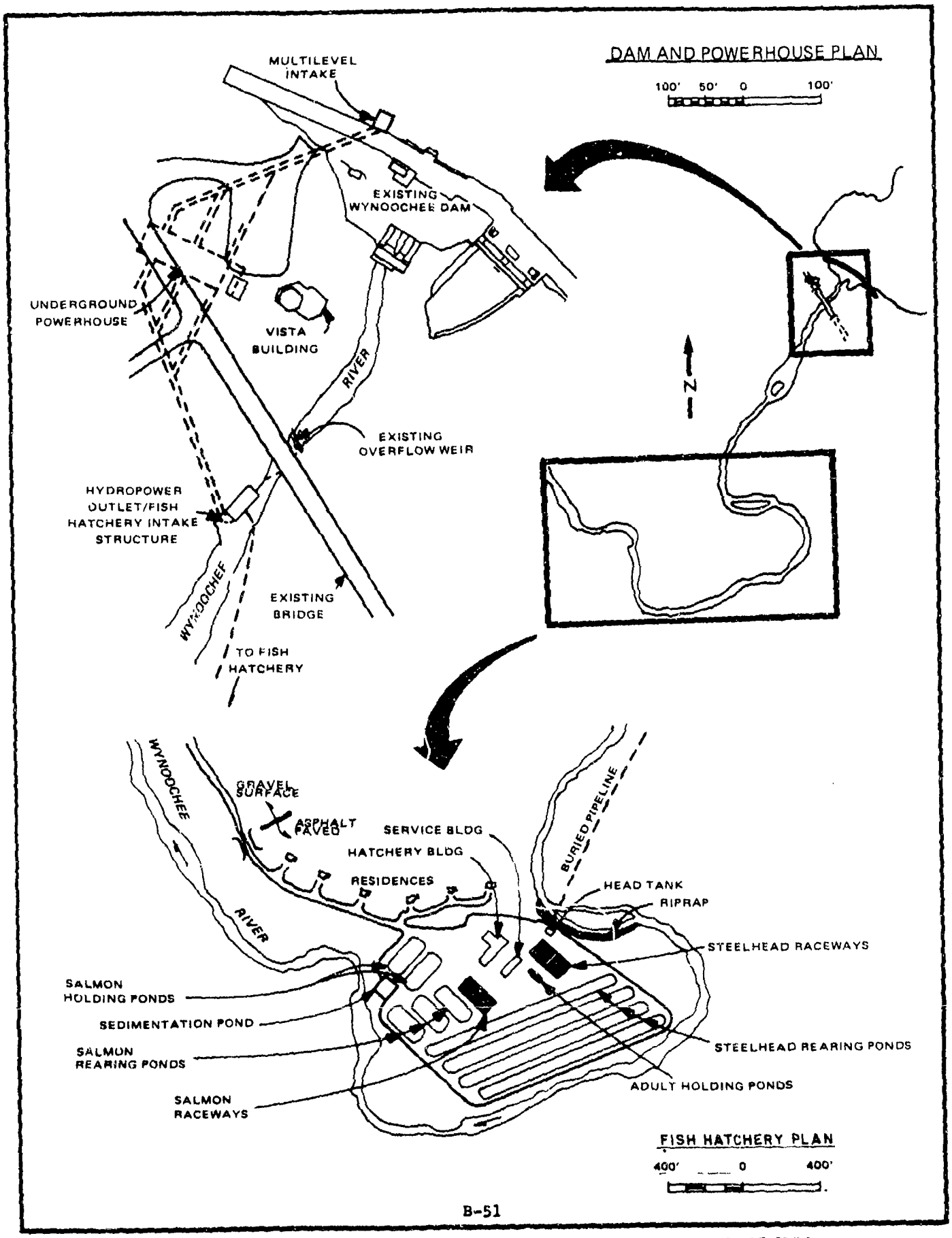
WHAT IS THE TENTATIVELY SELECTED PLAN?

The tentatively selected plan has not changed significantly since the public information meeting. The plan is an integrated 10.2 megawatt (nameplate) hydropower addition to Wynoochee Dam and a 396,000 pound fish hatchery for anadromous fish 3,000 feet downstream of the dam. The plan would produce 37,400 megawatt-hours of energy per year and add an estimated 118,500 adult salmon and steelhead to the annual anadromous fish harvest in the Chehalis River Basin, Grays Harbor area, other northern Washington coastal rivers, and northern Pacific Ocean.

The tentatively selected plan includes a multilevel intake structure to control the temperature of water taken from the reservoir, an underground powerhouse with three turbines, a fail-safe system to provide up to 190 cubic feet per second gravity-flow water supply to the fish hatchery, and a joint salmon and steelhead enhancement fish hatchery. Two satellite fish stations for enhancement of fish runs on other northern Washington coastal rivers have been added to the tentatively selected plan. The Grays Harbor PUD would construct a 22-mile buried transmission line from the dam to its Promised Land substation north of Aberdeen.

The Corps of Engineers would design and construct the combined hydropower/fish hatchery project, the Grays Harbor PUD would be local sponsor for the hydropower facility and market the power output, a Federal fish agency (National Marine Fisheries Service or Fish and Wildlife Service) would be the Federal sponsor for the fish hatchey, the State of Washington would be local sponsor for the fish hatchery, and the Washington Departments of Fisheries and Game would operate the fish hatchery under contract to the Federal fish agency.

The tentatively selected plan would operate as a fully integrated addition to the existing dam with no change in the existing project purposes. The hydropower operation would be subordinate to all other purposes and the hydropower facility would be operated as a run-of-river plant producing baseload energy from the reservoir releases. The fish hatchery would normally utilize the minimum flows from Wynoochee Dam after they passed through the powerhouse. The fish hatchery production would consist primarily of fish enhancement but would include fish production to mitigate for previous fish losses associated with the existing dam as well as losses associated with the combined hydropower/fish hatchery project. Final design, species selection, and details of the management and operation of the fish hatchery will be determined in advanced engineering and design as a coordinated effort among the Corps of Engineers, Federal and state fish agencies, user groups, Indian tribes, and interested parties.



WYNOOCHEE HYDROPOWER/FISH HATCHERY

HOW IS THE GRAYS HARBOR PUD INVOLVED IN THIS PLAN?

In response to the public's desire made known at the May 1981 public information meeting, the Corps of Engineers and Grays Harbor PUD have formed a hydropower partnership for the proposed hydropower facility at Wynoochee Dam. The PUD, as local sponsor of the hydropower facility, would market the power output and pay 100 percent of the hydropower construction cost and annual hydropower operation, maintenance, and replacement costs. This kind of Federal/non-Federal hydropower partnership would be a first of its kind and would require an exemption by Congress from the law that requires BPA to market power produced at Corps of Engineers projects in the Pacific Northwest. Several details of the hydropower partnership still have to be worked out by the Corps of Engineers and the PUD, including ownership, control of operations and maintenance, financial arrangements, and the transmission line. These details will be worked out in the next few months and will be included in the final feasibility report and EIS forwarded to Congress.

IS THE PLAN ECONOMICALLY JUSTIFIED AND ENVIRONMENTALLY SOUND?

The combined hydropower/fish hatchery project would cost $42,400,000 to construct at October 1981 prices, with $21,580,000 for the hydropower facility and $20,820,000 for the fish hatchery. The proposed plan is economically justified, producing $2.20 in average annual total benefits for every $1 in average annual total costs. The hydropower facility would produce $1.20 in average annual power benefits for every $1 in average annual power costs; the average annual cost of energy produced would be 5.3 cents per kilowatt hour. The fish hatchery would produce $2.90 in average annual fish enhancement benefits for every $1 in average annual fish costs.

The project would cause no significant adverse environmental impacts and would not have a significant impact on the human environment.

HOW WOULD THE COST OF THE TENTATIVELY SELECTED PLAN BE SHARED?

The Federal and non-Federal cost sharing under existing law is as follows:

	Construction	Annual Operation, Maintenance, and Replacement
Federal		
Corps of Engineers	$18,780,000 (fish)	
Federal Fish Agency		$679,000 (fish)
Non-Federal		
Grays Harbor PUD	21,580,000 (power)	341,000 (power)
State of Washington 1/	2,040,000 (fish)	305,000 (fish)
TOTAL	$42,400,000	$1,325,000

1/Additional construction cost sharing by the State of Washington may be required if Congress approves former President Carter's proposed cost sharing policy.

WHAT IS THE CORPS OF ENGINEERS' PRELIMINARY RECOMMENDATION?

The Corps of Engineers preliminary recommendation to Congress will be that an integrated hydropower/fish hatchery project at Wynoochee Dam be authorized for Federal construction, operation, maintenance, and replacement. The preliminary recommendation will be made with the provisions that the Grays Harbor PUD and State of Washington will comply with the various requirements of non-Federal sponsorship, and a Federal fish agency will agree to be the owner and manager and sponsoring Federal agency for the fish hatchery. The recommendation will be finalized after public and agency review.

WHAT CAN YOU DO?

Your input to this study is needed to help insure that the public's concerns have been addressed and that a plan the public wants and supports has been selected and recommended. In addition, only strong support by the public, local and state governments, Federal agencies, and the U.S. congressional delegation from Washington State will insure that this proposed project is placed before Congress for timely authorization, funding, and construction. Your continuing interest in the Wynoochee hydropower/fish hatchery project is appreciated.

I invite you to participate in the final public meeting. The information presented in this brochure should help answer your questions on this study. Please come to the meeting to receive additional information, comment on the study, or ask questions.

We encourage comments on the tentatively selected plan and preliminary recommendation. Please provide your comments on the attached comments page, adding additional pages if needed. You can turn in your comments at the public meeting or return them to us by mail at any time. To mail your comments, please detach and fold the comments page so the Corps of Engineers address is on the outside, tape or staple it closed, and put it in the mail; no postage is necessary.

If you have questions on this study, please contact me by mail at Post Office Box C-3755, Seattle, Washington 98124, or by telephone at (206) 764-3473.

Please bring this announcement to the attention of anyone you know who may be interested in the Wynoochee Hydropower/Fish Hatchery Study.

James O. Waller

JAMES O. WALLER, Ph.D.
Hydropower Study Manager
Seattle District
U.S. Army Corps of Engineers

YOUR COMMENTS

☐ I WANT TO CONTINUE RECEIVING INFORMATION ON THIS STUDY.
☐ PLEASE ADD MY NAME AND ADDRESS TO THE STUDY MAILING LIST.
☐ PLEASE REMOVE MY NAME AND ADDRESS FROM THE STUDY MAILING LIST.

NAME

STREET

CITY STATE ZIP

LIST OF RECIPIENTS

OF

DRAFT FEASIBILITY REPORT

AND

ENVIRONMENTAL IMPACT STATEMENT

(Wynoochee Hydropower/Fish Hatchery Study

Mailing List, as of 13 November 1981)

BAA0011 WA — NX X X

HONORABLE SLADE GORTON
UNITED STATES SENATE
WASHINGTON, DC 20510

BAA0012 WA — NX X X

HONORABLE SLADE GORTON
U. S. SENATOR
2988 FEDERAL OFC BLDG
SEATTLE, WA 98174

BAA0021 WA — NX X X

HON HENRY M JACKSON
UNITED STATES SENATE
137 RUSSELL SENATE OFC BLDG
WASHINGTON, DC 20510

BAA0022 WA — NX X X

HON HENRY M JACKSON
U. S. SENATOR
U. S. COURTHOUSE
SEATTLE, WA 98104

BAB0031 WA 03 — N X X

HON. DON BONKER
HOUSE OF REPRESENTATIVES
434 CANNON HOUSE OFC BLDG
WASHINGTON, DC 20515

BAB0032 WA 03 — NX X X

HON. DON BONKER
ATTN DAVID NYMAN
209 FEDERAL BLDG.
OLYMPIA WA 98501

BAB0071 WA 07 — N X X

HONORABLE MIKE LOWRY
HOUSE OF REPRESENTATIVES
1205 LONGWORTH HOUSE OFC BLDG
WASHINGTON, DC 20515

BAB0072 WA 07 — NX X X

HONORABLE MIKE LOWRY
REPRESENTATIVE IN CONGRESS
3400 RAINIER AVE SO
SEATTLE, WA 98144

BAC0015

ARTHUR L MARTIN, ADMIN ASST
CONGRESSMAN BONKER'S OFFICE
207 FEDERAL BLDG
OLYMPIA WA 98501

BBA0007

CORPS OF ENGINEERS
INSTITUTE OF WATER RESOURCES
KINGMAN BLDG
FORT BELVOIR VA 22060

BBA0011 — X (5)

CHIEF OF ENGINEERS
ATTN: DAEN-CWP
DEPARTMENT OF THE ARMY
WASHINGTON, DC 20314

BBA0013 — X

COMMANDER
NORTH PACIFIC DIVISION
CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OR 97209

BBA0021 — X (5)

RESIDENT MEMBER
BOARD OF ENGINEERS FOR
RIVERS AND HARBORS
KINGMAN BLDG,
FORT BELVOIR, VA 22060

BBA0026 — XX

PUBLIC AFFAIRS OFFICE
NORTH PACIFIC DIVISION
CORPS OF ENGINEERS
P O BOX 2870
PORTLAND OR 97208

BCA0010 — X X

CHIEF--RIVER BASIN PLANNING BR.
SOIL CONSERVATION SERVICE
U. S. DEPT. OF AGRICULTURE
PO BOX 2890
WASHINGTON, DC 20013

BCA0601 — X

FRANK R EASTER
AREA CONSERVATIONIST
SOIL CONSERVATION SERVICE
711 CAPITOL WAY, RM 502
OLYMPIA WA 98501

BCA1402
JERRY V WEBER
SOIL CONSERVATION SERVICE
330 PIONEER AVE
MONTESANO WA 98563

BCB1401 WA014 X XX X
DISTRICT CONSERVATIONIST SCS
ATTN: ALLEN SPRINGER
330 PIONEER WEST
MONTESANO WA 98563

BCC0060 X X X
REGIONAL FORESTER
PACIFIC NW REGION
US FOREST SERVICE
PO BOX 3623
PORTLAND, OR 97208

BCC0130 WA X X
FOREST SUPERVISOR
OLYMPIC NATL FOREST
US FOREST SERVICE
PO BOX 2288
OLYMPIA WA 98507

BCC0131
JACK GRUBB
US FOREST SVC
801 CAPITOL WAY
OLYMPIA WA 98501

BCC0132
JOHN DAVIS, DIST RANGER
SHELTON RANGER DIST
US FOREST SERVICE
2904 OLYMPIC HWY N
SHELTON WA 98584

BCC0133 495 34 WA 3 22
FRED BRANDAN
OLYMPIC NATL FOREST
US FOREST SERVICE
PO BOX 2288
OLYMPIA WA 98507

BCC0134 495 34 WA
GENE W CARLSON
OLYMPIC NATIONAL FOREST
US FOREST SERVICE
PO BOX 2288
OLYMPIA WA 98507

BCC0135
MAUREEN BECKSTEAD
US FOREST SERVICE
OLYMPIC NATL FOREST
PO BOX 2288
OLYMPIA WA 98507

BDC0020 X X
PHYLLIS LAMPHERE, REG DIR
DEPART OF COMMERCE
ECONOMIC DEV ADMINISTRATION
1700 WESTLAKE AVE N
SEATTLE WA 98109

BDE0040 X
DALE EVANS DIRECTOR #
ENVIRON & TECH. SERVICES DIV
NATL MARINE FISHERIES SERVICE
PO BOX 4332
PORTLAND OR 97208

BDE0100 XX X
H A LARKINS, DIRECTOR
PACIFIC NW REGION
NAT MARINE FISHERIES SVC
7600 SAND POINT WY NE/BIN C-15700
SEATTLE WA 98115

BDE0101 XX
NATL MARINE FISHERIES SVC, NOAA
PACIFIC NW REGIONAL DIRECTOR
7600 SAND POINT WY NE/BIN C-15700
SEATTLE WA 98115

BDE0105
MERRITT TUTTLE
ENVIRONMENTAL & TECH SVCS DIV
NATIONAL MARINE FISHERIES, NOAA
PO BOX 4332
PORTLAND OR 97208

BDE0170 609 17 WA
ROBERT AYERS
NATL MARINE FISHERIES SVC, NOAA
7600 SAND POINT WY NE/BIN C-15700
SEATTLE WA 98115

BDF0010 WA X X
REGIONAL DIRECTOR
SEATTLE REGIONAL OFC
SMALL BUSINESS ADMIN
710 2ND AVE
SEATTLE WA 98104

BFB0010 X X X
GEORGE J ROYBAL
REGIONAL ADMINISTRATOR REGION X
US DEPT OF HOUSING & URBAN DEV
1321 2ND AVE.
SEATTLE WA 98101

BGA0030 X X
FIELD REPRESENTATIVE
US DEPT OF THE INTERIOR
1002 NE HOLLADAY
PORTLAND OR 97232

BGB0010 X X
ADMINISTRATOR
BONNEVILLE POWER ADMIN
PO BOX 3621
PORTLAND OR 97208

BGB0020 X X
CH BRANCH OF POWER RESOURCES
BONNEVILLE POWER ADMIN
PO BOX 3621
PORTLAND OR 97208

BGB0050 WA Y X
MANAGER SEATTLE AREA (2)
BONNEVILLE POWER ADMIN
415 1ST AVE N
SEATTLE WA 98109

BGB1710
ELLERY HALL
BONNEVILLE POWER ADMIN
415 1ST AVE N
SEATTLE WA 98109

BGB9901
TERRY BELLERBY
BONNEVILLE POWER ADMIN
PO BOX 3621
PORTLAND OR 97208

BGB9902
MARK BOND
BONNEVILLE POWER ADMIN
PO BOX 3621
PORTLAND OR 97208

BGC0016 495 34 WA
DEL ROBINSON
OLYMPIA FISHERIES SERVICE UNIT
BUREAU OF INDIAN AFFAIRS
PO BOX 337
OLYMPIA WA 98507

BGC0020 WA X X X
SUPT WESTERN WASH AGENCY
BUREAU OF INDIAN AFFAIRS
ATTN: NATURAL RESOURCES
FEDERAL BLDG
EVERETT WA 98201

BGC1401
RAY MALDOMADO, SUPERINTENDENT
OLYMPIC PENINSULA AGENCY
POST OFFICE BOX 120
HOQUIAM WA 98550

BGF0005 X
LOUIS S WALL, CHIEF
WESTERN DIV OF PROJECT REVIEW
ADV COUNCIL ON HISTORIC PRES, GSA
44 UNION BLVD #616
LAKEWOOD CO 80228

BGG0010 X X
REGIONAL DIRECTOR (3 CYS)
PACIFIC NW REGION
BUREAU OF RECLAMATION
BOX 043-550 W FORT ST
BOISE ID 83724

BGI0001
PETER KLINT
RIVER, TRAILS, WATER PROJ DIV
NATIONAL PARKS SERVICE
1920 WESTIN BLDG, 2001 6TH AVE
SEATTLE WA 98121

BGI0015 609 17 WA XXXXXX
T ALAN COMP
DIRECTOR OF CULTURAL RESOURCES
NATIONAL PARK SERVICE
1920 WESTIN BLDG, 2001 6TH AVE
SEATTLE WA 98121

BGJ0008 X XX X
RICHARD J MYSHAK, REG DIR
US FISH & WILDLIFE SVC
500 MULTNOMAH ST #1692
PORTLAND OR 97232

BGJ0009 X X
CHARLES DUNN
FIELD SUPERVISOR
US FISH & WILDLIFE SVC
2625 PARKMONT LN, BLDG B3
OLYMPIA WA 98502

BGJ0011 X XXXXXXX
JOSEPH R BLUM AREA MANAGER
U S FISH & WILDLIFE SERVICE
BUILDING A
2625 PARKMONT LANE
OLYMPIA WA 98502

BGJ0020 X X
FIELD SUPERVISOR
DIV RIVER BASIN STUDIES
US FISH & WILDLIFE SERVICE
4620 OVERLAND RD, RM 209
BOISE ID 83705

BGJ0026
JEFF OPDYCKE
US FISH & WILDLIFE SVC
2625 PARKMONT LN SW, BLDG A
OLYMPIA WA 98502

BGK0040 XX X
PHILIP J CARPENTER, CHIEF
WATER RESOURCES DIV
US GEOLOGICAL SURVEY
1201 PACIFIC AVE SUITE 600
TACOMA WA 98402

BHC0010 NX XX X
COMMANDER (2)
13TH COAST GUARD DIST
ATTN: PLNG OFC, RM 3590
915 2ND AVE.
SEATTLE WA 98104

BIB0010 X NX XX X
JOHN R SPENCER, REG ADMIN
ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 6TH AVE
SEATTLE WA 98101

BIB0035 X X
ENVIRONMENTAL PROTECTION AGENCY
NEPA BRANCH
1200 6TH AVE.
SEATTLE WA 98101

BIB0070 XX X
ELIZABETH CORBYN, CHIEF
ENVIRONMENTAL EVALUATION BRANCH
US ENVIRONMENTAL PROTFCTION AGCY
1200 SIXTH AVE
SEATTLE WA 98101

BIB0071 XX X
JUDI SCHWARZ, FED PROJECTS COORD
ENVIRONMENTAL EVALUATION BRANCH
ENVIRONMENTAL PROTECTION AGENCY
1200 6TH AVE
SEATTLE WA 98101

BJB0010 X XXX
US DEPARTMENT OF ENERGY
OFFICE OF REGIONAL REPRESENTATIVE
19TH FLOOR FEDERAL BLDG
915 2ND AVE
SEATTLE WA 98174

CAA0002 NXXXXXX
HONORABLE JOHN SPELLMAN
GOVERNOR OF WASHINGTON
OLYMPIA WA 98501

CAB1901 WA 0319 XX X
J T QUIGG, JR
WASHINGTON SENATE
613 NORTH K ST
ABERDEEN WA 98520

CAC1901 WA 0319 X XX X
HON JOHN ERAK
WASH HOUSE OF REPRESENTATIVES
617 W 3RD
ABERDEEN WA 98520

CAC1902 WA 0319 X XX X
HON. CAROL MONOHON
WASH HOUSE OF REPRESENTATIVES
RT. 1 BOX 136
RAYMOND WA 98577

CAC9000
FRED ADAIR, STAFF
HOUSE ENERGY & UTILITIES COMM
219-A HOUSE OFC BLDG
OLYMPIA WA 98504

CADC026 C
TOM ELWELL
WASH DEPT OF ECOLOGY
PV-11
OLYMPIA WA 98504

CADC037
MIKE HAMBROCK
WASH DEPT OF ECOLOGY
PV-11
OLYMPIA WA 98504

CADF002 F XX
ROBERT GERKE
WASH DEPT OF FISHERIES
AX-11
OLYMPIA WA 98504

CADF011 495 34 WA F
BRIAN EDIE
WASH DEPT OF FISHERIES
AX-11
OLYMPIA WA 98504

CADF012 495 34 WA F
FRANK HAW, ASST DIR
WASH DEPT OF FISHERIES
AX-11
OLYMPIA WA 98504

CADF013 495 34 WA F
BOB HAGER
WASH DEPT OF FISHERIES
AX-11
OLYMPIA WA 98504

CADF016
WILLIAM C YOUNG
WASH DEPT OF FISHERIFS
AX-11
OLYMPIA WA 98504

CADG004 G
JAMES G FENTON
WASH DEPT OF GAME
GJ-11
OLYMPIA WA 98504

CADG017 003 14 WA 3 19 G
MGR, ABERDEEN FISH HATCHERY
WASH DEPT OF GAME
2503 CENTRAL PARK DR
ABERDEEN WA 98520

CADG023 495 34 WA 3 22 G
DAVE GUFLER
WASH DEPT OF GAME
GJ-11
OLYMPIA WA 98504

CADG024
MR JIM NEILSEN
WASHINGTON DEPT OF GAME
905 EAST HERON STREET
ABERDEEN WA 98520

CAD0009 XF X
WASH. DEPT. OF FISHERIES
DICK STONE
331 STATE HWY 12
MONTESANO WA 98563

CAD0011 XC X
DONALD W MOOS, DIR
WASH DEPT OF ECOLOGY
PV-11
OLYMPIA WA 98504

CAD0014 XH NX
BRIAN BOYLE
COMMISSIONER OF PUBLIC LANDS
DEPARTMENT OF NATURAL RESOURCES
QW-21
OLYMPIA WA 98504

CAD0018 XG NX
FRANK R LOCKARD, DIR
WASHINGTON DEPT OF GAME
GJ-11
OLYMPIA WA 98504

CAD0019 XF NX
ROLLAND A SCHMITTEN, DIR
WASHINGTON DEPT OF FISHERIES
AX-11
OLYMPIA WA 98504

CAD0020 WA A X XX X
M KEITH ELLIS, DIR
DEPT. OF AGRICULTURE
AX-41
OLYMPIA, WA 98504

CAD0029 G X
REGIONAL SUPERVISOR
DEPT OF GAME
905 E HERON
ABERDEEN WA 98520

CAD0030 G
ROBERT WATSON
DEPT OF GAME
905 E HERON
ABERDEEN WA 98520

CAD0032 G XX X
MR. JACK AYERST
WASHINGTON DEPARTMENT OF GAME
GJ-11
OLYMPIA WA 98504

CAD0115 X
EXECUTIVE SECRETARY
STATE OF WASHINGTON
CONSERVATION COMMISSION
PQ-11
OLYMPIA WA 98504

CAD0116 C XX X
DEPT OF ECOLOGY
ENVIRONMENTAL REVIEW SEC
ATTN: GREG SORLIE
PV-11
OLYMPIA WA 98504

CAD0800 WA XK XX X
ROBERT L WILDER, ADMIN
INTERAGENCY COMM FOR OUTDOOR
RECREATION
KP-11
OLYMPIA WA 98504

CAD0900 WA L X X X
JAN TVETEN, DIR
STATE PARKS & RECREATION COMSN
KY-11
OLYMPIA WA 98504

CAD1000 WA M X XX X
KAREN RAHM, DIR
PLANNING & COMM. AFFAIRS AGENCY
FN-41
OLYMPIA WA 98504

CAD1200 WA X X X
DIRECTOR
STATE OF WASHINGTON
WATER RESEARCH CENTER
WASH STATE UNIVERSITY
PULLMAN WA 99163

CAD1440 X X
EDWARD SHEETS, DIR
WASH STATE ENERGY OFFICE
ER-11
OLYMPIA WA 98504

CAE0006 X X
JEANNE M WELCH, DIR
STATE OFC OF ARCHEOL & HIST PRSVN
KL-11
OLYMPIA WA 98504

CAE0011
EXECUTIVE DIRECTOR
NW INDIAN FISHERIES CMSN
2625 PARKMONT LN, BLDG C
OLYMPIA WA 98502

CAE0030 XXX
KENNETH MADSEN, STAFF DIRECTOR
ST SEN ENERGY & UTIL COMMITTEE
201 INSTITUTIONS BLDG
OLYMPIA WA 98504

CAE0212 XX
EDWARD SHEETS, DIR
WASH STATE ENERGY OFFICE
ER-11
OLYMPIA WA 98504

CBB1401 14 WA 3 19 X XX X
MIKE MURPHY
BOARD OF GRAYS HARBOR CO
CMSNR DIST #1
PO BOX 535
ELMA WA 98541

CBB1402 14 WA 3 19 X XX X
BILL VOGLER
BOARD OF GRAYS HARBOR CO
CMSNR DIST #2
810 CANYON CT
ABERDEEN WA 98520

CBB1403 14 WA 3 19 X XX X
ROLLAND A YOUMANS
BOARD OF GRAYS HARBOR CO
CMSNR DIST #3
23 O ST
HOQUIAM WA 98550

CBB1404 14 WA 3 19 X X XX
GRAYS HARBOR COUNTY COMMISSIONERS
GRAYS HARBOR COUNTY COURTHOUSE
MONTESANO WA 98563

CBC1401 WA014 X X XX X
CHARLES C KIRKWOOD PE
GRAYS HBR CO DEPT OF PUBLIC WORKS
DIV OF ADMIN & PLNG
PO BOX 511
MONTESANO WA 98563

CBD1401 WA014 X XX X
PATRICK L DUGAN
GRAYS HARBOR REGIONAL PLNG CMSN
2109 SUMNER AVE #202
ABERDEEN WA 98520

CBD1402 X XX X
DIRECTOR
GRAYS HARBOR PLNG COMMSN.
COUNTY COURTHOUSE
MONTESANO WA 98563

CBO1401
DEAN WHORTON
CHEHALIS RIVER TASK FORCE
C/O PUBLIC WORKS DEPT
PO BOX 511
MONTESANO WA 98563

CBO2101
ROY MYKLEBUST
CHEHALIS RIVER TASK FORCE
1120 N WASHINGTON
CHEHALIS WA 98532

CBY3903
RICHARD E MOULTON EXTENSION
STAFF CHAIRMAN GRAYS HARBOR
COUNTY COOPERATIVE EXTENSION SV
200 1ST SOUTH
MONTESANO WA 98563

CCA0030003WA014 X X XX X
JACK DURNEY,MAYOR
ABERDEEN CITY HALL
200 E MARKET ST
ABERDEEN WA 98520

CCA1440144WA014 X X XX X
MAYOR OF COSMOPOLIS
COSMOPOLIS TOWN HALL
PO BOX G
COSMOPOLIS WA 98537

CCA1980 X
MAYOR OF ELMA
ELMA TOWN HALL
202 W MAIN ST
ELMA WA 98541

CCA2850285WA014 X X XX X
MAYOR OF HOQUIAM
HOQUIAM CITY HALL
609 - 8TH ST
HOQUIAM WA 98550

CCA4260426WA014 X XX X
MAYOR OF MONTESANO
MONTESANO CITY HALL
104 MAIN ST N
MONTESANO WA 98563

CCA7530753WA014 X X XX X
MAYOR OF WESTPORT
WESTPORT TOWN HALL
N MONTESANO BOX 505
WESTPORT WA 98595

CCC0030003WA014 XX X
ABERDEEN CITY COUNCIL (12)
ABERDEEN CITY HALL
200 E MARKET ST
ABERDEEN WA 98520

CCC0031
JERRY L KELTNER, PRESIDENT
ABERDEEN CITY COUNCIL
710 FIRST AVENUE
ABERDEEN WA 98520

CCC1440144WA014 XX X
COSMOPOLIS TOWN COUNCIL (5)
COSMOPOLIS TOWN HALL
100 E 1ST
COSMOPOLIS WA 98537

CCC1950195WA014 XX X
ELMA TOWN COUNCIL (5)
ELMA TOWN HALL
202 W MAIN ST
ELMA WA 98541

CCC2850285WA014 XX X
HOQUIAM CITY COUNCIL (12)
HOQUIAM CITY HALL
609 - 8TH ST
HOQUIAM WA 98550

CCC4260426WA014 XX X
MONTESANO CITY COUNCIL (7)
MONTESANO CITY HALL
104 MAIN ST N
MONTESANO WA 98563

CCC7530753WA014 XX X
WESTPORT TOWN COUNCIL (4)
WESTPORT TOWN HALL
N MONTESSANO BOX 505
WESTPORT WA 98595

CCG0030003WA014 X X X X
RUDOLPH J BALGAROO, CITY ENGINEER
ABERDEEN CITY HALL
200 E MARKET ST
ABERDEEN WA 98520

CCG1440144WA014 X X X
ENGINEER
COSMOPOLIS TOWN HALL
100 E 5TH
COSMOPOLIS WA 98537

CCG2851 285 14 WA 3 19
DONNA VOSS
HOQUIAM DEPT OF ENGINEERING
HOQUIAM CITY HALL
609 8TH ST
HOQUIAM WA 98550

CCG4260426WA014 X X X
CITY ENGINEER
MONTESANO CITY HALL
102 MAIN ST N
MONTESANO WA 98563

CCG7531 753 14 WA 3 19
MICHAEL KITCHELL
WESTPORT DEPT OF ENGINEERING
WESTPORT CITY HALL
PO BOX 505
WESTPORT WA 98595

CCJ0030 003 14 WA 3 19
WES PETERSON, DIRECTOR
ABERDEEN PARKS & RECREATION DEPT
200 E MARKET
ABERDEEN WA 98520

CCJ1401 XX X
RECREATION DIRECTOR
CITY OF ABERDEEN
200 E. MARKET ST.
ABERDEEN WA 98520

CCK0030003WA014 XX X
PLANNING CMSN CHMN
ABERDEEN CITY HALL
200 E MARKET ST
ABERDEEN WA 98520

CCK1440144WA014 XX X
PLANNING CMSN CHMN
COSMOPOLIS TOWN HALL
100 E 1TH
COSMOPOLIS WA 98537

CCK2850285WA014 XX X
PLANNING CMSN CHMN
HOQUIAM CITY HALL
609 - 8TH ST
HOQUIAM WA 98550

CCK4260426WA014 XX X
PLANNING CMSN CHMN
MONTESANO CITY HALL
104 MAIN ST N
MONTESANO WA 98563

CCK7530753WA014 X X
PLANNING CMSN CHMN
WESTPORT TOWN HALL
N MONTESSANO BOX 505
WESTPORT WA 98595

CCP1401 XX X
ROBERT A SALMON, PE
GENERAL SUPERVISOR, O & M
CITY OF ABERDEEN
200 E. MARKET ST.
ABERDEEN WA 98520

CCP1402 XX X
RALPH ERICKSON, SUPT.
HOQUIAM WATER DEPT.
609 8TH ST.
HOQUIAM WA 98550

CCR1401 XX X
SPECIAL SERVICES ENGINEER
DEPT. OF PUBLIC WORKS
GRAYS HARBOR CO. COURTHOUSE
MONTESANO WA 98563

CCR1402 XX X
GORDON LOGAN, DEV. COORD.
CITY OF ABERDEEN
200 E. MARKET ST.
ABERDEEN WA 98520

CCZ0114 14 WA
STAN LATTIN
PORT OF GRAY HARBOR
PO BOX 660
ABERDEEN WA 98520

CCZ0115 14 WA XX X
HANS M. BIELSKI, COMMSNR.
PORT OF GRAYS HARBOR
P.O. BOX 212
ABERDEEN WA 98520

CCZ0116 14 WA XX X
ROBERT L AIKEN, CMSNR
PORT OF GRAYS HARBOR
PO BOX 1058
OCEAN SHORES WA 98569

CCZ0117 14 WA XX X
JOHN H. STEVENS, COMMSNR.
PORT OF GRAYS HARBOR
P.O. BOX 777
ELMA WA 98541

CCZ0118 14 WA X NX XX X
HENRY E. SOIKE, MANAGER #
PORT OF GRAYS HARBOR
P.O. BOX 660
ABERDEEN WA 98520

CCZ0119 14 WA XX X
ROBERT KYCEK, ENGINEER
PORT OF GRAYS HARBOR
P.O. BOX 660
ABERDEEN WA 98520

DAA1401 WA014 X X
SECRETARY
ELMA CHAMBER OF COMMERCE
PO BOX 8
ELMA WA 98541

DAA1402 WA014 X X
MANAGER
GRAYS HARBOR CHAMBER OF COMMERCE
PO BOX 450
ABERDEEN WA 98520

DAA1404 WA014 X X
SECRETARY
MONTESANO CHAMBER OF COMMERCE
PO BOX 688
MONTESANO WA 98563

DAA1405 WA014 X X
PRESIDENT
OCEAN SHORES CHAMBER OF COMMERCE
BOX 382
OCEAN SHORES WA 98551

DAA1406 WA014 X X
EXECUTIVE SECRETARY
WESTPORT-GRAYLAND
CHAMBER OF COMMERCE
PO BOX 306
WESTPORT WA 98595

DAB0002 XX X

ELECTRIC LEAGUE OF PAC NW
555 116TH NE
BELLEVUE WA 98004

DAB0601 X

NW PUBLIC POWER ASSN
PO BOX 1307
VANCOUVER WA 98660

DAB1401 N XX X

GRAYS HARBOR CNTY PUD
P.O. BOX 480
ABERDEEN WA 98520

DAB1402

WASH PUBLIC PWR SUPPLY SYSTEM
PO BOX 1223
ELMA WA 98541

DAB1404
FERRIS G GILKEY
GRAYS HARBOR PUD
PO BOX 480
ABERDEEN WA 98520

DAB1405
DONALD L SWINHART
GRAYS HARBOR PUD
PO BOX 480
ABERDEEN WA 98502

DAB1406
LOIS M POWELL
GRAYS HARBOR PUD
PO BOX 480
ABERDEEN WA 98520

DAB1702 X
LAWRENCE HALL VP
MGMT & PUBLIC AFFAIRS
PUGET SOUND PWR & LIGHT CO
PUGET POWER BLDG
BELLEVUE WA 98004

DAB2102 XX X

LEWIS CNTY PUD
PO BOX 330
CHEHALIS WA 98532

DAB2301 XX X
PUBLIC UTILITY DIST. NO. 1
MASON COUNTY
RT. 5, BOX 555
SHELTON WA 98584

DAB2302 XX X

MASON CNTY PUD # 3
PO BOX 490
SHELTON WA 98584

DAB2304
RICHARD L THOMPSON
MASON CO PUD #3
PO BOX 490
SHELTON WA 98584

DAB2402 XX X

MCCLEARY POWER & LIGHT
BOX 360 CITY HALL
MC CLEARY WA 98557

DAB2501 X XX X

PACIFIC CNTY PUD # 2
P.O. BOX 472
RAYMOND WA 98577

DAB3401 XX X

THURSTON CNTY PUD
PROFESSIONAL ARTS BLDG
OLYMPIA WA 98501

DAB4003

PACIFIC POWER & LIGHT CO
ROUTE 2
CENTRALIA WA 98531

DAD1409 WA014 X X
AMY BRUMFIELD SECRETARY
WYNOOCHEE VALLEY GRANG NO 801
STAR ROUTE BOX 209
MONTESANO WA 98563

DAX1401
RAY HILL
GRAYS HARBOR REG PLNG COMM
PO BOX 236
ELMA WA 98541

DAX1402
JANET A RICHARDSON
GRAYS HARBOR REG PLNG COMM
2109 SUMNER AVE
ABERDEEN WA 98520

DAY1403 003 14 WA 3 '9
R E ANDREW
DIRECTOR - HSE & ENERGY
GRAYS HBR COMM ACTION COUNCIL
207 S CHEHALIS ST
ABERDEEN WA 98520

DAY1405
JAKE METCALF
G H FISH ENHANCEMENT TASK FORCE
350 GALE ST
HOQUIAM WA 98550

DBA1401 X N
NEWS EDITOR
DAILY WORLD
P.O. BOX 269
ABERDEEN WA 98520

DBA1404 X NX
NEWS EDITOR
MONTESANO VIDETTE
P.O. BOX 671
MONTESANO WA 98563

DBA1405 X N
NEWS EDITOR
TWIN HARBORS PRESS
P.O. BOX 547
WESTPORT WA 98595

DBA1417
CARMEL M FINLEY
THE FISHERMEN'S NEWS
STAR RT, BOX 240
ABERDEEN WA 98520

DBA1423 X N
NEWS EDITOR
GRAYS HARBOR SUBURBANITE
AND FARMER-LOGGER
BOX 671
MONTESANO WA 98563

DBA1424 X N
NEWS EDITOR
NORTH BEACH BEACON
P O BOX 1207
OCEAN SHORES WA 98569

DBA1703 WA017 X N XX X
NEWS EDITOR
SEATTLE TIMES
PO BOX 70
SEATTLE WA 98111

DBA1709 WA017 X N XX X
NEWS EDITOR
SEATTLE POST-INTELLIGENCER
PO BOX 1909
SEATTLE WA 98111

DBA1725 X N XX X
NEWS EDITOR
DAILY JOURNAL OF COMMERCE
83 COLUMBIA STREET
SEATTLE WA 98104

DBA2706 X N X X
NEWS EDITOR
TACOMA NEWS TRIBUNE
PO BOX 11000
TACOMA WA 98411

DBA3404 X N
NEWS EDITOR
THE OLYMPIAN
PO BOX 407
OLYMPIA WA 98501

DBB1403 N
NEWS DIRECTOR
KXRO RADIO
P.O. BOX 47
ABERDEEN WA 98520

DBB1404 N
NEWS DIRECTOR
KBKW RADIO
PO BOX 188
ABERDEEN WA 98520

DBB1406 N
NEWS DIRECTOR
KGHO RADIO
31ST & BAY AVE.
HOQUIAM WA 98550

DBB1710 X N XX X
NEWS DIRECTOR
KING-TV
333 DEXTER N
SEATTLE WA 98109

DBB1733 X N XX
NEWS DIRECTOR
KIRO TV
3RD & BROAD STS
SEATTLE WA 98121

DBB1734 X N XX
NEWS DIRECTOR
KOMO TV
100 4TH AVE N
SEATTLE WA 98109

DBB2701 WA X N XX X
NEWS DIRECTOR
KSTW TV
2320 S 19TH
TACOMA WA 98405

DBB2705 WA N XX X
NEWS DIRECTOR
KTAC RADIO
2000 TACOMA MALL OFFICE BLDG
TACOMA WA 98402

DBB2706 WA X N XX X
NEWS DIRECTOR
KTPS TV
1101 S YAKIMA
TACOMA WA 98405

DBB2710 WA N XX X
NEWS DIRECTOR
KLAY RADIO
215 TACOMA AVE S
TACOMA WA 98402

DBB2711 WA N XX X
NEWS DIRECTOR
KMO RADIO
BOX 1277
TACOMA WA 98401

DBB2712 X N XX
NEWS DIRECTOR
KCPQ-TV
4400 STEILACOOM BLVD SW
TACOMA WA 98499

DBB2718 N
NEWS DIRECTOR
KTNT RADIO
BOX 5200
TACOMA WA 98405

DBB2722
NEWS DIRECTOR
KQLA RADIO
5123 112TH SW
TACOMA WA 98499

DBB2723
NEWS DIRECTOR
KUPS RADIO
UNIVERSITY OF PUGET SOUND
1500 N WARNER
TACOMA WA 98406

DBB3401 WA N XX X
NEWS DIRECTOR
KGY RADIO
PO BOX 1249
OLYMPIA WA 98507

DBB3402 WA N XX X
NEWS DIRECTOR
KITN RADIO
BOX 48
OLYMPIA WA 98507

DBB3403 N XX
NEWS DIRECTOR
KAOS RADIO STATION
EVERGREEN STATE COLLEGE
PO BOX 1125
OLYMPIA WA 98507

DBE0007 XX X

REID-MIDDLETON ASSOC
121 5TH AVE N #200
EDMONDS WA 98020

DBE0010 XX X

R. W. BECK & ASSOC.
TOWER BLDG.
SEATTLE, WA 98101

DBE1728 609 17 WA
CAROL BROWN
KRAMER, CHIN, & MAYO, INC
1917 1ST AVE
SEATTLE WA 98101

DBE1729 036 17 WA
SVERDRUP & PARCEL AND ASSOC, INC
CONSULTING ENGINEERS
PO BOX 369
BELLEVUE WA 98009

DBE1768 609 17 WA
CECIL L FOX, PE
KRAMER, CHIN, & MAYO, INC
1917 1ST AVE
SEATTLE WA 98101

DBE1769 609 17 WA
JOHN DERMODY
RAVEN SYSTEMS AND RESEARCH, INC
2200 6TH AVE #519
SEATTLE WA 98121

DBE1776 036 17 WA
TOM HOLTZ
OTT ENGINEERING
ONE LAKE BELLEVUE BLDG
1159 120TH AVE BNE
BELLEVUE WA 98005

DBE1777
LYNDA BARBER
KRAMER, CHIN, & MAYO
1917 1ST AVE
SEATTLE WA 98101

DBE1778
A RICHARD GRIFFITH
R W BECK & ASSOC
TOWER BLDG
SEATTLE WA 98101

DBE1779
LARRY D COUPE
R W BECK & ASSOC
TOWER BLDG
SEATTLE WA 98101

DBE1780
CHRISTOPHER WELLER
R W BECK & ASSOC
TOWER BLDG
SEATTLE WA 98101

DBE1781
DONALD E BOWES
R W BECK & ASSOC
TOWER BLDG
SEATTLE WA 98101

DBE1782
WICHAI WICHIENWIDHTAYA
R W BECK & ASSOC
TOWER BLDG
SEATTLE WA 98101

DBE1783
STEVEN E HUGHES
NATURAL RESOURCES CONSULTANTS
4055 21ST AVE W
SEATTLE WA 98199

DBE1784
JOHN L LARSON
SVERDRUP-PARCEL & ASSOC, INC
PO BOX 369
BELLEVUE WA 98009

DBE3105 189 31 WA
ODA BASHIAN
REID-MIDDLETON ASSOC
121 5TH AVE N #200
EDMONDS WA 98020

DBE9941 99 DC
MICHAEL N MCCARTY
MCCARTY, NOONE, & WILLIAMS
490 L'ENFANT PLAZA #3306
WASHINGTON DC 20024

DBH0008 X X
ROBERT S. HOIT
SIMPSON TIMBER CO.
NORTHWEST OPERATIONS
SHELTON WA 98584

DBJ0006 XX X
WALFRED HENDRICKSON
GRAYS HARBOR GILLNETTERS ASSN
935 N JEFFRIES ST
ABERDEEN WA 98520

DBJ0014 XX X
FISHERMEN MARKETING ASSN OF WASH*
4215 21ST S.
SEATTLE WA 98199

DBN1401
PATRICK D QUIGG
QUIGG BROS-MCDONALD, CONTRACTORS
PO BOX 1707
ABERDEEN WA 98520

DBN9904 99 OR
HAMILTON CONSTRUCTION
PO BOX 659
SPRINGFIELD OR 97477

DBV1714 609 17 WA
NIEL MACDONALD
APPROPRIATE TECHNOLOGY, INC
370 WHEELER ST
SEATTLE WA 98109

DBX1792
JIM WALDO, ATTORNEY
GORDON, THOMAS, HONEYWELL,
MALANCA, PETERSON, & O'HERN
1847 BANK OF CALIFORNIA CTR
SEATTLE WA 98164

DBY1301 213 13 WA
JO ANN RUSHTON
NORTHERN STEEL & SUPPLY CO
PO BOX 1155
EPHRATA WA 98823

DBY1784 564 17 WA
RON GORE
GORE ELECTRIC COMPANY, INC
7730 185TH AVE NE
REDMOND WA 98052

DBY1789 609 17 WA
MARSHALL BUTLER
DODGE REPORTS
PO BOX C-9037
SEATTLE WA 98109

DBY9902 99 OR
DONALD D MUNRO
AMERON PIPE DIVISION NW
PO BOX 11097
PORTLAND OR 97211

DBZ0011 XX X
WASHINGTON STATE FARM BUREAU
PO BOX 2569
OLYMPIA WA 98507

DBZ0021
NORTHWEST FISHERIES ASSN
2208 NW MARKET ST
SUITE 210C
SEATTLE WA 98144

DBZ0035 X
NW MARINE TRADE ASSN
1900 N NORTHLAKE WY
SEATTLE WA 98103

DBZ0120 X
TOIMI MAKI, PRES
GRAYS HARBOR GILLNETTERS ASSN
S FOREST ST
WESTPORT WA 98595

DBZ1406
MARK V CEDERGREEN
WESTPORT CHARTER ASSN
PO BOX 654
WESTPORT WA 98595

DBZ1407

WESTPORT CHARTER ASSN
PO BOX 654
WESTPORT WA 98595

DBZ1408
JACK WESTRICK, PRES
WESTPORT CHARTER ASSN
PO BOX 654
WESTPORT WA 98595

DBZ1717 609 17 WA

WASHINGTON TROLLERS ASSN
PO BOX 17331
SEATTLE WA 98107

DCB0010 X X XX X
NW REGIONAL REPRESENTATIVE
DOUG SCOTT
SIERRA CLUB
4534-1/2 UNIVERSITY WAY NE
SEATTLE, WA 98105

DCB0020 X
BRUCE MATHESON
SASQUATCH GRP SIERRA CLUB
111 N THORNTON ST
ABERDEEN WA 98520

DCC0009 X
BONNIE GILOVICH, PRESIDENT
RAIN FOREST CHAPTER
AUDUBON SOCIETY
1016 LINDSTROM
ABERDEEN WA 98520

DCC0016 N XX X

SEATTLE AUDUBON SOCIETY
619 JOSHUA GREEN BUILDING
SEATTLE WA 98101

DCD0002 X X XX X
BILL SERRES, PRESIDENT
SEA CH,IZAAK WALTON LEAGUE
METRO
821 2ND AVE
SEATTLE WA 98104

DCE0005 WA X XX X
ADMIN COORDINATOR
WASHINGTON ENV. COUNCIL
107 S MAIN ST
SEATTLE, WA 98104

DCE0010 X NX
ROGER LEED, PRES
WASH ENVIRON. COUNCIL
107 S MAIN #4
SEATTLE WA 98104

DCE1702
TOBY THALER
WASHINGTON ENVIRONMENTAL COUNCIL
520 SMITH TOWER
SEATTLE WA 98104

DCE1703
SETH KELSEY
WASHINGTON ENVIRONMENTAL COUNCIL
5203 NE 70TH ST
SEATTLE WA 98115

DCE1704
JOHN BOWER
WASHINGTON ENVIRONMENTAL COUNCIL
520 SMITH TOWER
SEATTLE WA 98104

DCE1705
JOHN MCGLENN
WASHINGTON ENVIRONMENTAL COUNCIL
107 S MAIN
SEATTLE WA 98104

DCL0001 X NX XX X
NORTHWEST OFFICE
FRIENDS OF THE EARTH
4512 UNIVERSITY WAY NE
SEATTLE WA 98105

DCL0010 XX X
DAVID E ORTMAN
FRIENDS OF EARTH
4512 UNIVERSITY WAY NE
SEATTLE WA 98105

DCR0006 X X
STANLEY M. KNAPP, PRES.
OLYMPIA CONSERVATION COUNCIL
1745 E. 5TH ST.
PORT ANGELES WA 98362

DCR0009 X X XXX
CHARLES T KEENAN, EXEC DIR
WESTERN ENVIRONMENTAL TRADE ASSOC
OF WASH, INC.
3RD & LENORA BLDG #303
SEATTLE WA 98121

DCR0030 X XX X

PRES., OLYMPIC PARK ASSOCIATES
13245 - 40TH N.E.
SEATTLE WA 98125

DCR0173 XX X

GREENPEACE
4534 1/2 UNIVERSITY WAY NE
SEATTLE WA 98105

DCU9913 X
HOWARD BROWN, DIR
AMERICAN RIVERS CNSVN COUNCIL
317 PENNSYLVANIA AVE SE
WASHINGTON DC 20003

DEB1401 WA014 X XX X
MARTHA HILL, PRES.
LWV GRAYS HARBOR CO
212 FIRST AVE.
ABERDEEN WA 98520

DEC0001 XX X
STEVE LINDSTROM, EXEC VP
PACIFIC NW WATERWAYS ASSN
PO BOX 61473
VANCOUVER WA 98666

DED0001 XX X
W B GILLESPIE PRES
WA FLOOD CONTROL COUNCIL
KING CO DIST OF PUBLIC WORKS
KING CO ADMIN BLDG
SEATTLE WA 98104

DEI0012 X X
ABERDEEN PUBLIC LIBRARY
ATTN ROSALIE SPELLMAN
121 E MARKET
ABERDEEN WA 98520

DEI0013 X X

COSMOPOLIS PUBLIC LIBRARY
100 E 1ST
COSMOPOLIS WA 98537

DEI0031 X

LIBRARIAN
PUBLIC LIBRARY
ELMA WA 98541

DEI0033 X X

LIBRARIAN
125 MAIN S
MONTESANO WA 98563

DEI1751 180 17 WA 2 45
BRUCE WAGNER
PACIFIC MARINE TECHNICAL
RESEARCH LIBRARY
15900 300TH PL NE
DUVALL WA 98019

DEK0035 X
FRANK GREEN
WASH STATE HISTORICAL SOCIETY
315 N STADIUM WAY
TACOMA WA 98403

DFA0012 XX X
G H CHAPTER
NW STEELHEAD & SALMON COUNCIL
PO BOX 1050
ABERDEEN WA 98520

DFA0017 X
EVERETT SIMPSON, CHMN
WATER RESOURCES COMM
STATE SPORTSMEN CNCL
437 N PERCIVAL
OLYMPIA WA 98502

DFA0018 X
VERN BABCOCK, PRESIDENT
STATE SPORTSMEN CNCL
1210 PIERCE PL NE
RENTON WA 98055

DFA0025
SECRETARY SOUTHWEST WASHINGTON
SPORTSMEN'S COUNCIL, INC
437 N PERCIVAL
OLYMPIA WA 98502

DFA0029
HOWARD E NELSON SECRETARY INC.
STATE SPORTSMEN'S COUNCIL
9103 33RD ST W
TACOMA WA 98466

DFA0033

OLYMPIA SALMON CLUB
P O BOX 501
OLYMPIA WA 98501

DFA0400 183 04 WA 4 12 X NXXXXXX
C C PITTACK
TROUT UNLIMITED
1721 N AURORA
EAST WENATCHEE WA 98801

DFA0401
CHUCK LARGENT, PRES
WENATCHEE SPORTSMANS ASSOC
PO BOX 762
WENATCHEE WA 98801

DFA1402 003 14 WA 3 19
JERRY PAVELTICH, PRES
STEELHEAD & SALMON UNLIMITED
2100 BAY AVE
ABERDEEN WA 98520

DFA1404 285 14 WA 3 19
JAKE MEDCALF
NW STEELHEADERS ASSN
GRAYS HARBOR CHAPTE
350 GALE
HOQUIAM WA 98550

DFA1405
PAUL HEFFERNAN
QUINAULT INDIAN NATION
PO BOX 189
TAHOLAH WA 98587

DFA1406
MICHAEL PETTY
QUINAULT INDIAN NATION
PO BOX 189
TAHOLAH WA 98587

DFA1407
FRED KOONTZ
QUINAULT INDIAN NATION
PO BOX 189
TAHOLAH WA 98587

DFA1408
OLWING MASON
QUINAULT INDIAN NATION
PO BOX 189
TAHOLAH WA 98587

DFA1409 14 WA
JIM NELSON, PRES
GRAYS HARBOR CHAPTER
NW STEELHEAD & SALMON COUNCIL
322 "K" ST
HOQUIAM WA 98550

DFA1410 14 WA
STARR THURSTON
TWIN HARBOR FLY FISHERMEN
PO BOX 271
OCEAN SHORES WA 98569

DFA1411
DAN CRAIG
GRAYS HARBOR POGGIE CLUB
2330 WISHKAH RD
ABERDEEN WA 98520

DFA1412
KARL E ERICKSON
TWIN HARBORS FLY FISHERS
814 WEST THIRD
ABERDEEN WA 98520

DFA1413
JIM W LARGE
NW STEELHEADERS
PO BOX 1050
ABERDEEN WA 98520

DFA1702 567 17 WA 7 11 X NXXXXXX
CLIFF DURBIN
TROUT UNLIMITED
PO BOX 740
RENTON WA 98055

DFA1755
JO ROBERTS
THE MOUNTAINEERS
14632 NE 174TH
WOODINVILLE WA 98072

DFA1756
JOHN D KELLY
STEELHEAD/TROUT CLUB OF WASH
1612 SW 166TH ST
SEATTLE WA 98166

DFA6900 69 ID X NXXXXXX
ALLYN PHILLIPS
TROUT UNLIMITED
340 E 25TH ST
IDAHO FALLS ID 83401

DFA9500 95 MT X NXXXXXX
ROSS BRUNER
TROUT UNLIMITED
19 GARDNER PARK DR
BOZEMAN MT 59715

DGA0002
SMALL TRIBES OF WEST WASH
F DOUGLAS PENNOYER, EXEC DIR
P.O. BOX 578
SUMNER WA 98393

DGA0004 XX X
CHAIRMAN
QUINAULT TRIBAL OFFICE
PO BOX 1118
TAHOLAH WA 98587

DGA0510 237 05 WA
RICH MATTSON
FISHERY MANAGER
HOH INDIAN TRIBE FISH PROGRAM
STAR RT 1, BOX 917
FORKS WA 98331

DGA0513
MARY LIETKA, CHAIRMAN
HOH BUSINESS COMMITTEE
HOH INDIAN TRIBE
STAR ROUTE 1 BOX 917
FORKS WA 98331

DGA0514
MR JIM JORGENSON
HOH INDIAN TRIBE
STAR ROUTE 1, BOX 917
FORKS WA 98331

DGA1400
VIRGINIA CANALES, CHAIRPERSON
CHEHALIS TRIBAL COUNCIL
PO BOX 536
OAKVILLE WA 98568

DGA1401 483 14 WA 3 19
PERCY YOUCKTON
CHEHALIS TRIBE
PO BOX 536
OAKVILLE WA 98568

DGA1402 14 WA 3 19
GUY MCMINDS
QUINALT INDIAN NATION
QUINALT BUSINESS COMMITTEE
PO BOX 1118
TAHOLAH WA 98587

DGA1403 14 WA 3 19
JOSEPH DELACRUZ, PRES
QUINALT BUSINESS COMMITTEE
QUINAUT INDIAN NATION
PO BOX 1118
TAHOLAH WA 98587

DGA1405 14 WA
PAUL HUFFMAN, FISHERY MANAGER
QUINAULT INDIAN RES DEV PROGRAM
PO BOX 189
TAHOLAH WA 98587

DGA1406
MR OLIVER MASON
QUINAULT BUSINESS COMMITTEE
QUINAULT TRIBAL OFFICE
BOX 1118
TAHOLAH WA 98587

DHC0074 X
JERRY V JERMANN
PUBLIC ARCHAEOLOGIST
INST FOR ENVRL STUDIES FM-12
UNIV OF WASHINGTON
SEATTLE WA 98195

DHC0145 X

DR JOHN M SMITH
GRAYS HARBOR COLLEGE
ABERDEEN WA 98520

DHC1402
STEVE C HARBELL
WSU EXTENSION
COURTHOUSE, BOX 552
MONTESANO WA 98563

DHC1403
DONALD F SAMUELSON
GRAYS HARBOR COLLEGE
COLLEGE HTS
ABERDEEN WA 98520

DHC1721
POLLY DYER
INST FOR ENVIRONMENTAL STUDIES
UNIV OF WASHINGTON FM-12
SEATTLE WA 98195

DHC3813
DR DALE R CROES, DIR
WASH ARCHAEOLOGICAL RESEARCH CTR
COMMONS 326
WASH STATE UNIV
PULLMAN WA 99164

DHC3814 546 38 WA 5 09
RANDALL F SCHLAK
LABORATORY OF ANTHROPOLOGY
GLADISH SCHOOL
WASH STATE UNIV
PULLMAN WA 99163

DHD1733 609 17 WA
SALLY SCHAUMAN, CHAIR
DEPT OF LANDSCAPE ARCHITECTURE
COLLEGE OF ARCH & URBAN PLANNING
UNIV OF WASHINGTON JO-34
SEATTLE WA 98195

DHD1748 609 17 WA
DR STEPHEN MATHEWS
COLLEGE OF FISHERIES, WH-10
UNIVERSITY OF WASHINGTON
SEATTLE WA 98195

DHD1749 609 17 WA
DR EDWARD L BRANNON
COLLEGE OF FISHERIES
UNIVERSITY OF WASHINGTON
WH-10
SEATTLE WA 98195

1613175 609 17 WA

PAM CROCKER-DAVIS
17800 8TH AVE NE
SEATTLE WA 98155

2390355 681 27 WA XX X

HELEN ENGLE
4011 ALAMEDA AVE
TACOMA WA 98466

2475483

KARL ERICKSON
814 WEST THIRD
ABERDEEN WA 98520

2924304

GARY M FRAZIER
1123 W CUSHING
ABERDEEN WA 98520

3273528 NXXXXXX

LIZ GREENHAGEN
P.O. BOX 9578
SEATTLE WA 98109

3541735

RAYMOND HEGEL
528 BROADWAY
MONTESANO WA 98571

3693467

JOHN V HOLCOMBE
90 WHEELER RD
MONTESANO WA 98563

3705051

ARNE L HOLM
RT 4 BOX 643
HOQUIAM WA 98550

4676185

DON JOHNSON
2324 HIGHLAND DRIVE
HOQUIAM WA 98550

5114355

HELMER W LAAKSONEN
PO BOX 246
ABERDEEN WA 98520

5444666

OSCAR MAXI
706 TERRACE AVE
ABERDEEN WA 98520

5749464

JIM E MITBY
522 W KING
ABERDEEN WA 98520

6069041

ANDREW E NIEMI
1315 THOMAS
ABERDEEN WA 98520

6609459
JEFFREY D OPDYCKE
LINDA J OPDYCKE
7547 YOUNG RD NW
OLYMPIA WA 98502

6916457

JANET M PARKER
517 NOODING ST
ABERDEEN WA 98520

6986839

THOMAS H PENTT
1516 W MARKET
ABERDEEN WA 98520

7148787

SHIRLEY E POTTER
718 E 2ND
ABERDEEN WA 98520

7582521

LESLIE E ROSS
4201 CENTRAL PL DR
ABERDEEN WA 98520

7659201

E A RYDMAN, SR
216 "O" ST
HOQUIAM WA 98550

7659210

EDWARD A RYDMAN, JR
915 1ST
HOQUIAM WA 98550

7887088 609 17 WA

BEN SHUEY
4TH & PIKE BLDG
SEATTLE WA 98101

7914156
CORA J SIMON
EDWARD J SIMON
1305 GRISDALE
MONTESANO WA 98563

8390848

TOBY THALER
520 SMITH TOWER
SEATTLE WA 98104

9242532

LONNI C WATERBURG
422 GRISSLER RD
MONTESANO WA 98563

KEN SLATTERY
WASH DEPT OF ECOLOGY
PV-11
OLYMPIA, WA 98504

NEWS DIRECTOR
KDUX RADIO
PO BOX 1106
ABERDEEN, WA 98520

NEWS EDITOR
ELMA CHRONICLE
PO BOX 617
ELMA, WA 98541

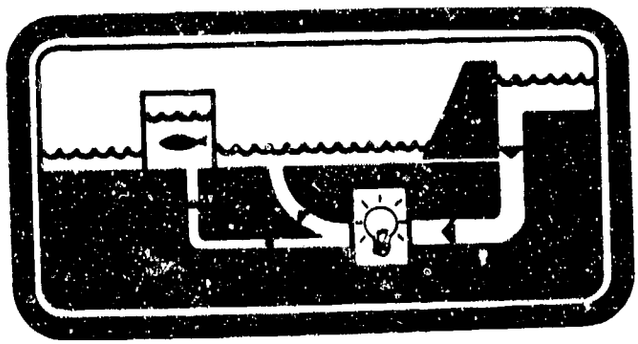
NEWS DIRECTOR
KPLU RADIO
PACIFIC LUTHERAN UNIVERSITY
TACOMA, WA 98447

NEWS EDITOR
OCEAN OBSERVER
OCEAN SHORES, WA 98569

NEWS DIRECTOR
KTOY RADIO
1101 S YAKIMA
TACOMA, WA 98405

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX C

APPENDIX C

BENEFITS, COST ALLOCATION, AND COST SHARING COORDINATION

TABLE OF CONTENTS

Paragraph		Page
	SECTION 1. HYDROPOWER BENEFITS	
1.01	Methodology to Determine Small Hydropower Dependable Capacity	C-1
1.05	Hydropower Benefits	C-2
	SECTION 2. FISH BENEFITS	
2.01	Fish Production	C-4
2.04	Fish Losses	C-5
2.05	Previous State of Washington's Mitigation Responsibility	C-5
2.06	Sport Fishery Benefits	C-5
	a. Methodology	C-5
	b. Without Project Condition	C-5
	c. With Project Condition	C-6
	d. Sport Fishery Benefits	C-6
2.07	Commercial/Indian Fishing Benefits	C-6
	a. Methodology	C-9
	b. Commercial/Indian Fishery Study Areas	C-9
	c. Without Project Condition	C-9
	d. With Project Condition	C-10
	e. Commercial/Indian Fishing Benefits	C-10
2.08	Total Fish Benefits	C-10
	SECTION 3. COST ALLOCATION	
3.01	Cost Allocation	C-12
	SECTION 4. COST SHARING COORINATION	
4.02	Cost Sharing Coordination	C-17
	TABLES	
C-1	Wynoochee Fish Hatchery Sport Fishing Recreation Use	C-7
C-2	Annual Sport Fishing Benefits	C-8
C-3	Annual Commercial/Indian Fishery Benefits	C-11
C-4	Summary of Construction Costs	C-13
C-5	Summary of Annual Operation, Maintenance, and Replacement Costs	C-14
C-6	Summary of Average Annual Costs and Benefits	C-15
C-7	Cost Allocation By Separable Cost-Remaining Benefits Method	C-16

TABLE OF CONTENTS (con.)

EXHIBITS

Number		Page
	Letter from Washington Department of Game, 3 July 1980	C-18
	Letter from Washington Department of Game, 24 July 1981	C-21
	Letter from Washington Department of Fisheries, 6 November 1980	C-23
	Letter from Governor Ray, State of Washington, 23 April 1980	C-24
	Letter to U.S. Fish and Wildlife Service, 20 March 1981	C-25
	Letter to National Marine Fisheries Service, 16 June 1981	C-28
	Letter from National Marine Fisheries Service, 18 June 1981	C-30
	Letter to Grays Harbor Public Utility District, 17 August 1981	C-31
	Letter from Grays Harbor Public Utility District, 5 October 1981	C-34
	Letter to Governor Spellman, State of Washington, 26 October 1981	C-35
	Letter from Governor Spellman, State of Washington, 20 November 1981	C-40

APPENDIX C

SECTION 1. HYDROPOWER BENEFITS

1.01 Methodology to Determine Small Hydropower Dependable Capacity. In the Pacific Northwest, the months of December and January are traditionally the most critical months. Load forecasts for the region indicate energy and capacity deficits through the year 2,000. For this study, an average monthly generation for the critical months of December-January was used to determine dependable capacity, most often defined as that generation capable of being produced under the most severe combination of streamflow and load conditions. Because this project is a relatively small project that would operate in the large Pacific Northwest generating system, the traditional method of computing a hydropower plant's dependable capacity based on its ability to carry peak loads under adverse water conditions was not used. For this project it was more appropriate to treat the availability of the plant's capacity in a manner similar to the availability of a thermal plant's capacity. The variability of a hydropower plant's capacity availability due to random streamflow patterns can be considered analogous to the variability of thermal plant availability due to the randomness of forced outages. Since the outflows of the project will not be regulated to meet power demand, the availability of the hydropower capacity is truly random in nature.

1.02 System reliability studies conducted by the Federal Energy Regulatory Commission (FERC) in Washington have confirmed that the hydrologic availability of hydropower capacity is equivalent to thermal plant electrical-mechanical availability in terms of peak load carrying ability in a large power system. Since the purpose of dependable capacity in computing hydropower benefits is to determine the amount of thermal capacity (and hence, cost) that would function the same as the proposed hydropower plant, it is appropriate to use the equivalent reliability approach to define a hydropower project's dependable capacity. Therefore, a hydropower project's dependable capacity can be defined as the amount of thermal generating capability that would carry the same amount of peak load as the proposed hydropower plant. Using this approach a hydropower plant's dependable capacity can be derived as follows: dependable capacity = average hydropower generation during peakload months x (hydropower plant mechanical availability/thermal plant mechanical availability).

1.03 For the Wynoochee hydropower project, the peakload months were considered December-January. The hydropower plant's mechanical availability was assumed to be 98 percent. The thermal plant's availability is based on 100 percent availability less the forced outage rate for the type and size of thermal plant considered to be the most likely alternative. For the Wynoochee hydropower study, a coal-fired generating plant

was considered the alternative and the availability assumed to be 83 percent. It should be noted that when this procedure is used to derive dependable capacity, the hydropower capacity credit included in the FERC power value to account for the greater mechanical availability of hydropower must be deleted from the computation of benefits.

1.04 Dependable capacity for the 10.2 megawatt (MW) nameplate capacity plant at Wynoochee was calculated as follows:

Installed Nameplate Capacity	10.2 MW
Average Annual Energy	37,400 MWh
Average Power Output in Dec-Jan	.072 x Avg Dec-Jan Flow x Avg Dec-Jan Head = .072 x 721 x 118 = 6.1 MW
Hydropower Mechanical Availability	98 percent
Thermal Mechanical Availability	83 percent
Hydropower Dependable Capacity	6.1 MW x (.98/.83) = 7.2 MW

1.05 Hydropower Benefits. Average annual benefits for the Wynoochee hydropower project were computed using the dependable capacity of 7.2 MW; the average annual project energy of 37,400 MW hours, and 1 October 1981 power values prepared by the San Francisco Regional Office of the FERC. FERC capacity values for the coal-fired plant, the most likely thermal alternative, included a 10 percent capacity value adjustment reflecting hydropower's reliability and flexibility when comparing a hydropower plant to a coal-fired plant. For this study, the reliability and flexibility adjustment was treated explicitly in the derivation of the dependable capacity, as discussed in the preceeding paragraphs, and should not be included in the capacity value. To avoid double counting, the 10 percent adjustment was removed from the FERC capacity value, leaving an unadjusted value. The values used are as follows: capacity at 1 October 1981 price level, $127.66 (140.43/1.1) per kilowatt year; energy value at 1 October 1981 price level, 20.8 mills per kilowatt hour (kWh).

1.06 Energy values for periods during the life of the project were increased by applying a real fuel cost escalation. Real fuel cost escalation occurs when the fuel prices rise faster than the general rate of inflation and must be evaluated when the most likely alternative to a hydropower plant is a thermal powerplant. The real fuel cost escalation was limited to a 29-year period beginning in 1981 and ending in 2010 and was based on the U.S. Department of Energy fuel price forecast. The 29-year cutoff is based on the expectation that the supply of petroleum products and natural gas will be heavily depleted by the end of that period, and that a transition to alternative energy sources and

technologies will be well underway. Given the high degree of uncertainty about the nature and costs of replacement energy sources, and the diminished (through discounting) impact of further increases in prices, no escalation beyond 29 years was considered. The annual rates of a real fuel cost escalation used to escalate the energy values were 5.7 percent for the period 1981-1985, 10.4 percent for the period 1985 to 1990, -0.5 percent for the period 1990 to 2010, and zero percent for the period beyond 2010. The 20.8 mills per kWh energy value for 1 October 1981 would increase to 31.6 mills per kWh in the year 1987 and 42 mills per kWh in the year 1990, would decrease to 38.5 mills per kWh in the year 2010 and would be 38.5 mills kWh for the years 2010 to 2087. The average annual equivalent energy value for the years 1987, the year the power project would be on-line, to 2087 (100-year economic life) is 40.1 mills per kWh. The average annual power benefits for the Wynoochee hydropower project are as follows:

Capacity:

7.2 MW dependable capacity x $127.66/kW year = $919,000.

Energy:

37,400 MWh average annual energy x 40.1 mills kWh = 1,500,000.

Total: $2,419,000

SECTION 2. FISH BENEFITS

2.01 Fish Production. The fish hatchery water supply would be divided equally between the salmon and steelhead production, each receiving up to 95 cubic feet per second (c.f.s.). The water would be distributed to the respective holding ponds, incubation facilities, rearing ponds, and raceways in accordance with the production needs of each species as determined by the Washington Departments of Game (WDG) and Fisheries (WDF). The production capability of the fish hatchery for salmon and steelhead is based on the flow available to the salmon and steelhead rearing ponds.

2.02 According to WDF figures (see 6 Novembere 1980 letter), 50 c.f.s. (22,500 gallons per minute (g.p.m.)) in the salmon rearing ponds would produce 180,000 pounds of smolts based on 8 pounds of smolts per g.p.m. Since there are 10 salmon smolts per pound, the hatchery would produce 1,800,000 salmon smolts. Based on a 5 percent survival rate from smolt stage to adult stage, 90,000 salmon would survive to adult stage. Allowing 11,000 adults to escape back to the spawning areas would result in 79,000 adult salmon available for harvest under the with-project condition. According to the WDG's actual fisheries data, the distribution of salmon harvest would be as follows:

SALMON HARVEST DISTRIBUTION

	Ocean	Terminal (River and Bay)	Total
Commercial/Indian	47,000	19,000	66,000 (83%)
Sport	6,000	7,000	13,000 (17%)
Total Production	53,000 (67%)	26,000 (33%)	79,000

2.03 According to WDG figures (see 3 July 1980 letter), 60 c.f.s. (27,000 g.p.m.) in the steelhead rearing ponds would produce 216,000 pounds of smolts based on 8 pounds of smolts per g.p.m. Since there are seven steelhead smolts per pound, the hatchery would produce 1,512,000 steelhead smolts. Based on a 3.5 percent survival rate from smolt stage to adult stage, 52,900 steelhead would survive to adult stage. Allowing 2,900 adults to escape back to the spawning areas would result in 50,000 adult steelhead available for harvest under the with-project condition. According to the WDG's actual fisheries data, the distribution of steelhead would be as follows:

STEELHEAD MARKET DISTRIBUTION

Commercial/Indian Fishery	25,000 (50%)
Sport Fishery	25,000 (50%)
Total	50,000

2.04 Fish Losses. The fish run present prior to construction of Wynoochee Dam was 1,500 adult coho salmon and 570 adult steelhead. These fish are using the fish collection, hauling, and passage mitigation facilities associated with the existing project for transport, with a decreasing level of success. Under the proposed hydropower/fish hatchery project, these upstream runs would be terminated at the existing fish collection facility and replaced by hatchery raised fish. Based on a 4:1 catch to escapement ratio for coho salmon, 6,000 coho salmon would be caught with 5,000 (83 percent) in the commercial/Indian fishery and 1,000 (17 percent) in the sport fishery (462 ocean and 538 terminal (river and bay)), and 1,500 would escape back into the Wynoochee River. Based on a 2:1 catch to escapement ratio for steelhead, 1,140 steelhead would be caught, with 570 (50 percent) in the commercial/Indian fishery, and 570 (50 percent) in the sport fishery, and 570 would escape back into the Wynoochee River. The 6,000 coho salmon and 1,140 steelhead production would be part of the without-project condition and would be subtracted from the total fish hatchery production in determining the with project enhancement production.

2.05 Previous State of Washington's Mitigation Responsibility. In addition, the State of Washington would fulfill its previous mitigation responsibility for steelhead spawning habitat losses associated with Wynoochee Dam under the memorandum of agreement, dated 28 July 1977, between the Corps of Engineers and the WDG. The agreement called for the return of 1,700 adult steelhead to Wynoochee Dam. Based on 2:1 catch to escapement ratio for steelhead, 3,400 steelhead would be caught, with 1,700 (50 percent) in the commercial/Indian fishery and 1,700 (50 percent) in the sport fishery, and 1,700 would escape back to Wynoochee River. The 3,400 steelhead production would also be part of the without-project condition and be subtracted from the total fish hatchery production in determining the with-project enhancement production.

2.06 Sport Fishery Benefits.

a. Methodology. Sport fishery benefits are evaluated in accordance with the Corps of Engineers' regulation on NED Benefit Evaluation Procedures: Recreation (ER 1105-2-300, subpart K). Because both salmon and steelhead represent specialized recreation activities, care was taken in identifying values for use in computing sport fishery benefits. All values used in this evaluation were provided to the Corps by WDF and WDG for salmon and steelhead, respectively. These current values are based on Washington coastal catches and are more appropriate to use than regional Natural Marine Fishery Service (NMPS) values prepared several years ago. The sport fishery benefit analysis has three component parts: (1) without-project condition, (2) with-project condition, and (3) sport fishery benefits.

b. Without Project Condition. The sport fishery harvest under the without project condition totals 1,000 coho salmon and 2,270 steelhead, as described above. Sport fishing is estimated to be 462 recreation

days[1/] for ocean-caught coho salmon, 3,013 recreation days for river- and bay-caught coho salmon, and 16,798 recreation days for steelhead (see table C-1). Westport, Washington, area ocean salmon fishing requires 1.0 recreation days per fish caught, while river and bay salmon fishing requires approximately 5.6 recreation days per fish (telephone interview with Dale Ward, WDF, on 16 July 1981). Steelhead caught in the Wynoochee River require an average of 7.4 recreation days per fish (see 24 July 1981 WDG letter).

c. With Project Condition. Sport fishing under the with-project condition will increase substantially due to improved fishing conditions. The Wynoochee fish hatchery production would make available 13,000 spring chinook salmon annually for sport fishery harvest (6,000 ocean catches and 7,000 terminal (river and bay) catches), plus 25,000 steelhead for sport fishery harvest. Sport fishing is expected to increase to 6,000 recreation days for ocean-caught spring chinook salmon, to 32,200 recreation days for river- and bay-caught spring chinook salmon, and to 100,000 recreation days for steelhead (see table C-1). This increase would occur with some access and overcrowding problems. Greater availability of fish in the Wynoochee River is expected to reduce to an estimated 4.6 recreation days required to catch a salmon in freshwater. For ocean-caught salmon, however, hatchery production is not expected to have a measurable effect. Only 4.0 recreation days will be required to catch a steelhead under the with-project condition. This estimate is based on an extensive creel census conducted on the Cowlitz River, Washington, by WDG and assumes that fishing conditions on the Wynoochee River will be quite similar (see 24 July 1981 WDG letter).

d. Sport Fishing Benefits. Benefits for sport fishing associated with the Wynoochee fish hatchery are based on the value of recreation use of the resource for the with-project condition less the value under without-project conditions. Economic values per recreation day of sport fishing were derived through discussion with WDF and WDG personnel (telephone interviews with Dale Ward, WDF, on 16 July 1981 and Gary Fenton, WDG, on 17 July 1981) and are based on extensive surveys and market studies by those two agencies.

Salmon sport fishing is valued at $56 per recreation day for ocean fishing and $47.60 for freshwater fishing, based on values provided by the WDF (telephone interview with Dale Ward, WDF, on 16 July 1981). Steelhead sport fishing is valued at $35.51 per recreation day, based on values provided by the WDG (see 24 July 1981 WDG letter). The value of sport fishing without the project is estimated at $766,000 (see table C-2). The value of the sport fishery with the project is estimated at $5,420,000. The sport fishery benefit attributable to the project, the difference between the without- and with-project conditions, is $4,654,000, $1,699,000 for salmon and $2,955,000 for steelhead.

1/A standard unit of use consisting of a visit by one individual to a recreation development or area for recreation purposes during any reasonable portion or all of a 24-hour period.

TABLE C-1

WYNOOCHEE FISH HATCHERY
SPORT FISHING RECREATION USE
(in Recreation Days)

	Days/Fish	Annual Recreation Days
I. Without Project Condition.		
A. Coho Salmon		
o 462 ocean-caught	1.0	462
o 538 river- and bay-caught	5.6	3,013
B. Steelhead (570 + 1,700 = 2,270)	7.4	16,798
TOTAL RECREATION DAYS WITHOUT PROJECT		20,273
II. With Project Condition.		
A. Spring Chinook Salmon		
o 6,000 ocean-caught	1.0	6,000
o 7,000 river- and bay-caught	4.6	32,200
B. Steelhead (25,000)	4.0	100,000
TOTAL RECREATION DAYS WITH PROJECT		138,200
III. Attributable to Project.		
A. Salmon		
o 5,538 ocean-caught		5,538
o 6,462 river- and bay-caught		29,187
B. Steelhead (22,730)		83,202
TOTAL RECREATION DAYS ATTRIBUTABLE TO PROJECT		117,927

TABLE C-2

ANNUAL SPORT FISHING BENEFITS

	Annual Recreation Days	Value Per Recreation Day	Economic Value
I. Sport Fishing Without Project.			
A. Salmon			
o Ocean-caught	462	$56.00	$ 26,000
o River- and bay-caught	3,013	47.60	144,000
B. Steelhead	16,798	35.51	596,000
TOTAL VALUE WITHOUT-PROJECT			$766,000
II. Sport Fishing With Project.			
A. Salmon			
o Ocean-caught	6,000	$56.00	$336,000
o River- and bay-caught	32,200	47.60	1,533,000
B. Steelhead	100,000	35.51	3,551,000
TOTAL WITH-PROJECT VALUE			$5,420,000
III. Benefit Attributable to Project.			
A. Salmon			
o Ocean-caught	5,538	$56.00	$310,000
o River- and bay-caught	29,187	$47.60	1,389,000
B. Steelhead	83,202	35.51	2,955,000
TOTAL SPORT BENEFIT			$4,654,000

2.07 Commercial/Indian Fishing Benefits.

a. Methodology. Commercial/Indian fishing benefits were evaluated in accordance with the Water Resource Council's NED Benefit Evaluation Procedures: Commercial Fishing (Federal Register 29 September 1980, Subpart L, pages 64461-64464). All values used in this evaluation were provided to the Corps by WDF and WDG for salmon and steelhead, respectively. Indian fishery benefits are treated the same as commercial fishing benefits in this evaluation.

b. Commercial/Indian Fishery Study Areas. The biological study area is the ecosystem within which the proposed hatchery will have impacts on fishery conditions. Stocks from hatchery production will intermix with most other anadromous fish stocks and migrate throughout various areas of the North Pacific Ocean. The economic study area, or that area in which the proposed hatchery will have impacts on the outputs of harvesters, would include portions of the states of California, Oregon, Washington, and Alaska, and the Province of British Columbia, Canada. The majority of hatchery output, however, will be caught in Washington State waters.

c. Without Project Condition. The without-plan condition is the most likely condition expected to exist in the future in the absence of any alternative plan being considered. Currently there is excess capacity among salmon harvesters in the study area due to declines in natural anadromous fish runs and Federal court decisions dividing the harvest among Indian and non-Indian commercial fishermen in Washington State. Due to this excess capacity, there is currently a state imposed policy of restricted entry to the non-Indian commercial gillnet and troll salmon fishery. In spite of state efforts to reduce the size of the salmon fishing fleet, excess capacity is expected to continue into the foreseeable future. The commercial/Indian harvest under the without-project condition totals 5,000 coho salmon and 2,270 steelhead, as described above. Ex-vessel prices are based on the expected total harvest of each species in the biological study area and are determined by international market conditions. Current ex-vessel prices provided by the WDF (telephone interview with Dale Ward, WDF, on 15 July 1981) and WDG (see 3 July 1980 letter) for spring chinook and coho salmon and steelhead, are as follows:

Spring Chinook Salmon (Ocean Harvest)	$2.50 per pound
Spring Chinook Salmon (Terminal (River and Bay) Harvest)	$1.90 per pound
Coho Salmon (Weighted Ocean and Terminal Harvest)	$2.15 per pound
Steelhead	$2.75 per pound

The average weight of harvested fish provided by WDF and WDG are: Spring chinook salmon (ocean), 12 lbs./fish; spring chinook salmon (freshwater), 19 lbs./fish; coho salmon, 6 lbs./fish; and steelhead, 9.5 lbs./fish.

d. With Project Conditions. The Wynoochee fish hatchery production would make available 66,000 spring chinook salmon annually for commercial/Indian harvest (47,000 ocean catches and 19,000 river and bay catches), plus 25,000 steelhead for commercial/Indian fishery harvest. Coho salmon would be replaced with spring chinook salmon under with-project conditions. Subtracting the portion of hatchery steelhead production which offsets without project mitigation measures associated with the original project (570 Corps steelhead plus 1,700 state steelhead), results in an annual enhancement of 22,730 adult steelhead available for commercial/ Indian harvest.

e. Commercial/Indian Fishing Benefits. NED benefits resulting from the increase in supply of commercial/Indian fish are measured as the increase in net income to harvesters. The projected increase in the harvest of spring chinook salmon and steelhead is so small in relation to total harvest in the study area that market prices will not be affected. The current without-project ex-vessel prices were, therefore, used in the with-project economic analysis. Due to the projected continuance of excess capacity among harvesters over project life, the vessels that are already operating will be able to harvest the extra catch without any change in variable costs. NED benefits are, therefore, the existing market price multiplied by the increase in catch, as displayed in table C-3. The total commercial/Indian fishing benefits are $2,626,000, $2,032,000 for salmon and $594,000 for steelhead.

2.08 Total Fish Benefits. Benefits for fish enhancement are as follows:

	Commercial/ Indian	Sport	Total
Salmon	$2,032,000	$1,699,000	$3,731,000
Steelhead	594,000	2,955,000	3,549,000
Total	$2,626,000	$4,654,000	$7,280,000

TABLE C-3

ANNUAL COMMERCIAL/INDIAN FISHERY BENEFITS

	Spring Chinook Salmon (Ocean)	Spring Chinook Salmon (Terminal)	Steelhead	Coho Salmon	Total Comm/Ind Benefit
Change in Output (fish)	47,000	19,000	22,730	(5,000)	
Ex-vessel Price	$30.00[1]/	$36.10[2]/	$26.12[3]/	($12.90)[4]/	
Total Value of Change in Output	$1,410,000	$686,000	$594,000	($64,000)	
Change in Harvesting Costs	Ø	Ø	Ø	Ø	
Annual NED Benefits	$1,410,000	$686,000	$594,000	($64,000)	$2,626,000

1/ 12 lbs/fish x $2.50/lb = $30.00/fish
2/ 19 lbs/fish x $1.90/lb = $36.10/fish
3/ 9.5 lbs/fish x $2.75/lb = $26.12/fish
4/ 6 lbs/fish x $2.15/lb = $12.90/fish

Sources: WDF supplied data on fish weight and ex-vessel prices for spring chinook and coho salmon. WDG provided similar data for steelhead.

SECTION 3. COST ALLOCATION

3.01 Cost Allocation. Project costs were allocated between the two project purposes, power and fish, using the separable costs-remaining benefits cost allocation procedure. Costs associated with the previous State of Washington mitigation responsibility were excluded from the cost allocation. Table C-4 summarizes the total construction costs. Table C-5 summarizes the annual operation and maintenance and replacement costs. Table C-6 summarizes the average costs and benefits. Table C-7 presents the cost allocation.

3.02 The allocated power and fish costs (in $1,000) are as follows:

	Power	Fish	Previous Washington Mitigation Responsibility
Construction Investment	$21,580	$20,250	$570
Annual Investment Costs	1,646	1,545	43
Annual OM&R Costs	341	957	27
Total Annual Costs	$1,987	$2,502	

TABLE C-4
SUMMARY OF TOTAL CONSTRUCTION COSTS
(October 1981 Prices in $1,000)

	Total Hydropower and Fish Hatchery Project	Previous State of Washington Mitigation Responsibility	Multiple-Purpose Project				Alternative Single-Purpose Projects		Alternative Multiple-Purpose Project With Purpose Omitted		Residual Joint Costs
			Specific Power	Specific Fish	Joint Use	Total	Power	Fish	Without Fish	Without Power	
		1/			2/	3/			3/	4/	
LANDS & DAMAGES	210	5			205	205	10	195	10	184	11
(Power)	(10)					(10)					
(Fish)	(200)					(195)					
DAM-INTAKE WORKS	5,270	2			5,268	5,268	5,180		5,180	83	5
(Power)	(5,180)					(5,180)					
(Fish)	(90)					(88)					
FISH & WILDLIFE	16,960	443			16,517	16,517	4,350	16,985		15,579	938
POWERPLANT											
Powerplant	5,320		5,320			5,320	5,320		5,320		
Turbines & Generators	4,350		4,350			4,350	4,350		4,350		
Accessory Electrical Equipment	960		960			960	960		960		
Misc. Powerplant Equipment	220		220			220	220		220		
Tailrace	2,340	30			2,310	2,310	1,200		1,190	1,056	64
(Power)	(1,200)					(1,200)					
(Fish)	(1,140)					(1,110)					
Switchyard	240		240			240	240		240		
Subtotal	13,430	30	11,090		2,310	13,400	12,290		12,280	1,056	64
BUILDINGS, GROUNDS, & UTILITIES	280				280	280	280		280		
(Power)						(280)					
(Fish)						(in F&W)					
PERMANENT OPERATING EQUIPMENT	950	20			930	930	190	740	190	698	42
(Power)	(190)					(190)					
(Fish)	(760)					(740)					
SUBTOTAL	37,100	500	11,090	0	25,510	36,600	22,300	17,920	17,940	17,600	1,060
ENGINEERING & DESIGN	2,7[illegible]	40	830		1,910	2,740	1,680	1,330	1,340	1,320	80
MODEL STUDIES	120		120			120	120	50	120		
SUPERVISION & ADMINISTRATION	2,400	30	720		1,650	2,370	1,400	1,150	1,160	1,140	70
TOTAL	42,400	570	12,760	0	29,070	41,830	25,500	20,450	20,560	20,060	1,210

1/2.6 percent of total fish hatchery cost.
2/Includes 5.7 percent of fish cost for multiple-purpose project mitigation - see note 4.
3/Excludes 2.6 percent of fish hatchery costs to fulfill previous State of Washington mitigation responsibility.
4/Mitigation cost for multiple-purpose project - 5.7 percent of fish cost.

TABLE C-5
SUMMARY OF ANNUAL OPERATION,
MAINTENANCE, AND REPLACEMENT COSTS
(October 1981 Prices in $1,000)

	Total Hydropower and Fish Hatchery Project	Previous State of Washington Mitigation Responsibility 1/	Multiple-Purpose Project: Specific Power	Specific Fish	Joint Use 2/	Total 3/	Alternative Single-Purpose Projects: Power	Fish 3/	Alternative Multiple-Purpose Project With Purpose Omitted: Without Fish	Without Power 3/	Residual Joint Costs 4/
OPERATION & MAINTENANCE (O&M)											
AVERAGE ANNUAL O&M COSTS	1,088	23	131	0	934	1,065	261	853	212	804	49
REPLACEMENTS											
LANDS & DAMAGES											
(Power)											
(Fish)											
DAM-INTAKE WORKS	1,550	1			1,549	1,549	1,530		1,520	27	2
(Power)						(1,520)					
(Fish)						(29)					
FISH & WILDLIFE	7,970	207			7,763	7,763	870	7,002		7,321	442
POWERPLANT											
Powerplant	350		350			350	350		350		
Turbines & Generators	4,350		4,350			4,350	4,350		4,350		
Accessory Electrical Equipment	960		960			960	960		960		
Misc. Powerplant Equipment	220		220			220	220		220		
Tailrace	320	4			316	316	160		155	152	9
(Power)						(160)					
(Fish)						(156)					
Switchyard	240		240			240	240		240		
SUBTOTAL	6,440	4	6,120		316	6,436	6,280		6,275	152	9
BUILDINGS, GROUNDS, & UTILITIES	280				280	280	280		280		
(Power)						(250)					
(Fish)						(in 7&U)					
PERMANENT OPERATING EQUIPMENT	950	20			930	930	190	740	190	698	42
(Power)						(190)					
(Fish)						(740)					
SUBTOTAL	17,190	232	6,120	0	10,838	16,958	9,150	8,542	8,265	8,198	495
SUPERVISION & ADMINISTRATION	1,117	15	398		704	1,102	595	555	537	533	32
TOTAL REPLACEMENTS	18,307 5/ 6/	247 6/	6,518 5/	0	11,542 5/ 6/	18,060 5/ 6/	9,765 5/	9,097 6/	8,802 5/	8,731 6/	527 5/ 6/
AVERAGE ANNUAL COSTS	237	4	61	0	172	233	91	148	82	144	7

1/2.6 percent of total fish hatchery cost.
2/Includes 5.7 percent of fish cost for multiple-purpose project mitigation - see note 4.
3/Excludes 2.6 percent of fish hatchery costs to fulfill previous State of Washington mitigation responsibility.
4/Mitigation cost for multiple-purpose project - 5.7 percent of fish cost.
5/Power replacements at 30 and 60 years.
6/Fish replacements at 25 and 75 years; complete rebuild at 50 years.

TABLE C-6
SUMMARY OF AVERAGE ANNUAL
COSTS AND BENEFITS
(October 1981 Prices in $1,000)

	Total Hydropower and Fish Hatchery Project	Previous State of Washington Mitigation Responsibility	Multiple-Purpose Project				Alternative Single-Purpose Projects		Alternative Multiple-Purpose Project With Purpose Omitted		Residual Joint Costs
			Specific Power	Specific Fish	Joint Use	Total	Power	Fish	Without Fish	Without Power	
		1/			2/	3/		3/		3/	4/
PROJECT COST	42,400	570	12,760	0	29,070	41,830	25,500	20,450	20,560	20,060	1,210
Interest During Construction	0	0	0	0	0	0	0	0	0	0	0
PROJECT INVESTMENT	42,400	570	12,760	0	29,070	41,830	25,500	20,450	20,560	20,060	1,210
AVERAGE ANNUAL COSTS											
Interest & Amortization	3,234	43	973		2,218	3,191	1,946	1,560	1,569	1,530	92
Operation & Maintenance	1,088	23	131		934	1,065	261	853	212	804	49
Replacements	237	4	61		172	233	91	148	82	144	7
TOTAL	4,559	70	1,165	0	3,324	4,489	2,298	2,561	1,863	2,478	148
AVERAGE ANNUAL BENEFITS											
(Power)						2,419	2,419		2,419		
(Fish)						7,280		7,280		7,280	
TOTAL						9,699	2,419	7,280	2,419	7,280	
NET BENEFITS						5,210	121	4,719	556	4,802	
BENEFIT-TO-COST RATIO						2.2	1.1	2.8	1.3	2.9	

1/2.6 percent of total fish hatchery cost.
2/Includes 5.7 percent of fish cost for multiple-purpose project mitigation - see note 4.
3/Excludes 2.6 percent of fish hatchery costs to fulfill previous State of Washington mitigation responsibility.
4/Mitigation cost for multiple-purpose project - 5.7 percent of fish cost.

TABLE C-7
COST ALLOCATION BY SEPARABLE
COST-REMAINING BENEFITS METHOD
(October 1981 Prices in $1,000)

	Power	Fish	Total	Previous State of Washington Mitigation Responsibility
1. ALLOCATION OF ANNUAL COSTS			1/	2/
a. Benefits	2,419	7,280	9,699	
b. Alternative Costs	2,298	2,561	4,859	
c. Limited Benefits	2,298	2,561	4,859	
d. Separable Costs	1,863	2,478	4,341	
e. Remaining Benefits	435	83	518	
f. Percent Remaining Benefits	84.0	16.0	100.0	
g. Allocated Residual Costs	124	24	148	
h. Total Allocation	1,987	2,502	4,489	70
i. Benefit-to-Cost Ratio	1.2	2.9	2.2	
j. Net Benefits	432	4,778	5,210	
2. ALLOCATION OF ANNUAL O&M COSTS				
a. Separable Costs	212	804	1,016	
b. Allocated Residual Costs	41	8	49	
c. Total O&M Allocation	253	812	1,065	23
d. Specific Costs	131	0	131	
e. Allocated Joint-Use Costs	122	812	934	
f. Percent Joint-Use Costs	13.1	86.9	100.0	
3. ALLOCATION OF ANNUAL MAJOR REPLACEMENT COSTS				
a. Separable Costs	82	144	226	
b. Allocated Residual Costs	6	1	7	
c. Total Replacement Allocation	88	145	233	4
4. ALLOCATION OF CAPITAL INVESTMENT				
a. Annual Investment Costs	1,646	1,545	3,191	43
b. Percent Annual Investment	51.6	48.4	100.0	
c. Allocated Investment	21,580	20,250	41,830	570
5. ALLOCATION OF PROJECT COSTS				
a. Specific Investment	12,760	0	12,760	
b. Investment - Joint-Use	8,820	20,250	29,070	
c. Interest During Construction	0	0	0	
d. Project Costs - Joint Use	8,820	20,250	29,070	
e. Percent Project Cost - Joint-Use	30.3	69.7	100.0	
f. Project Cost - Specific Facilities	12,760	0	12,760	
g. Total Project Cost	21,580	20,250	41,830	

1/Excludes 2.6 percent of total fish hatchery cost to fufill previous State of Washington mitigation responsibility.
2/2.6 percent of total fish hatchery cost.

SECTION 4. COST SHARING COORDINATION

4.01 Cost Sharing Coordination. Extensive coordination with the State of Washington, Grays Harbor Public Utility District No. 1, National Marine Fisheries Service, and U.S. Fish and Wildlife Service was required. Copies of pertinent correspondence follow.

STATE OF
WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF GAME
600 North Capitol Way GJ 11 Olympia, WA 98501 206 753 5700

July 3, 1980

Mr. Jack Thompson
Corps of Engineers
Post Office Box C-3755
Seattle, WA 98124

Dear Jack:

This letter is a compilation of Roger Bogden's and my data on the proposed Wynoochee Hatchery. The proposed hatchery would rear summer and winter steelhead. Listed below are various hatchery features and estimates of value of fish produced.

I. Production capacity would be 216,000 pounds.

II. Construction cost would be 5.6 to 6.3 million dollars at 1980 costs.

III. Hatchery would include:

A. Trough Room - 42' wide x 136' long, 128 troughs required, total flow 1.5 c.f.s.

B. Raceways - total of 20 required 10' wide x 100' long (overall) each - total of 30 c.f.s. maximum, 20 c.f.s. minimum.

C. Rearing Ponds (earth) - Four (4) required at 2 acres each - water surface - 80' wide x 1,089' long, 15 c.f.s. to each pond.

D. Holding Ponds (adults) - Two (2) required 10' wide x 100' long x 6' deep, total of 14.5 c.f.s. for both ponds.

IV. Steelhead would be planted at seven fish to the pound.

A. 216,000 pounds times seven to a pound is 1,512,000 smolts produced for release.

V. Annual operation and maintenance cost was estimated by our Hatchery Division to be 250,000 to 275,000 at 1980 costs. This would include four man-years.

VI. Department of Game uses 50 years as life of a hatchery. Replacement costs would be two percent a year.

VII. Value of steelhead to sport and commercial fisheries.

A. This hatchery is designed to produce best quality smolt possible, using an excellent quality and volume of water. A four percent return of smolts t adults is possible. Today a pollution problem exists in Grays Harbor and a three percent return of smolts to adults is possible. During project life a return of 3.5 percent of smolts planted is possible. Plant would be 1,512,000 smolts,at a 3.5 percent return 52,900 adults would return. About 50,000 of these could be harvested.

1. Indian harvest would be 25,000 adults.

a. Average weight of fish caught by Indians in Chehalis River from 1976 to 1980 was 9.5 pounds.

b. Indians were paid an average of $2.75 a pound for fish caught in Chehalis River in 1980.

c. Value is:

1) 25,000 fish at 9.5 pounds = 237,500 pounds of fish
2) 237,500 pounds times $2.75/lb. - $653,000

2. Twenty-five thousand (25,000) to sport harvest.

a. Steelhead fishery value for a day of fishing is 32.61 (Oliver et. al., 1975).

b. Takes 4.54 days to catch a steelhead (Oliver).

c. Value for sport caught steelhead is:

1) 4.54 x 25,000 equals 113,500 man-days
2) 113,500 x $32.61 equals $ 3,701,235

B. Total annual value is:

1. Indian Harvest	-	653,000
2. Sport Harvest	-	3,701,000
		4,354,000

C. The $32.61 figure for a day of steelhead fishing is not accepted by the Federal Government, they use $10.00 a day. The ten dollar figure is very unrealistic. If we used $10.00 a day for steelhead spent fishing, the run value would be:

1. 25,000 fish x 4.54 man-days equals 113,500 man-days

2. 113,500 x $10.00 a day equals $1,135,000

3. Total value is:

a) Indian Harvest	-	$ 653,000
b) Sport Harvest	-	$ 1,135,000
		$ 1,788,000

Very truly yours,

THE DEPARTMENT OF GAME

James G. Fenton, Wildlife Biologist
Habitat Maagement Division

JGF:fmb

JOHN SPELLMAN
Governor

STATE OF WASHINGTON
DEPARTMENT OF GAME
600 North Capitol Way, GJ-11 • Olympia, Washington 98504 • (206) 753-5700

July 24, 1981

Steve Babcock
Seattle District Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Mr. Babcock:

This letter will provide you with the information you requested on value of steelhead fisherman-day and length of time to catch a steelhead.

The department uses the report by Oliver et. al, August 1975, "A Short Form For Bioeconomic Evaluations of Wildlife in Washington State", to determine value of each fishing or hunting man-day. Appendix C gives the value per man-day for steelhead fishing as $32.61 in 1980. The value expanded 8.9 percent for inflation (as it was during other years) means each steelhead fisherman-day is worth $35.51 in 1981.

Game Department creel census work during the 1979-80 and 1980-81 winter steelhead season in Boldt case area streams (Puget Sound, Pacific coast through Grays Harbor) determined it took 6.18 fisherman-days to catch a steelhead (25.6 hours a fish, and 4.14 hours a man). This would make each sport harvested steelhead worth $219.45 (6.18 x $35.51) in 1981.

However, the Wynoochee fishery is not considered as good as Boldt case area streams. The Game Department conducted a creel census of winter steelhead fishermen on the Wynoochee River during winter season in 1974-75, 1975-76, and 1976-77. During this period, 2,864 fisherman-days were counted with a harvest of 387 fish (7.40 days to catch a steelhead). This makes each Wynoochee sport caught steelhead worth $262.77 (7.40 x $35.51).

When fish start returning from Wynoochee Hatchery, we think it will take less fisherman-days to catch each fish. The Cowlitz River, which receives a large fish plant, is probably about what the Wynoochee would be like after the hatchery is operating. An intensive creel census was conducted on the

Cowlitz River during winter steelhead season for four years (1976-77 through 1979-80). Using creel census information, an estimated harvest of 46,479 fish during 187,735 man-days was made. If took 4.04 man-days to catch each fish. This would make each Wynoochee fish worth $143.46 (4.04 x $35.51).

If you need any other information, please advise me.

Sincerely,

THE DEPARTMENT OF GAME

James G. Fenton, Wildlife Biologist
Applied Wildlife Ecology

JGF:mjf

STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF FISHERIES
115 General Administration Building, Olympia, Washington 98504 206 753 6600

November 6, 1980

Mr. Jack Thompson
Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Jack:

Following is the information you requested at our last meeting concerning the proposed Wynoochee Hatchery. This information, particularly the harvest data, is a preliminary analysis and is subject to change.

The production capacity of the Wynoochee Hatchery will be 180,000-225,000 lbs. of spring chinook (based on 8-10 lbs/gpm). This represents 1.8 million smolts (range: 1.5-2.25 millions; based on 8-10 fish/lb.)

Measurements have not been made of spring chinook survival rates for the Grays Harbor watershed; however, survival rates can be expected to fall in a 3.5-7% range (fall chinook-Grays Harbor, 3.6%; spring chinook-state-wide, 4-7%). A reasonable point estimate of survival is 5%, which gives an estimate of 90,000 adults (catch + escapement) from the hatchery production.

The estimated distribution between harvest and escapement of the hatchery production is as follows (Note: Tag data is only available for the ocean harvest):

Ocean Fisheries			53,000
Commercial	(90%)	47,000	
Sport	(10%)	6,000	
Terminal Fisheries			26,000
Commercial	(72%)	19,000	
Sport	(28%)	7,000	
Escapment			11,000
	Total Production		90,000

Attached is a copy of the Higgs Report, which documents the methods used to compute benefit/cost ratios for the 1977 enhancement package. Page 5 describes his method for determining the value of sport caught fish (3.35 times the commercial value).

Sincerely,

Brian Edie

Brian Edie
Biologist 4

BE:bk

WASHINGTON

Dixy Lee Ray
Governor

RECEIVED

April 23, 1980 APR 29 1980

APR 2 8 1980

Colonel Leon K. Moraski
Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Colonel Moraski:

The purpose of this letter is to request the Corps of Engineers to initiate studies of a fish hatchery below Wynoochee Dam with the ultimate objective of enhancing anadromous fish runs in the Chehalis River Basin and Grays Harbor area. We understand that adequate authority exists for such a study in the Chehalis River Basin.

The salmon and steelhead fisheries have been declining for several years in some areas of the state of Washington. Opportunities to reverse this trend and enhance the development of the fisheries should be fully considered at all levels of government with full involvement by the public. One of the favorable fish enhancement options in the Chehalis River Basin and Grays Harbor area is a combined salmon and steelhead hatchery just downstream from Wynoochee Dam. Because we believe that substantial benefits will accrue to fishery interests, a hatchery has been under consideration by the Washington Department of Fisheries for several years and is currently being discussed by the Grays Harbor Fishery Enhancement Task Force. A preliminary design for a hatchery has been prepared by the state and provided to your staff for planning purposes.

Recognizing that a Wynoochee hydropower study is already underway, development of both hydropower and a fish hatchery could yield benefits to both purposes. A fish hatchery could use water after it first generates hydroelectric power, would benefit from an abundant gravity-flow supply of good quality water in the Wynoochee reservoir, and would not require large amounts of power for pumping water. The unique opportunity this combined hydropower and fish hatchery development offers should be vigorously pursued.

I strongly recommend that the Corps of Engineers consider further fishery enhancement in addition to hydropower at Wynoochee Dam. It is the intent of the state to act as local sponsor of the hatchery. Personnel from the departments of Fisheries and Game will work closely with your staff.

Sincerely,

Dixy Lee Ray
Governor

cc: NWIFC
Senator Magnuson
Senator Jackson
Representative Bonker
Jerry Foy, Mayor, City of Aberdeen
Henry Soike, Manager, Port of Grays Harbor
Ferris Gilkey, Manager, Grays Harobr Public Utility District
Thomas E. Kruse, Acting Regional Director, NMFS
Joseph R. Blum, Area Manager, USFWS
Patrick Dugan, Director, Grays Harbor Regional Planning Commission

NPSEN-EL-LA

20 MAR 1981

Joseph Blum, Area Manager
U.S. Fish and Wildlife Service
2625 Parkmont Lane, Building A
Olympia, Washington 98502

Dear Mr. Blum:

On 18 November 1980, members of my staff met with you and your staff to discuss your agency's role in cost sharing the hatchery portion of the combined Wynoochee Hydropower/Fish Hatchery project. The purpose of this letter is to summarize the events that have occurred since that meeting and to request your initiation of the U.S. Fish and Wildlife Service (FWS) letter of intent process.

At the 18 November meeting, my staff understood that you would be willing to initiate the letter of intent process pending a meeting with the directors of the Washington State Departments of Fisheries (WDF) and Game (WDG) confirming their support. The directors would have to assure you that: (1) the state supports the Wynoochee hatchery, (2) the state accepts the potential impacts of the hatchery on the wild anadromous fish stocks of the Wynoochee River and Chehalis River Basin and believes that the system could be managed to minimize those impacts, and (3) the state intends to act as local sponsor of the fish hatchery and would cost share hatchery first costs and annual hatchery operation, maintenance, and replacement (OM&R) costs.

On 24 December 1980, I requested the Governor to provide a letter advising me of the State of Washington's intent to act as local sponsor of the fish hatchery portion of the combined Wynoochee Hydropower/Fish Hatchery project and to meet the six items of responsibility. A copy of that letter was provided to your office at that time. As you are aware, WDG has had concerns regarding cost sharing and funding, especially in view of their own budgetary constraints. Nevertheless, in a letter dated 18 February 1981 (inclosure 1), the WDG formally expressed support for the hatchery and for a letter of intent from the Governor committing the state to act as the local sponsor. The WDF has continued their support for the hatchery and for a letter of intent from the state. I have now received the state's letter of intent, dated 6 March 1981, and have attached it as inclosure 2.

NPSEN-PL-ER
Joseph Blum, Area Manager

Both WDG and WDF are prepared to meet with you to discuss and confirm their support of the hatchery. Through coordination with Mr. Charles Dunn of your Olympia field office we had arranged a meeting with WDF and WDG for you on 11 March 1981, but it was cancelled due to last minute schedule changes. Per our conversations with Mr. Dunn on 10 and 12 March 1981, we now understand that such a meeting is no longer necessary in view of the continued coordination your office has had with WDG and WDF and your knowledge of the letter of intent from the Governor's office. We further understand that you are prepared to initiate the FWS letter of intent process.

I would appreciate you initiating your agency's letter of intent process as soon as possible. The letter of intent should state that the FWS intends to meet the following items of responsibility:

a. Become owner and operator of the proposed Wynoochee fish hatchery.

b. Provide for the life of the fish hatchery, 92.5 percent of the total annual project operation, maintenance, and replacement costs attributable to the fish hatchery, an annual amount presently estimated at $1,013,000.

c. Enter into a memorandum of understanding with the State of Washington regarding fish hatchery operation, maintenance, and replacement.

We are at a point in the Wynoochee Hydropower/Fish Hatchery feasibility study where initiation of your process is critical to our study progress. We will submit our draft feasibility report to our Division Office in Portland at the end of March for review and comment prior to public distribution in late May. We hope to include in our report to Division notification from you that the FWS letter of intent process has been initiated. This would require that we receive your notification by 27 March 1981.

In order to assist you in your letter of intent process we have attached a copy of our most recent recommended plan description (inclosure 3). As the project is now planned, the U.S. Army Corps of Engineers would construct the combined hydropower and fish hatchery project and would operate and maintain the hydropower facility; the FWS would own and manage the fish hatchery and would contract with WDF and WDG for its operation and maintenance; and the State of Washington would be the local sponsor of the fish hatchery. The project plan is contingent upon the Corps of Engineers, as the owner and operator of the Wynoochee Lake project and planned owner and operator of the proposed appurtenant hydropower facility, providing a water supply of adequate volume (up to 190 cubic feet per second) and temperature to the fish hatchery intake structure within the existing operational constraints of the Wynoochee Lake project.

We were informed at the 18 November 1980 meeting with you and again in recent conversations with your staff that formal transmittal of the draft Fish and Wildlife Coordination Act (FWCA) report for the Wynoochee Hydropower/Fish

NPSEN-PL-ER
Joseph Blum, Area Manager

Hatchery study will occur upon initiation of the FWS letter of intent process. We would appreciate receiving a copy of the draft FWCA report along with your notification that the FWS letter of intent process has been initiated. Although we have not had the benefit of any written input from your agency, we are aware of the FWS concerns relative to the hydropower/fish hatchery plan through informal coordination with your staff and are treating those concerns in the draft feasibility report. Our report will be reviewed by agencies and the public and must be approved by higher level Corps of Engineers' offices before submittal to Congress for authorization. Once the project has been authorized by Congress and funds are provided for advanced engineering and design, we will proceed to develop a final plan. Final species selection and hatchery design will be determined during advanced engineering and design studies through detailed consultation with your agency and the state. Following approval of the final plan, we will request funds from Congress for construction.

We feel we have a unique opportunity at the existing Wynoochee Dam to meet a portion of two major needs in the Pacific Northwest - energy and anadromous fish. We appreciate your continued interest and participation in the study and look forward to hearing from you in the near future. I will personally continue to keep you advised of any future developments regarding the Wynoochee Hydropower/Fish Hatchery study. If you have any questions or require additional information, please do not hesitate to contact me at FTS 399-3680. Dr. James O. Waller, Wynoochee Study Manager, and Ms. Karen Northup, Environmental Coordinator, at FTS 399-3475 and FTS 399-3624, respectively, are also available to assist both you and your staff.

Sincerely,

LEON K. MORASKI
Colonel Corps of Engineers
District Engineer

3 Incl
as stated

Copy furnished:
Frank A. Lockard, Director
Washington Department of Game
600 North Capitol Way
Olympia, Washington 98504

Roland A. Schmitten, Director
Washington Department of Fisheries
115 General Administration Building
Olympia, Washington 98504

16 JUN 1981

NPSEN-PL-HP

Bert Larkin, Regional Director
Pacific Northwest Region
National Marine Fisheries Service
1700 Westlake North
Seattle, Washington 98109

Dear Mr. Larkin:

Our Wynoochee hydropower/fish hatchery studies and our coordination with your office have progressed to the point where your formal response is needed regarding National Marine Fisheries Service's (NMFS) intent to act as Federal sponsor of the fish hatchery portion of the combined Wynoochee hydropower/fish hatchery project. I would appreciate receiving your statement as soon as possible.

The letter of intent should state that NMFS intends to meet the following items of responsibility:

a. Become owner and operator of the proposed Wynoochee fish hatchery.

b. Provide, for the life of the fish hatchery, 100 percent of the total annual project operation, maintenance, and replacement costs attributable to the commercial enhancement portion of the fish hatchery, an annual amount presently estimated at $603,000.

c. Enter into a memorandum of understanding with the State of Washington regarding fish hatchery operation, maintenance, and replacement.

If you have any questions or require additional information, please do not hesitate to contact me at 764-3690. Dr. James O. Waller, Wynoochee Study Manager, and Ms. Karen Northup, Environmental Coordinator, at 764-3473 and 764-3624, respectively, are also available to assist both you and your staff.

Sincerely,

LEON K. MORASKI
Colonel, Corps of Engineers
District Engineer

Copy furnished:
(See next page)

NPSEN-PL-HP
Bert Larkin, Regional Director

Copy furnished:
Mr. Robert Ayers
Pacific Northwest Region
National Marine Fisheries Service
1700 Westlake North
Seattle, Washington 98109

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
1700 Westlake Avenue North
Seattle, Washington 98109

June 18, 1981

F/NWR/1505-07

Colonel Leon K. Moraski
District Engineer, Seattle District
U. S. Army Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Lee:

First, I should make clear that the following comments are those of the Northwest Regional Office of NMFS, not NMFS as a whole, although by copy of this letter and yours of June 16 to our Headquarters I am recommending agency concurrence with my views.

I believe the Wynoochee Hatchery project proposed by your office has extraordinary potential as a regional salmon and steelhead wild stock recovery and enhancement facility. As I am sure you are aware, runs of native chinook and coho salmon and of steelhead to many Washington coastal streams are severely depressed. These poor stock conditions have serious implications regarding Indian treaty fishing rights vis-a-vis Pacific Council and State of Washington salmon management.

The State and Federal fishery agencies, and as I understand it the coastal Indian tribes, prefer to maintain native fish runs where possible rather than replacing those wild stocks with hatchery strains. The proposed Wynoochee facility, given proper design of its ponds and raceways and because of its location and its water quantity and quality, seems ideally suited for rearing the progeny of wild fish from this critical and sensitive area for out-planting back to their native rivers.

In the context of the above, I heartily endorse the Corps' proposed Wynoochee Hatchery project. That endorsement, however, is predicated on the condition that any NMFS financial and administrative responsibility for project O and M be subject to specific authority and appropriation from the Congress.

Sincerely,

H. A. Larkins
Regional Director

cc: Leitzell
(w/project proposal and COE letter)
Martinson, FWS
Blum, FWS

10TH ANNIVERSARY 1970-1980
National Oceanic and Atmospheric Administration
A young agency with a historic tradition of service to the Nation

NPSEN-PL-HP

17 AUG 1981

Ferris Gilkey, Manager
Grays Harbor Public Utility District
Post Office Box 480
Aberdeen, Washington 98520

Dear Mr. Gilkey:

For the last 2 months we have been informally discussing with you a possible partnership between us to develop the hydropower potential at Wynoochee Dam. Our discussions have progressed to the point where formal response by the Grays Harbor Public Utility District (PUD) is required regarding its intent to act as local sponsor of the hydropower portion of the combined hydropower/fish hatchery project.

The partnership, as we now perceive it, would primarily involve the following:

a. The U.S. Army Corps of Engineers would design, construct, operate, and maintain the hydropower facility.

b. The Grays Harbor PUD would distribute and market any energy and capacity produced by the hydropower facility. As a part of project authorization, Congress would have to specifically exempt this project from the provisions of Section 5 of the 1944 Flood Control Act which requires the marketing of Federal power by the Bonneville Power Administration.

c. Grays Harbor PUD would pay 100 percent of the construction cost allocated to hydropower at the time of construction and 100 percent of the annual hydropower operation, maintenance, and replacement cost for the life of the hydropower facility.

d. Grays Harbor PUD would fund and construct any necessary power transmission line.

The proposed hydropower facility would be a 10.2-megawatt (MW) (nameplate) underground facility which would produce approximately 40,000 MW hours of energy per year. Hydropower development would be combined with enhancement fish hatchery development into an integrated hydropower/fish hatchery project with no change in the existing Wynoochee Lake project operations.

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

NPSEN-PL-HP
Ferris Gilkey, Manager

Hydropower operation would be subordinant to all other purposes and the facility would operate as a run-of-river plant.

The specific responsibilities of the Grays Harbor PUD as local sponsor of the hydropower portion of the combined hydropower/fish hatchery project are as follows:

a. Provide a cash contribution equal to 100 percent of the total project first cost attributable to hydropower, presently estimated at $19,400,000 (does not include transmission costs).

b. Provide a cash or in-kind annual contribution for the life of the hydropower facility equal to 100 percent of the total annual project operation, maintenance, and replacement costs attributable to hydropower, an annual contribution presently estimated at $306,000.

c. Distribute any energy and capacity which is produced from the hydropower facility.

d. Furnish power free of cost to the United States for operation and maintenance of the Wynoochee Lake project and recommended fish hatchery at voltage and frequency required and at a point adjacent thereto.

e. Hold and save the United States free from damages due to the construction and subsequent operation and maintenance of the hydropower facility, except for such damages that are due to the fault or negligence of the United States or its contractors.

f. Hold and save the United States free from any and all claims and damages for lost power revenues and additional operation costs resulting from operation and maintenance of the Wynoochee Lake project and from the construction, operation, and maintenance of the recommended fish hatchery.

After we have had an opportunity to discuss this matter, I would appreciate receiving a resolution from the commission stating Grays Harbor PUD's intent to act as local sponsor of the hydropower portion of the combined hydropower/fish hatchery project. The resolution should restate the items of responsibility (a through f) listed above and include a statement of the PUD's authority and financial capability. The resolution will be included in our draft feasibility report now in preparation. Our report will be reviewed by agencies and the public and must be approved by higher level Corps of Engineers offices before submittal to Congress for authorization. Once authorized by Congress, and funds provided for advanced engineering and design, we will proceed in cooperation with all interested parties to develop a final integrated hydropower/fish hatchery plan. Following approval of the final plan, we would request the Grays Harbor PUD to pay all subsequent costs allocated to hydropower design, construction, operation, and maintenance.

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

NPSEN-PL-HP
Ferris Gilkey, Manager

Your decision to act as local sponsor of the hydropower facility will be needed prior to final congressional action, and the commitment of PUD funds will be needed prior to final design and advertisement of the construction contracts.

If you or the PUD commissioners have any questions concerning this letter, please contact me at telephone (206) 764-3690, or Dr. James O. Waller, Hydropower Study Manager, at telephone (206) 764-3473.

Sincerely,

LEON K. MCMillan
Colonel, Corps of Engineers
Commanding

BEST AVAILABLE COPY
FURNISHED TO DDC

PUBLIC
UTILITY
DISTRICT
No. 1

GRAYS HARBOR COUNTY

October 5, 1981

Colonel Leon K. Moraski
Corps of Engineers, Seattle District
Department of the Army
P. O. Box C-3755
Seattle, Washington 98124

Dear Colonel Moraski:

During the past several months representatives of your office and the District have been discussing an arrangement under which the District might become a sponsor of the power facilities which the Corps proposes to build as a part of its joint development of power and fisheries facilities at the Wynoochee dam. During those discussions both parties have expressed a number of concerns which need to be addressed.

Because of the complex nature of those concerns, agreement has not yet been reached but it appears that a solution is possible. We understand that, in order to meet the timing requirements of your office, an indication of the District's position is needed at this time. Therefore, subject to a satisfactory agreement being reached upon the concerns which the District has expressed, the District would be willing to act as a sponsor for all of the costs allocated to the hydropower facilities which the Corps proposes to be added to the Wynoochee dam.

Yours very truly,

Arnold L. Holm

Arnold L. Holm
President of the Commission

P. O. BOX 480 ABERDEEN, WASHINGTON 98520 PHONE 533-[illegible]

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSEN-PL-HP

26 OCT 1981

Honorable John D. Spellman
Governor of Washington
Olympia, Washington 98504

Dear Governor Spellman:

In our previous correspondence on the Wynoochee Hydropower/Fish Hatchery Study, we requested (inclosure 1) a letter from you advising of the State of Washington's intent to act as local sponsor of the fish hatchery portion of the combined Wynoochee hydropower/fish hatchery project. You responded on 6 March 1981 (inclosure 2) stating it is your intention to do what you can to have the State of Washington act as local sponsor for the fish hatchery portion of the combined project and meet the six items of responsibility, subject to funding by the legislature.

In the past few months, the results of our studies have been reviewed by our higher authorities in Portland, Oregon, and Washington, D.C. Several changes in the project design, economics, and cost sharing resulted from their comments. In addition, the scope of the proposed fish hatchery has been expanded in consultation with the Washington State Departments of Fisheries and Game into an enhancement facility for anadromous fish in several Washington coastal rivers, not just the Wynoochee River.

These changes require a revised letter of intent from the State of Washington. On 22 September, my staff briefed Messrs. Lockard, Schmitten, and Spencer of the Departments of Game, Fisheries, and Ecology and their staffs on this project. We discussed the concept and scope of the fish hatchery and the revised cost sharing figures. The agencies expressed their strong support for the project.

As the project is now planned, the U.S. Army Corps of Engineers would construct the combined hydropower/fish hatchery project, the Grays Harbor Public Utility District would be the local sponsor for the hydropower facility and market the power output (instead of power marketing by Bonneville Power Administration), the National Marine Fisheries Service or Fish and Wildlife Service would own and manage the fish hatchery and contract with the Washington State Departments of Fisheries and Game for its operation and maintenance, and the State of Washington would be the local sponsor of the fish

hatchery. The combined project would produce 37,400-megawatt hours of average annual energy from the 10.2-megawatt hydropower facility and add 129,000 adult salmon and steelhead to the anadromous fish harvest annually. The proposed project would cost $42,400,000 (October 1981 price level) and would produce $1.20 in hydropower benefits for every $1 in hydropower costs and $2.90 in fish enhancement benefits for every $1 in fish costs.

The project plan includes and is contingent upon the following:

a. The Corps of Engineers, as owner and operator of the Wynoochee Lake project and planned owner and operator of the proposed appurtenant hydropower facility, providing a water supply of adequate volume (up to 190 cubic feet per second) to the fish hatchery intake structure within the existing operational constraints of the Wynoochee Lake project.

b. A Federal fish agency accepting ownership of the fish hatchery from the Corps of Engineers and assuming the responsibility for the management of the fish hatchery and the Federal Government's share of the annual operation, maintenance, and replacement costs attributable to the fish hatchery.

c. The State of Washington fulfilling its obligation under the signed memorandum of agreement (MOA) with the Corps of Engineers dated 28 July 1977 (Construction of Fish Hatchery Facilities for Prevention of Natural Spawning Areas for Anadromous Trout Occasioned by Construction of Wynoochee Lake Project) by providing funds for accomplishing said construction as part of the proposed fish hatchery. The MOA dated 28 July 1977 may need to be amended or supplemented, as legally required, to reflect this change of fulfilling the state obligation.

The total allocated first cost of the fish hatchery is presently estimated at $20,820,000, and the total annual allocated operation, maintenance, and replacement cost of the fish hatchery is presently estimated at $984,000. The total allocated first cost of the hydropower facility is presently estimated at $21,580,000, and the total annual allocated operation, maintenance, and replacement cost of the hydropower facility is presently estimated at $341,000. All costs are at the October 1981 price level. The percentage of the allocated fish hatchery first and annual costs attributable to the existing state mitigation responsibility as set forth in the 28 July 1977 MOA is 2.6 percent based on the percentage of total fish production attributable to said mitigation. The remaining fish production is enhancement and would be distributed 29.3 percent to the sport fishery and 70.7 percent to the commercial and Indian fishery based on state catch figures. The State of Washington's share of allocated first costs and allocated annual operation, maintenance, and replacement costs of the enhancement fish hatchery (97.4 percent of the fish hatchery) are 25 percent of the separable first costs and 100 percent of the separable annual costs attributable to the sport fishery. This cost sharing is in accordance with the Federal Water

Project Recreation Act (Public Law 89-72, as amended) and the Water Resources Council's Principles and Standards for Water and Related Land Resources. The Federal Government's share of the cost is 75 percent of the separable sport fishery first cost, 100 percent of the joint sport fishery first and annual costs, and 100 percent of the commercial and Indian fishery first and annual costs. The Grays Harbor PUD's share is 100 percent of the hydropower costs.

In addition, former President Carter's proposed cost sharing policy must be addressed. This policy, if implemented by Congress, would require states to participate more actively in project implementation decisions. This proposed cost sharing is in addition to any non-Federal cost sharing required under existing law. Specifically, the state would be required to provide a cost contribution for 10 percent of the construction (first) cost associated with vendable outputs in exchange for 10 percent of net revenues and 5 percent of the construction cost associated with nonvendable outputs. My recommendation to Congress for project authorization will be in accordance with former President Carter's proposed cost sharing policy.

The responsibilities for the State of Washington as local sponsor of the fish hatchery are as follows:

a. Provide a cash contribution equal to the allocated first costs attributable to the fish hatchery for constructing a part of the fish hatchery to fulfill the state's obligation under the signed MOA dated 28 July 1977 (as amended or supplemented as legally required), a contribution presently estimated at $570,000.

b. Provide a cash or in-kind annual contribution for the life of the fish hatchery equal to the annual allocated operation, maintenance, and replacement costs attributable to the fish hatchery for operating, maintaining, and replacing a part of the fish hatchery to fulfill the state obligation under the signed MOA dated 28 July 1977 (as amended or supplemented as legally required), an annual contribution presently estimated at $27,000.

c. Provide a cash contribution equal to 25 percent of the separable first cost attributed to the recreation (sport) enhancement portion of the fish hatchery, a contribution presently estimated at $1,470,000.

d. Provide cash or in-kind annual contribution for the life of the fish hatchery equal to 100 percent of the separable annual operation, maintenance, and replacement costs attributable to the recreation (sport) enhancement portion of the fish hatchery, an annual contribution presently estimated at $278,000.

e. In accordance with former President Carter's proposed cost sharing policy, provide a cash contribution equal to 10 percent of the allocated

construction cost attributable to hydropower plus 5 percent of the allocated construction cost attributable to the fish hatchery, a contribution presently estimated at $3,199,000.

f. Enter into a memorandum of understanding with the sponsoring Federal fish agency regarding fish hatchery operation, maintenance, and replacement.

g. Obtain any necessary permits.

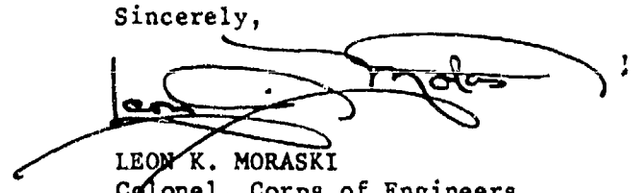
h. Hold and save the United States free from damages due to the construction and subsequent operation and maintenance of the fish hatchery, except for such damages that are due to the fault and negligence of the United States or its contractors.

We will appreciate receiving a new letter from you advising of the State of Washington's intent to act as local sponsor of the fish hatchery portion of the combined Wynoochee hydropower/fish hatchery project. Your letter should restate the items of contingency (a-c) and items of responsibility (a-h) listed in this letter and include your intention in regards to the items of responsibility. This preauthorization stage letter of intent is not binding and does not obligate future legislatures. However, a firm binding commitment on the estimated cost contributions will be required subsequent to congressional authorization as a basis for the Corps of Engineers to initiate construction. Your letter of intent will be included in our draft feasibility report now in preparation.

Our report will be reviewed by Federal agencies, the state, and the public and must be approved by higher level Corps of Engineers offices before submittal to Congress for authorization. Once the project is authorized by Congress and funds provided for advanced engineering and design, we will proceed in cooperation with the state to develop a final plan. Following approval of the final project, we will request funds for construction from Congress. The decision to act as local sponsor of the fish hatchery will be needed prior to final congressional action and a commitment of state funds will be necessary prior to advertisement of the construction contracts.

If you or your staff have any questions concerning this letter, please contact me at telephone (206) 764-3690 or Dr. James O. Waller, Hydropower Study Manager, at (206) 764-3473.

Sincerely,



LEON K. MORASKI
Colonel, Corps of Engineers
District Engineer

2 Incl
As stated

Copy furnished w/incl:
(see next page)

NPSEN-PL-HP
Honorable John D. Spellman

Copy furnished w/incl:
Rolland A. Schmitten, Director
Department of Fisheries
State of Washington
115 General Administration Building
Olympia, Washington 98504

Frank R. Lockard, Director
Department of Game
State of Washington
600 North Capitol Way
Olympia, Washington 98504

Donald W. Moos, Director
Department of Ecology
State of Washington
Olympia, Washington 98504

Edward Sheets, Director
Washington State Energy Office
400 East Union Avenue
Olympia, Washington 98504

H. A. Larkins, Regional Director
National Marine Fisheries Service
1700 Westlake Avenue North
Seattle, Washington 98109

Joseph R. Blum, Area Manager
U.S. Fish and Wildlife Service
2625 Parkmont Lake
Olympia, Washington 98502

State of Washington

JOHN SPELLMAN, Governor

November 20, 1981

OFFICE OF THE GOVERNOR

Colonel Norman C. Hintz, District Engineer
Seattle District Corps of Engineers
Post Office Box C-3755
Seattle, Washington 98124

Dear Colonel Hintz:

I have reviewed your letter of October 26, 1981, regarding the proposed hydropower and anadromous fish enhancement facility at Wynoochee. I find a combined facility that would produce both power and anadromous fish very appealing.

As you are aware, this office by itself cannot commit the legislature to the funding required for local sponsorship of this or any other project. However, I believe the legislature in their wisdom, and as they have in the past, will recognize the value to the state of this proposal. It is my intention to strongly support this project and have the state of Washington act as local sponsor for their share of this project.

The state acknowledges the following contingencies contained in your October 26, 1981, letter:

a. The Corps of Engineers, as owner and operator of the Wynoochee Lake project and planned owner and operator of the proposed appurtenant hydropower facility, providing a water supply of adequate volume (up to 190 cubic feet per second) to the fish hatchery intake structure within the existing operational constraints of the Wynoochee Lake project.

Legislative Building • Olympia, Washington 98501 • (206) 753-6780 • (Scan) 234-6780

b. A Federal fish agency accepting ownership of the fish hatchery from the Corps of Engineers and assuming the responsibility for the management of the fish hatchery and the Federal Government's share of the annual operation, maintenance, and replacement costs attributable to the fish hatchery.

c. The state of Washington fulfilling its obligation under the signed memorandum of agreement (MOA) with the Corps of Engineers dated 28 July 1977 (Construction of Fish Hatchery Facilities for Prevention of Natural Spawning Areas for Anadromous Trout Occasioned by Construction of Wynoochee Lake Project) by providing funds for accomplishing said construction as part of the proposed fish hatchery. The MOA dated 28 July 1977 may need to be amended or supplemented, as legally required, to reflect this change of fulfilling the state obligation.

The state also accepts as local sponsor the following responsibilities for the fish hatchery:

a. Provide a cash contribution equal to the allocated first costs attributable to the fish hatchery for constructing a part of the fish hatchery to fulfill the state's obligation under the signed MOA dated 28 July 1977 (as amended or supplemented as legally required), a contribution presently estimated at $570,000.

b. Provide a cash or in-kind annual contribution for the life of the fish hatchery equal to the annual allocated operation, maintenance, and replacement costs attributable to the fish hatchery for operating, maintaining, and replacing a part of the fish hatchery to fulfill the state obligation under the signed MOA dated 28 July 1977 (as amended or supplemented as legally required), an annual contribution presently estimated at $27,000.

c. Provide a cash contribution equal to 25 percent of the separable first cost attributed to the recreation (sport) enhancement portion of the fish hatchery, a contribution presently estimated at $1,470,000.

d. Provide cash or in-kind annual contribution for the life of the fish hatchery equal to 100 percent of the separable annual operation, maintenance, and replacement costs attributable to the recreation (sport) enhancement portion of the fish hatchery, an annual contribution presently estimated at $278,000.

f. Enter into a memorandum of understanding with the sponsoring Federal fish agency regarding fish hatchery operation, maintenance, and replacement.

g. Obtain any necessary permits.

h. Hold and save the United States free from damages due to the construction and subsequent operation and maintenance of the fish hatchery, except for such damages that are due to the fault and negligence of the United States or its contractors.

However, item e of your letter about former President Carter's proposed cost-sharing policy, which adds an estimated $3,199,000 to the state share, causes some concern. This, as we understand it, is policy only and not a law. It would require congressional enactment before the state would have to meet this item of responsibility. If this proposed policy is implemented by Congress, the state's sponsorship of this project could become highly uncertain. Therefore, we cannot agree to this item e now.

In conclusion, this combined project is important to the state of Washington and I will do whatever I can to make the state the local sponsor of the fish hatchery.

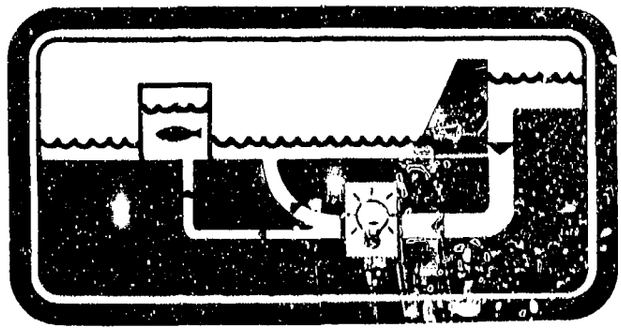
Sincerely,

John Spellman
Governor

cc: Director of Game
Director of Fisheries

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX D

APPENDIX D

FINAL U.S. FISH AND WILDLIFE SERVICE REPORT

Report Transmittal Letter, 2 July 1981

Fish and Wildlife Service Coordination Act Report

Supplemental Letter to Corps of Engineers from National Marine Fisheries Service, 13 November 1981

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Area Office
2625 Parkmont Lane
Olympia, Washington 98502

July 2, 1981

Colonel Leon K. Moraski
District Engineer
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Moraski:

Enclosed are two copies of our final Fish and Wildlife Coordination Act report on the proposed hydropower and hatchery projects at Wynoochee Dam, Washington. The draft report was circulated to other Federal and State agencies for review. Letters of concurrence from these agencies are included. Recommendations made in letter of concurrence were considered in preparing this final report. We believe this final report reflects the views of the appropriate resource agencies.

Sincerely,

Joseph R. Blum
Area Manager

Enclosures

cc: PO (AE)
AO
FAO
WDG (Fenton)
WDF (Wright)
NMFS (Evans)
(Groves)

WYNOOCHEE
HYDROPOWER AND HATCHERY
PROJECTS

Fish and Wildlife
Coordination Act Report

Ecological Services, Olympia Field Office
Olympia, Washington

July, 1981

Fish and Wildlife Service
U.S. Department of the Interior

WYNOOCHEE HYDROPOWER PROJECT
WYNOOCHEE HATCHERY PROJECT

Final
Coordination Act Report
submitted to
Seattle District, U.S. Army Corps of Engineers
Seattle, Washington

Prepared by:

Robert Wunderlich
Jeffrey Opdycke

U.S. Fish and Wildlife Service
Ecological Services, Olympia Field Office
Olympia, Washington

July 1981

TABLE OF CONTENTS

	Page
Description of the Plan Area	1
Description of the Selected Plan	1
Combined Hydropower and Hatchery Project	1
Hydropower Portion Alone	3
Hatchery Portion Alone	3
Fishery Resources	5
Without the Project	5
With the Project	8
Hydropower Portion Alone	8
Hatchery Portion Alone	11
Combined Hydropower and Hatchery Project	12
Wildlife Resources	12
Without the Project	12
With the Project	13
Hydropower Portion Alone	13
Hatchery Portion Alone	13
Combined Hydropower and Hatchery Project	13
Threatened and Endangered Species	14
Discussion	14
Recommendations	17
Hydropower Portion Alone	17
Hatchery Portion Alone	17
Combined Hydropower and Hatchery Projects	18
References	19

LIST OF TABLES AND FIGURES

		Page
Table 1.	Percentage contributions of Chehalis River Basin salmon stocks to sport and commercial fisheries	7
Table 2.	Anadromous fish returns to the Wynoochee Project barrier dam collection facility	9
Table 3.	Upper Wynoochee River coho returns - 1971-1978	10
Table 4.	Oakville Tribe spring chinook catch records - 1970-1980	15
Figure 1.	The Wynoochee River Basin and vicinity with existing Wynoochee Lake project features	2
Figure 2.	Proposed Wynoochee River hydropower and hatchery project features in vicinity of existing Wynoochee Dam	4

DESCRIPTION OF THE PLAN AREA

The Wynoochee River basin occupies a 126-square-mile area in the southern portion of Washington's Olympic Peninsula (Figure 1). From its headwaters in the southern slopes of the Olympic Mountains, the Wynoochee River flows generally south for 67 miles to its confluence with the Chehalis River near Montesano. The uppermost portion of the river is steeply mountainous, followed by the more moderate gradient of the Weatherwax Basin, a narrow steep-walled canyon, and alternating gorges and open brushy bottoms until it becomes a broad valley near its confluence with the Chehalis. The lower mile of the Wynoochee River is under tidal influence.

Lands in the upper valley are primarily used for timber production, where Douglas fir, western red cedar, and western hemlock forests predominate. Recently logged or otherwise disturbed areas exhibit typical regenerative plant associations of red alder, bigleaf maple, and other subclimax species. Lower valley lands (below river mile 27) are used primarily for agriculture, mostly pasture and cropland, and exhibit various stages of natural regenerative growth peripheral to farmed areas.

A wide range of wildlife occurs in the Wynoochee drainage. Some of the many species are Roosevelt elk, black-tailed deer, black bear, cougar, brush rabbit, muskrat, river otter, grouse, osprey, and harlequin and wood ducks.

Anadromous fish resources of the Wynoochee River system presently include coho, chum, and fall chinook salmon; steelhead and cutthroat trout. Washington Department of Fisheries feels the former run of spring chinook salmon has disappeared in recent years. Resident fish include cutthroat and rainbow trout and mountain whitefish. Suckers, squawfish, and other nongame fish species are also present.

A primary feature of the drainage is the existing Corps of Engineers' Wynoochee Lake Project at river mile 51.8 in the Weatherwax Basin (Figure 1). The project, completed in 1972, consists of a concrete and earthfill dam creating a 1,170-acre reservoir at full pool. Construction of the project was authorized in 1962 for the purposes of industrial water supply, irrigation, flood control, with fish and wildlife mitigation measures included. Project mitigation features included provisions for anadromous fish and resident wildlife species. Anadromous fish features consisted of upstream and downstream fish passage facilities, downstream flow and passage enhancement, and a one-time monetary payment to Washington Department of Game for hatchery production sufficient to offset project losses to anadromous trout. Wildlife mitigation consisted of acquiring easements on Wynoochee bottomlands for elk habitat improvement purposes (see Figure 1).

DESCRIPTION OF THE SELECTED PLAN

Combined Hatchery and Hydropower Project

The plan recommended by the Corps of Engineers is a 10.2-megawatt (nameplate) hydropower addition to Wynoochee Dam which would produce an average of 40,000 megawatt-hours of energy per year, and a hatchery designed for

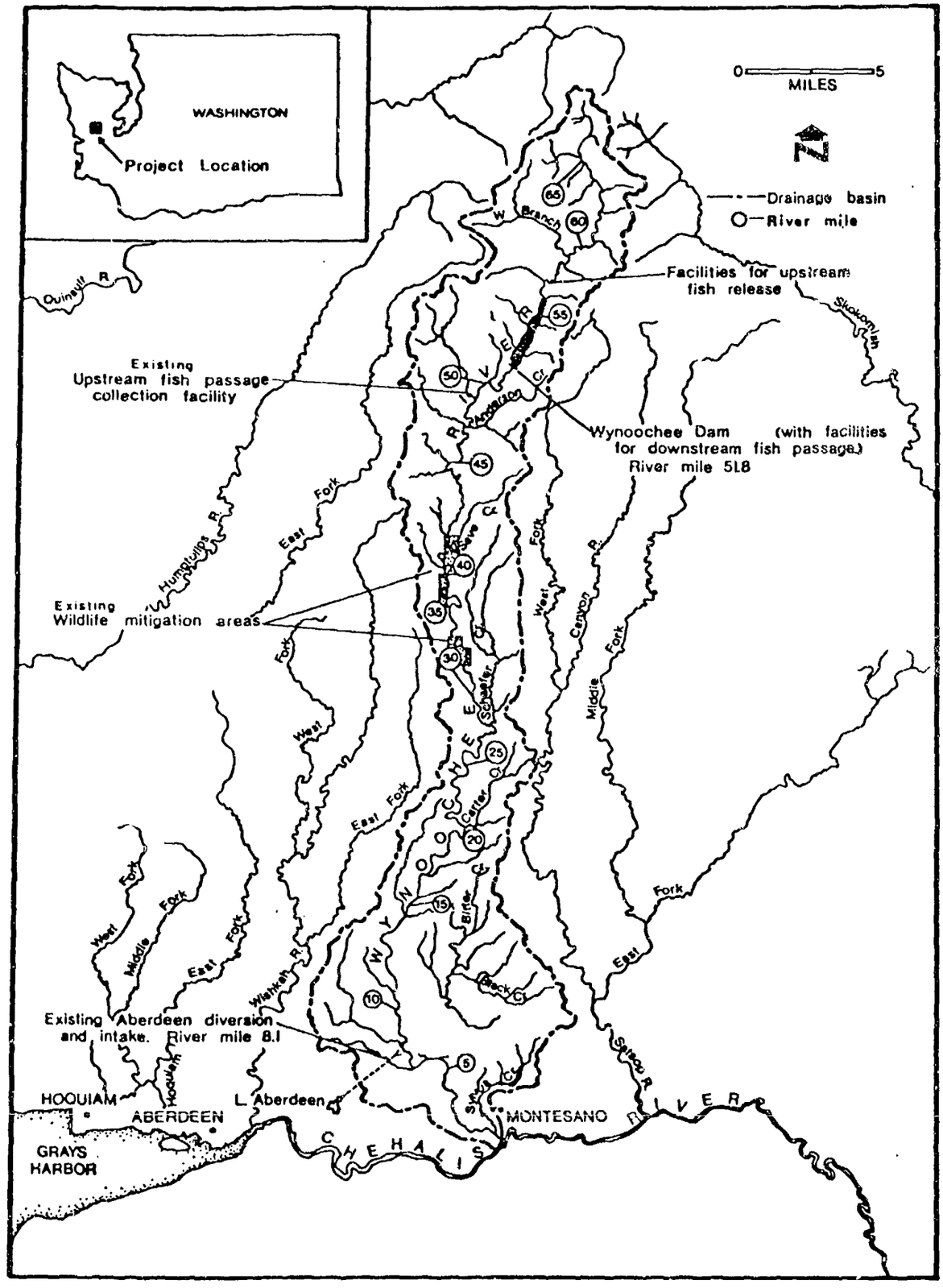


Figure 1. The Wynoochee River Basin and vicinity with existing Wynoochee Lake project features.

anadromous fish production of up to 396,000 pounds/year, 3,000 feet downstream of the dam. The hydropower outfall would be directed to the hatchery as water supply by means of the fish hatchery intake structure. An additional backup water supply line directly from the dam to the fish hatchery intake structure would ensure a fail-safe water supply to the proposed hatchery.

With a combined project, the existing downstream migrant fish passage facility would become obsolete; water would only pass through the facility on rare occasions, as water would normally be diverted through the turbines. No new bypass facility would be built, resulting in termination of natural production above the dam.

Hydropower Portion Alone

This proposal consists of a small-scale hydropower addition to the existing Corps of Engineers' Wynoochee Dam at river mile 51.8. It would employ an underground powerhouse on the right bank with a penstock tunneled beneath the right abutment and through the right bank (Figure 2). A multi-level intake structure would be built in the reservoir on a 720-foot elevation bench adjacent to the upstream side of the dam. Water would be withdrawn from multiple levels for downstream water temperature control. The penstock would be tunneled beneath the grout curtain to the underground powerhouse located under the existing visitor center parking lot, 200 feet downstream of the dam and 200 feet back from the canyon wall. The powerhouse would be 128 feet long, 40 feet wide, and 57 feet high. It would utilize flows from the existing project, and the total hydraulic capacity of the powerhouse would be 1,200 c.f.s. Flows from the reservoir in excess of 1,200 c.f.s. would exit from the existing dam's multi-level outlets, sluices, or spillway. The powerhouse tailrace would exit from the right canyon wall about 400 feet downstream of the dam, approximately 100 feet downstream of the U.S. Forest Service bridge.

Development of the hydropower portion alone, without the fish hatchery, would require the construction of a fish attraction and bypass facility to pass juvenile salmon and steelhead outmigrants safely downstream, or augmentation of existing hatchery production elsewhere in numbers equal to the loss of natural production above the dam. In neither case would there be any enhancement opportunity.

Hatchery Portion Alone

The proposed hatchery portion of the recommended plan consists of a 396,000-pound chinook salmon and steelhead trout hatchery located approximately 3,000 feet downstream of the existing Wynoochee Dam on a relatively flat terrace area on the right bank of the river (Figure 2). Chinook and steelhead could be reared to 10 and 6 fish per pound, respectively, prior to release. In addition, the hatchery could produce coho salmon in numbers equivalent to the upstream watershed's pre-dam potential for release in the Wynoochee River.

The hatchery proposal would utilize a 1900/140 c.f.s. fail-safe gravity water supply from the powerhouse. A buried pipeline would run generally along the

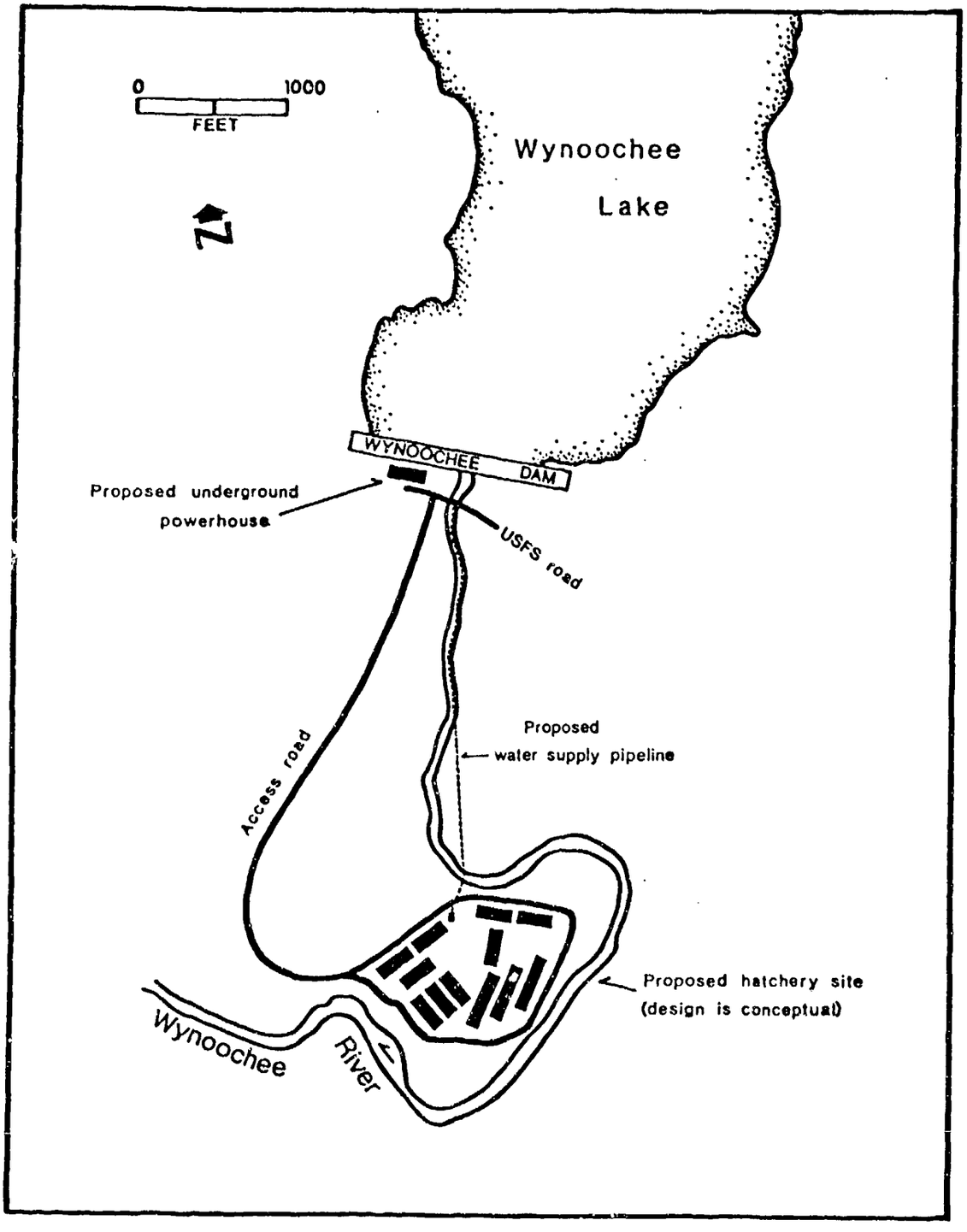


Figure 2. Proposed Wynoochee Hydropower and Hatchery Project features in vicinity of existing Wynoochee Dam.

canyon bottom and left riverbank directly from the powerhouse to the hatchery site. Water would be of adequate quality and quantity to meet all hatchery needs for the proposed size. Flows downstream of the hatchery outlet would not be affected by hatchery operation.

Currently proposed physical features of the hatchery would include the water intake and supply line serving a hatchery building, two series of raceways, four 2-acre rearing ponds for steelhead, five ½-acre holding and rearing ponds for salmon, and a water treatment pond. The development would include residences for most of the operators, a service building, and access road. In total, the physical layout of the hatchery facility would occupy approximately 50 acres. The existing fish barrier dam and collection facilities located 2.2 miles downstream of Wynoochee Dam could be used to obtain native hatchery brood stock. To prevent erosion of the right bank of the river immediately above the hatchery site, 700 feet of shoreline would be stabilized with a 2-foot-thick riprap blanket designed to withstand extreme flooding velocities.

To the extent possible, hatchery plans and construction activities would be formulated to preserve as much of the natural vegetation as possible, reducing the impact of the facility on wildlife. During Advanced Engineering and Design, as the details of the hatchery and associated facilities are finalized, design considerations will be given to wildlife protection through such measures as maintenance of riparian vegetation and a vegetative buffer zone around the hatchery complex and maintenance of natural vegetation interspersed throughout the hatchery grounds (subject to construction constraints and safety requirements). Areas unavoidably disturbed by construction activity, but suitable for revegetation, would be seeded and planted with native plant species and restored as much as possible to pre-development conditions.

The fish hatchery would result in the termination of anadromous fish runs above Wynoochee Dam; as with the combined plan, the present bypass facility would become obsolete and no provision has been made for continued maintenance of the fish runs. With the hatchery, the existing program of transporting fish above Wynoochee Dam would be discontinued. Mitigation for the lost upstream runs, as well as mitigation for the previous loss of steelhead spawning habitat associated with the existing Wynoochee Lake project, would be met and performed as part of yearly hatchery production.

FISHERY RESOURCES

Without the Project

The Wynoochee River and tributaries contribute significantly to fisheries of the region. Salmon contribute primarily to the commercial and sport fisheries of the United States and Canada in the Pacific Ocean, the gillnet fishery in Grays Harbor and the Chehalis River, and to the sport fisheries in the Chehalis and Wynoochee Rivers. Steelhead contribute to the Indian and sport fisheries in the Chehalis and Wynoochee Rivers. Searun cutthroat trout, and resident rainbow and cutthroat trout, whitefish, and Dolly Varden contribute to the sport fishery in the Wynoochee River.

Table 1 summarizes the estimated proportion of total catch, plus escapement, of Grays Harbor salmon stocks based on most recent Washington Department of Fisheries tagging and harvest data. Of the total harvestable number of salmon and steelhead from the Chehalis drainage taken by Washington fishermen, Treaty Indians are entitled to one-half the catch, subject to the moderate living standard. Accordingly, anadromous fish harvest over the planning period will likely reflect this apportionment.

Prior to construction of the existing Wynoochee Dam and Reservoir project, an average of about 5,000 coho, 2,500 chum, 50 spring chinook, and 2,000 fall chinook salmon; and 4,300 steelhead and 3,300 searun cutthroat trout were reported to enter the Wynoochee River annually to spawn (USFWS, 1967)[1]. Additional steelhead were taken in the sport fishery and Washington Department of Game estimates a total average of over 6,000 steelhead adults utilized the river annually. Chum salmon spawned primarily in the lower 40 miles of the river above the limits of tidal influence. Two-thirds of the coho salmon population spawned below the Wynoochee Dam site, and the remainder spawned in the area upstream from the dam, including a valuable late-run fish. Spring chinook salmon spawned in the mainstem river both above and below the Wynoochee Dam, although their numbers have significantly decreased in recent years to the point Washington Department of Fisheries no longer considers this species to be present in the Wynoochee watershed. About 75 percent of the fall chinook salmon spawned in the lower 40 miles of the river. Steelhead and searun cutthroat trout spawned in the mainstem and tributaries from tidewater to the upstream limit of migration at river mile 62.

A significant influence on Wynoochee River anadromous stocks is the existing Wynoochee Dam Project at river mile 51.2 and its associated fish mitigation features. Originally, a spawning area for an estimated 1,000 steelhead and 330 cutthroat trout was inundated by the Wynoochee Reservoir, and an estimated additional 1,500 coho salmon and 558 steelhead and 130 searun cutthroat trout were potentially blocked from upper watershed spawning grounds. Inundation losses were mitigated by providing a one-time monetary payment of $680,000 to Washington Department of Game for construction, operation, and maintenance of a hatchery capable of production to maintain a run of 6,000 steelhead, plus additional steelhead to replace lost sea-run cutthroat trout for the life of the project. Mitigation for the blockage losses consisted of a trap-and-haul facility for upstream migrants, and a prototype multi-level flow outlet system in the dam for passing downstream migrants. The project also augments downstream flows during low-flow months, improving migration and rearing conditions for salmon and steelhead. Additionally, should upstream water diversions authorized by the project eventually be used, a series of small check dams would be installed in the lower Wynoochee River to overcome potential fish passage problems.

Presently, anadromous fish production above the Wynoochee Project is significantly below preproject levels, as the original mitigation proposals

1 These estimates were made by various agencies during early project discussions. They were considered to be the best estimates available at the time.

Table 1. Proportion of total catch plus escapement taken in various fisheries - by Grays Harbor stock*

Species	Washington Ocean Troll	Washington Ocean Sport	Puget Sport	British Columbia Troll	British Columbia Sport	British Columbia Net	Oregon	Alaska	Puget Net	Terminal Harvest	Escapement	Total	Total Survival (catch per fish released)
Coho 1+	.088	.056	.002	.343	---	.004	.046	.002	---	.213	.246	1.000	.025
Chinook	.017	.013	.009	.378	.002	.017	.004	.156	.001	.141	.262	1.000	
Fall 0+													.010
Spr/Sum 0+													.010
Spr/Sum 1+													.035
Chum										.500	.500	1.000	.005

*Estimated contribution rate to various fisheries would be computed by multiplying fishery proportions times total survival rate.

were never fully realized. Post project studies (Dunn, 1978 and LaVoy, 1978) indicate that downstream fish passage is not satisfactory and, accordingly, above-reservoir salmon and steelhead stocks are declining. While escapement data alone does not provide a complete analysis of above-dam native fish production, Table 2 does indicate a general decline of all species above the dam, including those which would seem to be little or unaffected by ocean harvest rates and artificial production releases (i.e., cutthroat and steelhead). Data assembled by Washington Department of Fisheries on upper Wynoochee River coho returns for 1971 to 1978 (Table 3), which includes interception and artificial production information, similarly indicates a downward trend for coho salmon. Moreover, Washington Department of Game has been unable to construct the agreed-upon steelhead facilities due to rising construction costs and lack of an affordable water supply for such a facility, although some rearing of Wynoochee steelhead has been accomplished at the existing Aberdeen hatchery. Consequently, losses of steelhead and searun cutthroat due to Wynoochee Reservoir itself have not been, nor likely will be, compensated for under the present mitigation arrangement. In sum, over the next 50 years without the proposed project, Wynoochee River anadromous fish stocks will likely remain depressed, absent full compensation for the existing Wynoochee Project losses.

With the Project

With-project impacts were evaluated for three conditions: Implementation of hydropower alone; hatchery alone; and the selected combined hydropower/hatchery plan.

Hydropower Portion Alone

Addition of hydropower alone to the existing Wynoochee Project will likely have an adverse impact on the abundance and distribution of anadromous salmonids due to passage loss of downstream migrants. Attraction/collection devices necessary to prevent fish entrainment in the proposed hydrogeneration system are, with few exceptions (e.g., Baker Lake Project), unsuccessful in safely and efficiently passing downstream migrants. Over the life of the hydropower project, therefore, there is a strong likelihood that the anadromous fish resource will be further reduced, if not virtually eliminated, above Wynoochee Dam with the hydropower project only. Fishery resources lost above the dam could be mitigated, however, through augmentation of existing hatchery production elsewhere, minimizing impact to sport and commercial fisheries.

Impacts to anadromous fish below Wynoochee Dam will be insignificant as water releases and quality would remain at preproject levels, and initial construction impacts to aquatic habitat would be localized and minor.

Resident fish utilizing the approximately 500-foot reach between the existing Wynoochee tailrace and the proposed hydropower outfall will be adversely affected from significantly reduced streamflow, particularly during summer low-flow months. This loss will be relatively minor, however, and no loss of fishing opportunity will occur in this canyon reach.

Table 2. Anadromous fish returns to the Wynoochee Project barrier dam collection facility

Year	Spring Chinook	Steelhead	Cutthroat	Adult Coho**	Jack Coho**
1971-72	8	1,765	303	5,698	1,595
1972-73	0	562	11	1,019	178
1973-74	0	719	83	873	261
1974-75	0	524	31	2,764	382
1975-76	0	417	11	1,054	291
1976-77	0	153	19	3,049	128
1977-78	0	143	19	444	65
1978-79	*	42	0	708	76
1979-80		46	0		

** Coho returns may be influenced by hatchery plants in the Wynoochee River in recent years.

* Spring chinook returns from hatchery plants were recorded.

Table 3. Upper Wynoochee River coho returns - 1971-1978.

Return Year	Wynoochee Trap Count	Number of Smolts Planted	Expected Survival Rate	Estimated Hatchery Adult Production	Estimated Hatchery Adults To Trap	Estimated Native Adults To Trap	Catch-to-Escapement Ratio*	Estimated Total Native Run
1971	5,714	307,000	1.2%	3,684	1,228	4,486	2:1	13,458
1972	1,019	202,000	1.2%	2,424	606	413	3:1	1,652
1973	873	96,000	1.2%	1,152	288	585	3:1	2,340
Pre-Dam Average	2,535	---	1.2%	2,420	707	1,828	---	5,817
1974	2,762	162,000	2.7-3.6% avg. 3.18%	5,157	1,289	1,473	3:1	5,892
1975	1,054	146,000	1.2-1.8% avg. 1.49%	2,182	436	618	4:1	3,090
1976	3,049	273,000	1.2-2.4% avg. 1.42%	3,883	1,213	1,836	2.2:1	5,875
1977	444	63,000	1.2%	756	151	293	4:1	1,465
1978	708	99,000	1.2%	1,188	238	470	4:1	2,350
Post-Dam Average	1,603	---	---	2,633	665	938	---	3,734

* Does not include Canadian catch

Hatchery Portion Alone

Development of the proposed Wynoochee hatchery would enhance riverine, estuarine, and offshore fisheries by providing additional chinook salmon and steelhead to the total annual anadromous fish harvest by commercial, Indian, and sport fishermen over the life of the project. Treaty Indians would realize 50 percent of the Washington harvest; non-Indian sport and commercial fishermen would realize the remainder of this harvest over the project life. Non-Washington harvest of chinook would likely be predominately Canadian, as relative distribution of this catch over the project life presumably will not change significantly from existing conditions (Table 1).

As a portion of the proposed hatchery salmon production could also produce coho smolts annually for release to the Wynoochee system, all losses of natural anadromous fish production due to the existing Wynoochee Project could be more than offset by this proposal.

Depending on fish management and culture practices associated with the project, potential genetic and harvest impacts to existing natural fish stocks in the Chehalis watershed could be realized. Hatchery production of non-native salmon and steelhead at the proposed levels would likely result in reductions or losses of corresponding native stocks in the Chehalis watershed unless stocks with substantial enough differences in run timing from the native stocks were obtained. Introduction of non-native spring chinook salmon of similar run timing, for example, at the proposed rate would rapidly lead to the elimination of the native stock, which constitutes one of the last three remaining stocks on the north coast. Likewise, propagation of non-native steelhead at the proposed level could result in reduction of the existing native stocks of the Chehalis drainage, including the Wynoochee strain, which is noted for its larger-sized adults. Additionally, if non-native steelhead brood are selected, harvest at a rate consistent with the proposed hatchery production could lead to conflict with late-running native coho salmon, as the mid-winter return of this stock would substantially overlap with many non-native steelhead stocks. However, these impacts can be substantially minimized through appropriate management and culture practices to be detailed during the Advanced Engineering and Design phase.

Lessened water quality conditions below the hatchery outfall may adversely affect fish inhabiting that vicinity. Lowered dissolved oxygen, increased temperatures, and occasional presence of hatchery chemotherapeutics and disease pathogens in the hatchery outfall will reduce wild fish survival in the discharge zone. However, these effects will likely be localized and minor, as wastewater treatment will be accomplished onsite prior to discharge into the Wynoochee River.

Although streamflow below the hatchery outfall will not change from preproject levels, the 6,800-foot reach of river between the existing overflow weir and hatchery oulet may experience reduced streamflow, particularly during summer low-flow months, should the full complement of water be supplied to the hatchery during a time of minimum discharge from the reservoir. This reduced streamflow will limit resident fish populations and potential angling opportunity. However, these losses will not likely be significant as existing

resident populations are small. Additionally, this reach of river is presently closed to sport fishing year-around, and will likely remain so. A maintenance flow will be provided in this river reach as a project feature by provision of checkdams. Minimum flow requirements will be determined with the State resource agencies during the Advanced Engineering and Design phase of the planning period.

Natural production above the dam would cease in that no provision has been made in project design to allow continuation of juvenile bypass activities or adult transport above the dam.

Combined Hydropower and Hatchery Project

Effects on fish and fishing from a combined hydropower and hatchery project will essentially be the same as those described above for the hatchery portion alone. The combined plan eliminates the necessity for costly and historically inefficient fish bypass facilities associated with hydropower alone, and as with the hatchery portion alone, incorporates mitigation for the loss of upstream anadromous fish runs, as well as mitigates for loss of steelhead spawning habitat associated with the existing Wynoochee Lake project. Additionally, the hatchery water supply is expected to remain fail-safe with the combined projects, thus ensuring a dependable water system for the proposed fish culture facility.

WILDLIFE RESOURCES

Without the Project

The mixed bottomland of the upper Wynoochee Valley provides important habitat for a range of wildlife species. Of particular significance in the project vicinity are big game, furbearer, and upland game bird populations.

Lands bordering the river provide important year-long habitat for Roosevelt elk and blacktail deer. Elk and deer populations are primarily resident, with slight seasonal migrations to lower elevations, such as the proposed hatchery site, during the winter period. Winter carrying capacity of these bottomlands range from approximatley 10 to 35 elk per square mile, which is perhaps four times greater than that which occurs during the summer period (Smith, personal communication). Deer abundance information is less precise, but relative seasonal use is approximately the same.

Elk numbers are likely to be reduced in that winter insulation areas, like the proposed hatchery site, are slated for cutting by the U.S. Forest Service.

Furbearers, particularly beaver, are also important in the streamside environment of the project area where food and denning requirements are readily available. Upland game birds, such as blue and ruffed grouse, are also present in the mixed bottomland habitat where food and cover are abundant.

With the Project

With-project impacts were evaluated for three conditions: Implementation of hydropower alone; hatchery alone; and the selected combined hydropower/hatchery plan.

Hydropower Portion Alone

For the most part, addition of hydropower to the existing Wynoochee Project will have little impact to wildlife, as the proposed powerhouse would be located underground and the power transmission line would be immediately adjacent to an existing road. Reduction in stream flow from the Wynoochee tailrace to the hydropower outfall will likewise have little, if any, impact to wildlife in the affected reach.

Depending on location of borrow sources for the powerhouse construction, loss and disruption of wildlife habitat could occur, particularly if bottomlands are used for an aggregate source.

Hatchery Portion Alone

The proposed hatchery will adversely affect wildlife populations through the direct loss of habitat at the hatchery site, reduction in stream flow between the existing overflow weir and the hatchery outlet, riprapping of streambank, and the general increase in human disturbance in the hatchery vicinity.

The 50 acres of Wynoochee bottomlands used for the hatchery site will essentially be lost to larger wildlife species production and use for the life of the project. Human activity at the facility will further reduce the value of surrounding lands for wildlife use in general. Of particular concern will be the overall reduction in elk and deer carrying capacity, with a commensurate reduction in elk and deer numbers, particularly during more severe winters when the project site provides essential food and cover requirements not found at higher elevations in the watershed. In the context of overall carrying capacity of the upper Wynoochee watershed, this loss will not likely be significant, however.

Reduced streamflows between the existing overflow weir and the proposed hatchery outlet, together with streambank armoring above the proposed hatchery site, will adversely affect riparian habitat. Furbearer populations, particularly beaver, which utilize soft bank substrate and hardwoods of the riparian zone for food and cover, will be reduced in this stream reach.

Because the upriver anadromous fish run would be discontinued with hatchery construction, a seasonal food source will be lost to wildlife in the upper basin, as some of the spawned-out salmon carcasses provide food for carrion feeders, such as the bald eagle, bear, and raccoon.

Combined Hydropower and Hatchery Projects

Wildlife impacts associated with the combined project will be virtually the same as those associated with the hatchery portion alone. However, impact

could be somewhat lessened as the proposed hatchery site could serve as a borrow source for construction of the hydropower facility, additional impact from creation of a borrow pit elsewhere in the watershed could be avoided.

THREATENED AND ENDANGERED SPECIES

Pursuant to the Endangered Species Act of 1973, as amended, this agency notified the U.S. Army Corps of Engineers on January 23, 1981, as requested, that the bald eagle occurs within the proposed project area. This species is Federally listed as threatened in Washington State. We understand that the Corps is preparing a biological assessment, as required by the Act, to determine if the proposed hydropower and hatchery project will affect this species. Should that assessment conclude that the project may affect the bald eagle, the Corps is required to enter into formal consultation with this Service.

DISCUSSION

Regional policy of the Fish and Wildlife Service encourages maintenance and, where possible, restoration of natural-occurring runs of anadromous fish, with emphasis on wild fish strains over hatchery strains. The rationale for this policy is that hatchery production may, over the long term, alter the wild gene pool of native fish stocks through artificial selective pressure for such traits as early time of return and rapid hatchery growth. These traits may not be advantageous to survival in the wild. Further, hatchery runs can sustain a greater harvest rate than wild stocks, resulting in the possible reduction or loss of wild fish in a system fished at a hatchery harvest rate. These factors suggest caution in development of hatchery programs in some situations. Additionally, restoration of native spring chinook stocks in coastal Washington is a Service priority.

With regard to the Wynoochee River system and the Chehalis River basin as a whole, however, hatchery development offers a potential solution to unmet mitigation needs associated with the existing Wynoochee Project, as well as a much needed fishery enhancement tool for the overall drainage. Restoration of the diminishing anadromous fish runs above Wynoochee Dam appears unlikely without substantial further study and redesign of the existing downstream passage facility, during which time upriver stocks will likely continue to decline without hatchery inputs. Hatchery production, however, should be consistent with long-range management goals for anadromous salmonids in the Grays Harbor drainage, as hatchery outputs may detrimentally affect fish stocks basin-wide.

Accordingly, hatchery propagation of a stock non-indigenous to the Chehalis system, such as summer chinook, would reduce potential adverse impacts to any existing native stocks, including spring chinook, while providing a high quality sport and commercial fish for marine and freshwater fisheries. At the same time, low-level upriver plants of native spring chinook could assist restoration efforts for this fish. While past efforts by WDF to secure native spring chinook broodstock have met with little success, Oakville tribal catch records (Table 4) indicate at least sufficient numbers enter the river to support such an endeavor. It is possible an interagency cooperative effort

Table 4. Oakville Tribe spring chinook catch records - 1970-1980.[1]

Year	Catch	Year	Catch
1970	947	1976	388
1971	607	1977	775
1972	852	1978	559
1973	773	1979	675
1974	239	1980	286
1975	149		

1 Obtained through John Easterbrooks, Washington Department of Fisheries.

with the Tribe to secure native broodstock could succeed, with maintenance of historical distributions as a planning criteria.

With regard to steelhead, propagation of only native stocks at the proposed levels would reduce potentially adverse impacts to the Chehalis basin gene pool, although the steelhead/coho harvest conflict could adversely affect the late-run coho. A program of fry or fingerling outplants aimed at maintaining historical distributions of coho may reduce this impact, however. Needs and opportunities for anadromous fish restoration in the entire watershed should be addressed via a long-term study in order to maximize fishery benefits over the life of the proposed project.

From a siting standpoint, the proposed hatchery location appears to have an excellent water source, which is all-important in fish culture, particularly for those species under consideration. However, development of this bottomland site will destroy 50 acres of important elk range, as well as riparian habitat of value to beaver and other wildlife. Additional habitat treatment at existing wildlife mitigation areas in the Wynoochee basin may offset wildlife losses incurred at the Wynoochee hatchery site and should be considered in further project planning.

Development of hydropower in conjunction with the hatchery proposal is preferable over development of hydropower alone, as the proposed hatchery facility provides an opportunity to mitigate anadromous fish production above Wynoochee Reservoir that would be jeopardized by a hydropower water withdrawal system in Wynoochee Dam. A lesser consideration is that borrow materials for the hydropower project construction could be obtained from the proposed hatchery site, rather than impacting another location. Development of hydropower alone would require measures to offset all anticipated passage losses to downstream fish migrants, either through inclusion of an attraction/collection device in the existing Wynoochee Dam, or hatchery production plantings of anadromous fish sufficient to offset all upstream losses.

Without development of the proposed hatchery or significant improvement in the existing downstream passage facility in Wynoochee Dam, other, perhaps less viable, means will be necessary to achieve mitigation for original Wynoochee Project anadromous fish losses.

In an attempt to achieve optimum production, we would find it desireable to maintain natural production above the dam, as well as fish culture production below the dam. In the case of a combined hatchery and hydropower construction, several reasons give the Service cause to reluctantly accept termination of above-dam natural production. The existing production above Wynoochee Dam is, in a sense, already artificially maintained since adults are physically transported by truck around the dam. Because the existing juvenile bypass facility would become obsolete, construction of an expensive new system to shunt fish around the hydropower facility would be necessary. There is no reason to believe a new system would be any more effective than the present one. The primary cause for the ineffectiveness of the present system is the less-than-desireable attraction of juveniles to the outlet points, due to low average flows, resulting in migrational delays and residualism in the lake

itself. Because flow regime would not change from pre-project values, this problem would continue to plague the bypass system. The steelhead run has been almost totally eliminated. The State of Washington has therefore approached the Corps of Engineers and asked for full steelhead mitigation. If something is not done for the coho run, they may, in turn, suffer the same demise. Hatchery production would more than offset the loss to fisheries resulting from termination of natural production above the dam. For these reasons, we, like the Washington Departments of Fisheries and Game, accept termination of natural production as a project feature for the selected combined hatchery and hydropower plan.

In the opinion of the Service, there is not sufficient justification to terminate natural production above the dam if the hatchery portion alone is constructed without a hydropower facility. The existing bypass structure could still be operated and adults collected and transported above the dam. If present multi-level outlets were used as a water source for the hatchery, salmonid mortality presently suffered at the tailrace would probably be reduced, increasing the effectiveness of the bypass facility.

RECOMMENDATIONS

Hydropower Portion Alone

We recommend that:

1. Measures be incorporated in further project design to offset all anticipated passage losses to downstream fish migrants resulting from addition of hydropower generation to the existing Wynoochee Project. Such measures may include an attraction/collection device in the existing Wynoochee Dam Project and/or artificial production of anadromous fish in numbers equivalent to the total upstream watershed potential.

2. As presently proposed, water flow and quality be maintained at preproject levels to avoid adverse impact to downstream fishery values.

3. Selection of borrow sites for construction materials be coordinated with Federal and State resource agencies to minimize wildlife impacts in the upper Wynoochee basin.

Hatchery Portion Alone

We recommend that:

1. Fish production at the proposed facility should emphasize protection of native Chehalis system stocks, and should be compatible with long-range management goals of Washington Departments of Fisheries and Game.

2. Funds for a comprehensive, long-term examination of anadromous fish restoration needs and potentials in the Chehalis drainage be included in your authorization request in order to maximize fish production benefits from the proposed hatchery over the project life.

3. Maintenance flows between Wynoochee Dam and the hatchery outfall be included as a project feature.

4. As presently proposed, water flow and quality be maintained at preproject levels to avoid adverse impact to downstream fishery values.

5. Natural production above the dam be maintained to at least pre-project levels.

6. As presently proposed, natural vegetation destruction be minimized at the project site and revegetation accomplished when feasible.

Combined Hydropower and Hatchery Projects

We recommend that:

1. Fish production at the proposed facility should emphasize protection of native Grays Harbor stocks, and should be compatible with long-range management goals of Washington Departments of Fisheries and Game.

2. Funds for a comprehensive, long-term examination of anadromous fish restoration needs and potentials in the Chehalis drainage be included in your authorization request in order to maximize fish production benefits from the proposed hatchery over the project life.

3. Maintenance flows between Wynoochee Dam and the hatchery outfall be included as a project feature.

4. As presently proposed, water flow and quality be maintained at preproject levels to avoid adverse impact to downstream fishery values.

5. As presently proposed, natural vegetation destruction be minimized at the project site and revegetation accomplished when feasible.

REFERENCES

Dunn, C. 1978. Evaluation of downstream fish passage at the multi-level outlet pipes at Wynoochee Dam. Washington Department of Fisheries. 96 pp.

LaVoy, L. and Fenton, J. 1978. Evaluation of adult steelhead returns to Wynoochee River from smolt releases 1973, 1974, and 1975 and comparisons with juvenile studies. Contract #DACW 67-73-C-0057. Washington Department of Game. 34 pp.

Smith, Jack. October 1980. Washington Department of Game. Personal communication.

U.S. Fish and Wildlife Service. 1967. Detailed Fish and Wildlife Coordination Act Report for Wynoochee Dam and Reservoir Project. 15 pp.

APPENDIX

Agency comments on the draft Coordination Act report

JOHN SPELLMAN
Governor

ROLLAND A. SCHMITTEN
Director

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600

April 21, 1981

Mr. Charles Dunn, Field Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
Ecological Services
2625 Parkmont Lane, S.W.
Building E-3
Olympia, Washington 98502

Dear Chuck:

We have reviewed the draft Coordination Act report entitled Wynoochee Hydro-power Project, Wynoochee Hatchery Project and find that it generally presents an accurate appraisal of project impacts to salmon stocks of the Wynoochee River. Some specific comments are offered which should be considered in your preparation of the final report.

Page 1, paragraph 4. Our data indicates that the former remnant run of spring chinook has probably been completely lost in recent years.

Page 5, paragraph 3. Due to the lack of references, we are unable to comment specifically on the percentages cited in the second sentence. We suggest, however, that the current data bases available from Morris Barker and Rich Lincoln of WDF's Harvest Management Division should be used for any such analysis. The third sentence should be revised to state that treaty Indians are entitled to up to one-half the allowable catch subject to the moderate living standard.

Page 5, paragraph 4. The referenced salmonid escapement numbers were offered by various agency representatives during early project discussions as the best estimates available. A footnote to this effect should be included in the final report to prevent acceptance of the numbers as anything except early estimates. In addition, although recent fall chinook surveys indicate that some limited spawning occurs above Wynoochee Canyon, nearly all occurs below the canyon. Approximately 65 to 75 percent spawn in the mainstem below the canyon and the balance in Carter and Schaefer Creeks. With respect to coho salmon, the area above the dam once supported a valuable early-run stock that has probably been lost or at least greatly diminished (due primarily to lower river fish passage problems below the diversion).

Page 6, Table 1. These data need to be updated since WDF Progress Report No. 49 is somewhat out-of-date. The current stock model data needed for this table can be obtained from Rich Lincoln.

Page 7, paragraph 2 and Page 8, Table 2. Any analysis of stock status must also include such factors as harvest and artificial production releases in addition to escapement data. We provided such an analysis in a November 1979 letter to Mr. Steven F. Dice (Seattle District, Corps of Engineers) but did not receive a response. We will be updating this analysis due to the newer data base now available, including complete 1979-80 and 1980-81 escapement counts. Although useful as reference material, your Table 2, Anadromous Fish Returns to the Wynoochee Project Barrier Dam Collection Facility does not provide enough information to draw the conclusions reached in the statement regarding salmon production trends.

Page 9, paragraph 3. With respect to the introduction of non-native spring or summer chinook stocks, adverse impacts could be forecasted for the upper Chehalis River native stocks only if the runs overlapped to such a degree that their respective harvests could not be separated and controlled by practical fisheries management measures. Even if this occurred while the two stocks were mixed in Grays Harbor and the lower Chehalis River, there would still be additional harvest options for hatchery fish within the Wynoochee River system.

Page 12, paragraph 1. The current WDF long-range management intent is that all Grays Harbor fall salmon runs originating below the Chehalis Indian reservation should be managed for their full natural production potential. To date, this intent, as expressed in the actual management practices of recent years, has not been formally challenged by the Quinault Indian Nation (the only Indian group with current treaty fishing rights inside Grays Harbor).

Page 12, paragraph 2. Reference to use of a "native" spring chinook stock from the Wynoochee itself should be deleted. The closest thing to a native stock would be fish from the upper Chehalis, particularly the Skookumchuck system. Even here, a past WDF effort relative to broodstock collection failed, indicating that anything approaching an adequate egg source for a major hatchery operation would have to come from outside the Grays Harbor drainage. In addition, the upper Chehalis native stock would yield a Wynoochee hatchery return of comparable run timing, even if broodstock collection proved to be cost effective.

With respect to your recommendations, we believe that the only way in which this project can make a reasonable case for feasibility is via use of non-local spring and/or summer chinook broodstock as an up-front "given". In the past, failures to secure preferred broodstocks for other facilities have typically led to pressures for "filling the ponds" with whatever stock or species is available at a given point in time. This problem should be recognized at the onset, even if it results in rejection of a proposed project for biological or other reasons.

We hope our comments will be useful to you in the preparation of the final draft. If you have any questions, please contact Sam Wright (753-3621).

Sincerely,

by Sam Wright

for Rolland A. Schmitten,
Director.

JOHN SPELLMAN
Governor

STATE OF WASHINGTON
DEPARTMENT OF GAME
600 North Capitol Way, GJ-11 • Olympia, Washington 98504 • (206) 753-5700

May 6, 1981

Charles Dunn
Field Supervisor
United States Department of Interior
Fish and Wildlife Service
Ecological Services
2625 Parkmont Lane, S.W. Bldg. B-3
Olympia, Washington 98502

Dear Chuck:

We have reviewed your draft Fish and Wildlife Coordination Act Report for the Wynoochee Hydropower and Wynoochee Hatchery projects. We concur with your recommendations with limited exceptions. The following are our comments, by page.

Page 1, third paragraph. Suggest starting the second sentence of this paragraph with, "Some of the many species are..." Remove "included are".

Page 1, fourth paragraph, and page 5, second paragraph. We don't believe any Dolly Varden are produced in the Chehalis Basin. Some may stray into the Wynoochee, but only rarely.

Page 5, third paragraph under Fishery Resources states there were 4,300 steelhead and 3,300 sea-run cutthroat spawning in the system annually. Additional fish were taken in the sport harvest. We estimate the steelhead run was actually over 6,000 fish.

Page 5, last paragraph. Mitigation was for a hatchery to rear enough steelhead smolts to maintain the run size at 6,000 fish, plus sufficient additional steelhead to replace lost sea-run cutthroat. Steelhead replaced sea-run cutthroat because we did not have a sufficient broodstock of sea-run cutthroat.

It is important to note the contract signed by the Corps and Game does not discuss numbers of smolts to be released. The actual agreement is to return 1,700 additional anadromous game fish adults to the Wynoochee River.

We estimate an additional 558 steelhead (9.3% of 6,000) and 130 sea-run cutthroat were produced from the upper water shed, not 400 total you report.

Page 7, under "With the Project - Hydropower Project". We need assurance that if only the hydro project is built a multi-level intake structure will be included to control water temperature.

Page 9, 1st complete paragraph. If coho are produced to replace native anadromous fish losses, spring chinook production will be reduced.

Page 9, 2nd complete paragraph. The facts you state about propagation of non-native fish are true, but the Department plans to use only native Chehalis Basin fish.

Page 9, 4th complete paragraph. We agree with your statement, but we need to say a minimum flow will be required.

Some place under Fisheries Resources with the project, we recommend a screen system be designed to keep resident fish in the lake. This would allow increased resident fish production in the reservoir.

Page 12, 3rd complete paragraph. We believe potential exists to develop wildlife habitat on the 50 acres impacted. We suggest about 30 acres be provided adjacent to the 50 acres hatchery plot. These 30 acres could be developed to increase wildlife carrying capacity and mitigate impacts.

Page 13, under Recommendations - Hatchery Project.

Number 2. If funds are provided for a long-term examination in the Chehalis Basin, they should go to the Department of Game for anadromous game fish.

Number 4. It is possible wildlife mitigation could be done at the hatchery site with some additional land set aside and developed. However, the mitigation could occur at existing mitigation lands.

Except for the few changes recommended, we believe the report was well done with good information provided.

Sincerely,

THE DEPARTMENT OF GAME

James G. Fenton, Wildlife Biologist
Habitat Management Division

JGF:mjf

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Environmental & Technical Services Division
P.O. Box 4332, Portland, Oregon 97208

June 8, 1981 F/NWR5:MET:cd

Charles A. Dunn, Field Supervisor
U.S. Fish and Wildlife Service
Olympia, Washington 98502

Dear Mr. Dunn:

On May 14, you and members of my staff discussed several comments pertaining to your March 30, draft report for Wynoochee hydropower and hatchery projects. As agreed we are providing these following comments.

1. We agreed that both fish passage and the fish hatchery would be requested, rather than having the hatchery substitute for passage. This was necessary to achieve one essential goal - to maximize fish produced from Wynoochee system. Maintaining and improving passage through improvements in outlet facilities needed for hydroelectric power production would encourage restoration of those runs using the system prior to the existing project. Then by adding substantial production through construction of the fish hatchery we could achieve both restoration and enhancement. Therefore, the recommendations should be modified to prevent the misunderstanding that the hatchery is an acceptable substitute for fish passage.

2. The existing project operation mode should not be considered as a given constraint. If changes in water releases are desired to achieve better fish passage or spawning or rearing conditions, now is the time to make such a request, prior to reauthorization. We should work with the Corps of Engineers to assure that anticipated hydropower development improves the aforementioned conditions needed for anadromous fish.

3. Apparently the adult collection fa ility does not adequately function at high flows. The project should include modification of that facility.

4. Fish passage studies associated with the improvements for the new hydropower project should be required. (Only hatchery studies had been contemplated).

5. The report should specify the amount of flow needed between the dam and the hatchery outfall.

10TH ANNIVERSARY 1970-1980
National Oceanic and Atmospheric Administration
A young agency with a historic tradition of service to the Nation

Charles A. Dunn

We appreciate the opportunity to meet with you and to comment on this project. If we can be of further assistance please let me know.

Sincerely yours,

Dale R. Evans

Dale R. Evans
Division Chief

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASHINGTON 98124

NPSEN-PL-ER

8 MAY 1981

Charles A. Dunn, Field Supervisor
U.S. Fish and Wildlife Service
2625 Parkmont Lane Southwest, Building B-3
Olympia, Washington 98502

Dear Mr. Dunn:

We have completed our review of the draft Wynoochee Hydropower/Fish Hatchery Fish and Wildlife Coordination Act (FWCA) Report which was transmitted to our office by your letter dated 30 March 1981. Our major comments on the report, including responses to the report recommendations, are attached as inclosure 1. Additional comments are provided in the attached copy of the report (inclosure 2).

The responses to the report recommendations were discussed between Ms. Karen Northup of my staff and Mr. Jeff Opdycke of your staff on 28 April 1981. They recognized that additional coordination may be necessary to resolve recommendation (4) regarding wildlife mitigation for the combined hydropower/hatchery project. Please note that we have responded in detail only to those recommendations made for the combined project as this is the plan we have tentatively selected for recommendation to Congress. In our initial stages of planning, we were pursuing study of separate hydropower and hatchery projects at Wynoochee Dam; however, the decision was made to combine the two separate projects into one integrated plan. Accordingly, in order to be consistent with our draft feasibility report, we are requesting throughout your report that references to the "hydropower and hatchery projects" be revised to read the "hydropower and hatchery portions" of the combined plan.

Our draft Wynoochee Hydropower/Fish Hatchery feasibility report and environmental assessment are scheduled for public review starting in mid-June 1981. We prefer to include the final signed FWCA report in our report for public review. In order for that to occur, we would have to receive the final FWCA report by 1 June 1981. If that is not possible, we request that you provide us with the final report by 1 July 1981 so it may be available prior to the final public meeting, tentatively planned for mid-July.

We are pleased with the overall quality of the draft FWCA report and particularly wish to thank Messrs. Bob Wunderlich, Jim Bottorff, and Jeff Opdycke

NPSEN-PL-ER
Charles A. Dunn

for their efforts in preparing a clear, concise document. Should you or your staff have any questions regarding our comments, please call Ms. Northup, Environmental Coordinator, at FTS 399-3624. She will be contacting Mr. Opdycke in the near future to arrange any additional coordination necessary before finalization of your report and its recommendations.

Sincerely,

R.P. Sellevold

R.P. SELLEVOLD, P.E.
Chief, Engineering Division

2 Incl
As stated

Copy furnished w/incl:
Mr. Jeff Opdycke
U.S. Fish and Wildlife Service
2625 Parkmont Lane Southwest, Building B-3
Olympia, Washington 98502

NPSEN-PL-ER 30 April 1981

SUBJECT: Seattle District Comments on the Draft Fish and Wildlife Report for the Wynoochee Hydropower/Fish Hatchery Study

1. Description of Project Area, Page 1. In the Wynoochee draft feasibility report, the project area is termed the plan area. For consistency, we recommend the same be done in the FWCA report. In planning terminology, until a plan is authorized and enters advanced engineering and design, it is usually referred to as a plan not a project.

2. Description of Projects, Page 1. The selected plan is the combined hydropower/fish hatchery project and it should be presented as such in the draft FWCA report. To that end, the title of the section should be revised to read "Description of the Selected Plan" and the hydropower and fish hatchery project should be referred to as "portions" of the combined plan. Refer to inclosure 2 for recommendations regarding the organization of this section.

3. Hydropower Project, Page 4, First Complete Paragraph. Because hydropower is a portion of the integrated plan, a fish attraction facility to bypass downstream migrants will not be necessary. This paragraph should be rewritten to reflect that development of hydropower only would have required a fish passage facility, but such is not necessary with the combined plan. Suggested wording is "Development of the hydropower portion alone, without the fish hatchery, would provide no enhancement of the anadromous fisheries and would require a costly fish attraction and bypass facility at Wynoochee Dam to pass downstream migrants."

4. Hatchery Project, Page 4, Second Paragraph. Revisions, as provided in inclosure 2, are necessary in this paragraph to clarify "with project" flow conditions. The hatchery is designed for a water supply of 190 c.f.s. Except for the months of May and June, 190 c.f.s. is the operational minimum flow from the existing Wynoochee Dam. In May and June, the operational minimum flow may drop to 140 c.f.s. The powerhouse is designed to utilize the 190/140 c.f.s. minimum flow from the existing project up to a hydraulic capacity of 1,200 c.f.s. Discharge from the reservoir that is not passed though the powerhouse would be discharged from the existing dam's multilevel outlets, sluices, and/or spillway. The water supply system to the hatchery is designed with an intake structure at the hydropower outlet which can be supplied with water from either the powerhouse or the dam discharges. Accordingly, should the powerhouse be shut down for any reason, water supply to the hatchery would not be interrupted.

5. Hydropower Project, Page 5, Top Paragraph. If the hydropower were developed alone, the existing program of transporting anadromous fish for release above Wynoochee Dam would continue. With the hatchery alone, as well as with the combined plan, the program would be discontinued. Suggest

Incl. 1

deletion of the paragraph at the top of page 5 and insertion of the following as a final paragraph to the Hatchery Project discussion on page 5: "The fish hatchery would result in the termination of the anadromous fish runs above Wynoochee Dam but would enhance the overall anadromous fishery resources in the Chehalis River Basin, Grays Harbor area, and northern Pacific Ocean. With the hatchery, the existing program of transporting fish above Wynoochee Dam would be discontinued. Mitigation for the lost upstream runs, as well as the mitigation for the previous loss of steelhead spawning habitat associated with the existing Wynoochee Lake project, would be incorporated as part of the hatchery production."

6. With the Project, Page 7. For clarification, after With the Project, add "With project impacts were evaluated for three conditions: implementation of hydropower alone; hatchery alone; and the selected combined hydropower/fish hatchery plan." The same sentence should be added after With the Project on page 10.

7. With the Project, Hatchery Project, Page 9, Second Complete Paragraph. This paragraph discusses the potential adverse impacts of the hatchery on native stocks but does not indicate that these impacts could be minimized with appropriate management and culture practices. The hatchery plan, as now proposed, is to propagate Wynoochee River native stock steelhead and Skookumchuck stock spring chinook salmon. Accordingly, the negative impacts discussed may not be realized. This point should be noted in the referenced paragraph.

8. Recommendations, Page 13. We have provided detailed responses only to these recommendations provided for in the combined hydropower/hatchery project as this is the plan we have tentatively selected for recommendation to Congress. We basically concur with your recommendations for the hydropower project; there is no need to respond separately to the recommendations for the hatchery project as they are the same as for the combined plan.

a. Recommendation 1. Concur. It is the intent of the hatchery portion of the proposal to emphasize protection of native Grays Harbor stocks and to be compatible with long-range management goals of the Washington Departments of Fisheries (WDF) and Game (WDG). In a letter dated 6 March 1981, the Governor of the State of Washington provided the Corps a letter of intent to become the local sponsor of the hatchery. The Corps views this letter as indication that enhancement of the anadromous fish runs in the Chehalis River Basin is a high state priority and that the Wynoochee hatchery offers the state an opportunity to achieve a portion of a recognized need.

b. Recommendation 2. Concur. Examination of anadromous fish restoration needs and potentials in the Chehalis River drainage in order to maximize fish production benefits from the hatchery is included in the authorization request as part of the monitoring program over the life of the hatchery. The current estimated cost of the monitoring program is an annual amount of $159,000. Other aspects of this program would include postconstruction water quality monitoring of the hatchery effluent, assessment of the effects of the effluent on the biota of the Wynoochee River and of any

consequent increases in salmonid and resident fish natural production downstream of the hatchery outlet, and evaluation of fishery contribution rates and hatchery management strategies of Wynoochee hatchery released fish for the purpose of maximizing harvest with minimal impact on wild stocks. Information from the monitoring program would provide continual input to fisheries management of the Chehalis River Basin and Grays Harbor area as well as provide important data on salmonid production for application in other watersheds. The details of the monitoring program for the Wynoochee hatchery would be formulated in coordination with state and Federal fisheries agencies, Indian tribes, and interested public during advanced engineering and design studies.

c. Recommendation 3. Flow in the Wynoochee River in the 6,800-foot reach between the existing overflow weir and the hatchery outlet could become extremely low should the full compliment of water be supplied to the hatchery during a time of minimum flows (190/140 c.f.s.) from the reservoir. The impacts of a low flow in that reach would primarily be reduced visual esthetics and a lower aquatic production. We believe an exception to a minimum flow requirement is warranted in this case because the impacts of low flow would not be significant and provision of a minimum flow during a low flow period may result in decreased water supply to the hatchery and a subsequent decrease in fish production. We will continue our coordination with the State of Washington during advanced engineering and design studies to determine the requirement for, and amount of, minimum flows for the subject reach. A concrete weir in the river just upstream of the powerhouse tailrace would assure water in the 400-foot reach of the river between the main dam and powerhouse tailrace. Downstream of the hatchery outlet, the river discharge would be the same as that without a hatchery and powerhouse project.

d. Recommendation 4. As stated in the draft FWCA report, page 10, last sentence, "In the context of overall carrying capacity of the upper Wynoochee watershed, this loss (referring to the loss of 50 acres of wildlife habitat due to hatchery construction) will not likely be significant." We concur with your evaluation, and because the impacts to wildlife in the upper Wynoochee watershed would not likely be significant, we believe mitigation is not warranted. Further, as a result of our impact evaluation, we believe the unavoidable adverse wildlife impacts to be a tradeoff that would be more than offset by the enhancement of the anadromous fishery of the Chehalis River Basin and consider the with project condition an overall net plus to the environment. In order to give your recommendation further consideration, we would require additional information from you regarding its scope, justification, and cost of implementation. Since we determined that impacts to wildlife would not be significant, we did not explore mitigation alternatives ourselves.

e. Recommendation 5. No adverse impacts to downstream fishery values are expected to result from the recommended plan. As discussed in c above, downstream of the hatchery outlet the river discharge would be the same as

that without a hatchery and powerhouse project. Water supply to the hatchery and the operation of the powerhouse would not result in a change to the existing operational mode of Wynoochee Dam, and river discharge frequency in the Wynoochee River would not change from existing conditions. The powerhouse would operate as baseload and would not be operated for peaking. Accordingly, no flow-related adverse impacts to downstream fishery values would occur.

Short-term increases in suspended sediment and turbidity would occur in the Wynoochee River and reservoir during instream construction activities associated with the recommended plan. Although increases in turbidity may result in exceeding the Washington State water quality standard, the effect on water quality is not considered significant due to the short-term, localized nature of the impact. The construction contractor(s) would be required to utilize methods which would minimize turbidity. Cofferdams would be used for instream construction of the hatchery supply pipeline crossings, the hatchery outlet channel, and the powerhouse outlet structure to minimize impacts to water quality.

The powerhouse intake would be a selective withdrawal structure to maintain preproject water quality from reservoir releases. The hatchery effluent could affect water quality by the addition of nutrients to the Wynoochee River with resulting increases in aquatic productivity and an alteration in the aquatic benthic community in the area near the effluent outlet. The impact may be beneficial to downsteam fishery values because aquatic productivity in the Wynoochee River is rather low naturally.

As a project feature of the hatchery, a pollution abatement pond would be constructed for treatment of the water from the raceways and rearing ponds during cleaning. Additionally, when chemotherapeutics are used in large doses, the waters would be routed to the pollution abatement pond. The hatchery would be operated to meet the effluent limitations established by the Environmental Protection Agency for suspended and settleable solids, and the limitations for other parameters (biological oxygen demand, nitrates, ammonia, fecal coliforms, etc.) as determined by the Washington State Department of Ecology in cooperation with the WDG and WDF. Water quality monitoring would be accomplished at the outlet, and if allowable limits were approached, provision would be made for treatment of the effluent water prior to release to the river. The carcasses of returning adult salmon and steelhead used for spawning or surplus to spawning needs would be sold commercially under WDG and WDF policies or disposed of in an approved landfill. These procedures, as required by Federal law, would eliminate water quality impacts generated from large quantities of carcasses decomposing in the Wynoochee River. All domestic wastes from the hatchery and residences would be treated by a septic tank system.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E.
BIN C15700
Seattle, WA 98115

F/NWR5:MET

NOV 13 1981

Colonel Norman C. Hintz
District Engineer, Seattle District
Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Hintz:

We have concluded that Wynoochee Hydropower/Fish Hatchery Project should proceed as you have proposed, after review of the July 1981 Fish and Wildlife Service (FWS) report transmitted to you on July 2, and discussions with your staff on October 29.

For mitigation we are satisfied that your staff has carefully analyzed the costs involved in fish passage as compared to additional capacity within the hatchery. In this instance, where the hatchery is intended to be an integral part of the total project, hatchery expansion for mitigation is the most reasonable alternative.

We appreciate the efforts of your staff in resolving our concerns.

Sincerely,

Thomas E. Kruse

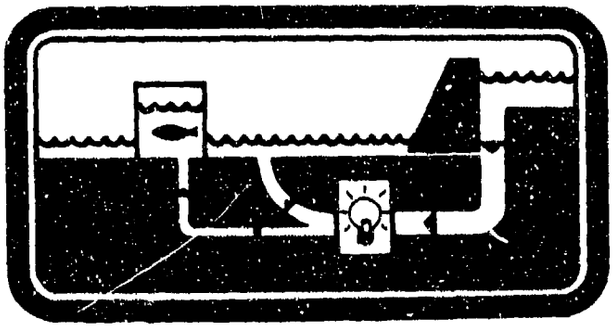
for H. A. Larkins
Regional Director

cc: Fish and Wildlife Service, Olympia

10TH ANNIVERSARY 1970-1980
National Oceanic and Atmospheric Administration
A young agency with a historic
tradition of service to the Nation

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX E

APPENDIX E

DESIGN AND COST ESTIMATES

TABLE OF CONTENTS

Number		Page
	COST ESTIMATE SUMMARY TABLES	
E-1	Design Option 1	E-1
E-2	Design Option 2	E-2
E-3	Design Option 3	E-3
E-4	Design Option 4	E-4
E-5	Design Option 5	E-5
	DETAILED COST ESTIMATE TABLE	
E-6	Recommended Plan	E-6
	DESIGN DETAIL PLATES	
E-1	Wynoochee Hydropower/Fish Hatchery Recommended Plan - Design Details I	
E-2	Wynoochee Hydropower/Fish Hatchery Recommended Plan - Design Details II	
E-3	Wynoochee Hydropower/Fish Hatchery Recommended Plan - Design Details III	

TABLE E-1

COST ESTIMATE SUMMARY

DESIGN OPTION 1

UNDERGROUND HYDROPOWER ONLY

Account No.	Feature or Item	April 1980 Item Cost ($1,000)	April 1980 Feature Cost ($1,000)	October 1981 Cost ($1,000)
01	LANDS AND DAMAGES		$10	$10
04	DAM		4,620	5,180
.4	Power Intake Works	$4,620		
06	FISH AND WILDLIFE FACILITIES		3,880	4,350
	Downstream Fish Bypass Facility	3,880		
07	POWERPLANT		10,970	12,290
.1	Powerhouse	4,750		(5,320)
.2	Turbines and Generators	3,880		(4,350)
.3	Accessory Electrical Equipment	860		(960)
.4	Miscellaneous Powerplant Equipment	200		(220)
.5	Tailrace	1,070		(1,200)
.6	Switchyard	210		(240)
19	BUILDINGS, GROUNDS, AND UTILITIES		250	280
20	PERMANENT OPERATING EQUIPMENT		170	190
	Subtotal		$19,900	$22,300
30	ENGINEERING AND DESIGN		1,600	1,800
	Engineering and Design (7-1/2 percent)	1,480		(1,680)
	Model Studies	120		(120)
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		1,300	
	Subtotal (April 1980 Price Level)		$22,800	
	Increase Price Level to October 1981 (+12 percent)		2,700	
	TOTAL (October 1981 Price Level)		$25,500	$25,500

TABLE E-2

COST ESTIMATE SUMMARY

DESIGN OPTION 2

SURFACE HYDROPOWER ONLY

Account No.	Feature or Item	April 1980 Item Cost ($1,000)	April 1980 Feature Cost ($1,000)	October 1981 Cost ($1,000)
01	LANDS AND DAMAGES		$20	$20
04	DAM		5,840	6,540
.4	Power Intake Works	$5,840		
06	FISH AND WILDLIFE FACILITIES		3,880	4,350
	Downstream Fish Bypass Facility	3,880		
07	POWERPLANT			8,960
.1	Powerhouse	2,520		(2,820)
.2	Turbines and Generators	3,740		(4,190)
.3	Accessory Electrical Equipment	590		(660)
.4	Miscellaneous Powerplant Equipment	250		(280)
.5	Tailrace	690		(770)
.6	Switchyard	210		(240)
08	ROADS, RAILROADS, AND BRIDGES		140	160
19	BUILDINGS, GROUNDS, AND UTILITIES		250	280
20	PERMANENT OPERATING EQUIPMENT		170	190
	Subtotal		$18,300	$20,500
30	ENGINEERING AND DESIGN (7-1/2 percent)		1,500	1,660
	Engineering and Design (7-1/2 percent)	1,380		(1,540)
	Model Studies	120		(120)
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		1,200	1,340
	Subtotal (April 1980 Price Level)		$21,000	
	Increase Price Level to October 1980 (+6 percent)		2,500	
	TOTAL (October 1980 Price Level)		$23,500	$23,500

TABLE E-3

COST ESTIMATE SUMMARY

DESIGN OPTION 3

FISH HATCHERY ONLY

Account No.	Feature or Item	April 1980 Item Cost ($1,000)	April 1980 Feature Cost ($1,000)	October 1981 Cost ($1,000)
01	LANDS AND DAMAGES		$180	$200
06	FISH AND WILDLIFE FACILITIES		15,540	17,440
	Fish Hatchery	$15,540		
20	PERMANENT OPERATING EQUIPMENT		680	760
	Subtotal		$16,400	$18,400
30	ENGINEERING AND DESIGN		1,300	1,420
	Engineering and Design (7-1/2 percent)	1,250		(1,370)
	Model Studies	50		(50)
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		1,100	1,180
	Subtotal (April 1980 Price Level)		$18,800	
	Increase Price Level tc October 1981 (+12 percent)		2,200	
	TOTAL (October 1981 Price Level)		$21,000	$21,000

TABLE E-4

COST ESTIMATE SUMMARY

DESIGN OPTION 4

UNDERGROUND HYDROPOWER PLUS FISH HATCHERY

Account No.	Feature or Item	April 1980 Item Cost ($1,000)	April 1980 Feature Cost ($1,000)	October 1981 Cost ($1,000)
01	LANDS AND DAMAGES		$190	$210
04	DAM		4,700	5,270
.4	Power Intake Works	$4,700		
06	FISH AND WILDLIFE FACILITIES		15,120	16,960
	Fish Hatchery	15,120		
07	POWERPLANT		11,990	13,430
.1	Powerhouse	4,750		(5,320)
.2	Turbines and Generators	3,880		(4,350)
.3	Accessory Electrical Equipment	860		(960)
.4	Miscellaneous Powerplant Equipment	200		(220)
.5	Tailrace	2,090		(2,340)
.6	Switchyard	210		(240)
19	BUILDINGS, GROUNDS, AND UTILITIES		250	280
20	PERMANENT OPERATING EQUIPMENT		850	950
	Subtotal		$33,100	37,100
30	ENGINEERING AND DESIGN		2,600	2,900
	Engineering and Design (7-1/2 percent)	2,480		(2,780)
	Model Studies	120		(120)
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		2,200	2,400
	Subtotal (April 1980 Price Level)		$37,900	
	Increase Price Level to October 1981 (+12 percent)		4,500	
	TOTAL (October 1981 Price Level)		$42,400	$42,400

TABLE E-5

COST ESTIMATE SUMMARY

DESIGN OPTION 5

SURFACE HYDROPOWER PLUS FISH HATCHERY

Account No.	Feature or Item	April 1980 Item Cost ($1,000)	April 1980 Feature Cost ($1,000)	October 1981 Cost ($1,000)
01	LANDS AND DAMAGES		$200	$220
04	DAM		5,840	6,540
.4	Power Intake Works	$5,840		
06	FISH AND WILDLIFE FACILITIES		15,120	16,960
	Fish Hatchery	15,120		
07	POWERPLANT		8,300	9,290
.1	Powerhouse	2,520		(2,820)
.2	Turbines and Generators	3,740		(4,190)
.3	Accessory Electrical Equipment	590		(660)
.4	Miscellaneous Powerplant Equipment	250		(280)
.5	Tailrace	990		(1,100)
.6	Switchyard	210		(240)
08	ROADS, RAILROADS, AND BRIDGES		140	160
19	BUILDINGS, GROUNDS, AND UTILITIES		250	280
20	PERMANENT OPERATING EQUIPMENT		850	950
	Subtotal		$30,700	$34,400
30	ENGINEERING AND DESIGN		2,400	2,680
	Engineering and Design (7-1/2 percent)	2,280		(2,560)
	Model Studies	120		(120)
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		2,000	2,200
	Subtotal (April 1980 Price Level)		$35,100	
	Increase Price Level to October 1981 (+12 percent)		4,200	
	TOTAL (October 1981 Price Level)		$39,300	39,300

TABLE E-6

DETAILED COST ESTIMATE

TENTATIVELY SELECTED PLAN

(UNDERGROUND HYDROPOWER PLUS FISH HATCHERY)

Summary

Account No.	Feature or Item	April 1980 Item Cost ($1,000)	April 1980 Feature Cost ($1,000)	October 1981 Cost ($1,000)
01	LANDS AND DAMAGES		$190	$210
04	DAM		4,700	5,270
.4	Power Intake Works	$4,700		
06	FISH AND WILDLIFE FACILITIES		15,120	16,960
	Fish Hatchery	15,120		
07	POWERPLANT		11,990	13,430
.1	Powerhouse	4,750		(5,320)
.2	Turbines and Generators	3,880		(4,350)
.3	Accessory Electrical Equipment	860		(960)
.4	Miscellaneous Powerplant Equipment	200		(220)
.5	Tailrace	2,090		(2,340)
.6	Switchyard	210		(240)
19	BUILDINGS, GROUNDS, AND UTILITIES		250	280
20	PERMANENT OPERATING EQUIPMENT		850	950
	Subtotal		$33,100	$37,000
30	ENGINEERING AND DESIGN		2,600	2,900
	Engineering and Design (7-1/2 percent)	2,480		(2,780)
	Model Studies	120		(120)
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		2,200	2,400
	Subtotal (April 1980 Price Level)		$37,900	
	Increase Price Level to October 1981 (+12 percent)		4,500	
	TOTAL (October 1981 Price Level)		$42,400	$42,400

TABLE E-6 (con.)

DETAILED COST ESTIMATE

Account No.	Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
01	LANDS AND DAMAGES					
	Hydropower					$10,000
	Powerhouse and Penstock	AC.	5	$2,000.00		
	Fish Hatchery					
	Site, Pipeline, Access Road	AC.	60	2,000.00		120,000
	Satellite Fish Stations	AC.	10	2,000.00		20,000
	Subtotal					$150,000
	Contingencies 25 Percent ±					40,000
	TOTAL					$190,000
04	DAM					
.4	Power Intake Works					
	Mobilization and Preparation	JOB	1	L.S.		1,000,000
*	Resident Engineer Facility (1/2 cost)	JOB	1	L.S.		175,000
	Foundation Excavation Rock Dry	C.Y.	500	25.00		12,500
	Foundation Concrete	C.Y.	40	275.00		11,000
	Cement	CWT	240	3.50		840
	Anchors 50K	EA.	10	700.00		7,000
	Assembly Area	JOB	1	L.S.		10,000
	Concrete	C.Y.	630	275.00		173,250
	Cement	CWT	2,836	3.50		9,926
	Resteel All	LBS.	100,000	0.45		45,000
	Filler Concrete	C.Y.	120	275.00		33,000
	Treme Concrete	C.Y.	8	185.00		1,480

*Replaceable item.

TABLE E-6 (con.)

Account No.		Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
.4		Power Intake Works (con.)					
		Cement	CWT	768	3.50		2,688
	*	Gate Guides	LBS.	55,400	2.50		138,500
		Shaft					138,376
		Excavation Rock	C.Y.	790	100.00	79,000	
		Rock Bolts 1" dia. x 15'	EA.	165	140.00	23,100	
		Shotcrete Liner	C.Y.	60	115.00	6,900	
		Concrete Liner	C.Y.	96	285.00	27,360	
		Cement	CWT	576	3.50	2,016	
		Machinery House					76,814
		Concrete Walls (tilt-up)	C.Y.	66	125.00	8,250	
		Concrete Roof and Floor	C.Y.	58	200.00	11,600	
		Cement	CWT	261	3.50	914	
		Resteel	LBS.	9,000	0.45	4,050	
	*	Machinery	JOB	1	L.S.	50,000	
	*	Roll-up Door 24' x 20'	EA.	1	2,000.00	2,000	
	*	Selective Gates (4)	LBS.	59,550	2.00		119,100
	*	Emergency Gate	EA.	1	84,000.00		84,000
	*	Trash Racks (4)	LBS.	55,110	2.00		110,220
	*	Stoplogs (16)	LBS.	167,110	2.00		334,220
		Penstocks					750,468
		Excavation Rock	C.Y.	2,300	100.00	230,000	
		Shotcrete Lining	C.Y.	133	115.00	15,295	
		Concrete Filler	C.Y.	553	285.00	157,605	
		Cement	CWT	3,224	3.50	11,284	
		Steel Lining - Plate	TON	56	3,636.00	203,616	
		Steel Lining - Stiffners	TON	13	3,636.00	47,268	
		Rock Bolts	EA.	610	140.00	85,400	
		Trifurcation					459,840
		Steel Liner	LBS.	76,000	3.50	266,000	
		Concrete	C.Y.	540	200.00	108,000	
		Cement	CWT	3,240	3.50	11,340	
	*	8.0' dia. Butterfly Valve	EA.	2	28,000.00	56,000	
	*	5.0' dia. Butterfly Valve	EA.	1	18,500.00	18,500	

*Replaceable item.

TABLE E-6 (con.)

Account No.	Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
.4	Power Intake Works (con.)					
	Powerhouse Bypass					67,715
	Excavation Rock	C.Y.	100	100.00	10,000	
	Mass Concrete	C.Y.	64	285.00	18,240	
	Steel Pipe	TON	5.7	3,636.00	20,725	
*	3.5' Diameter Butterfly Valve	EA.	1	18,750.00	18,750	
	Subtotal					$3,760,937
	Contingencies 25 Percent ±					939,063
	TOTAL					$4,700,000
06	FISH AND WILDLIFE FACILITIES					
	Fish Hatchery					
	Land Development	JOB	1	L.S.		191,300
	Roads	JOB	1	L.S.		323,100
*	Hatchery Building	JOB	1	L.S.		715,000
*	Service Building	JOB	1	L.S.		314,000
*	Freezer	JOB	1	L.S.		275,000
*	Spawn Building	JOB	1	L.S.		300,000
*	Small Service Building	JOB	1	L.S.		55,000
*	Head Tank	JOB	1	L.S.		603,000
	Raceway	JOB	1	L.S.		1,617,000
*	Salmon Holding Ponds (2)	JOB	1	L.S.		194,000
	Fish Outlet	JOB	1	L.S.		165,000
	Collection Structure	JOB	1	L.S.		110,000
	Sedimentation Pond	JOB	1	L.S.		100,000
	Salmon Rearing Ponds (3)	JOB	1	L.S.		232,000
	Steelhead Rearing Ponds (4)	JOB	1	L.S.		1,200,000
	Housing	JOB	1	L.S.		461,000
*	Domestic Water	JOB	1	L.S.		56,000
*	Fire Protection	JOB	1	L.S.		95,000
*	Domestic Sewage	JOB	1	L.S.		55,000

*Replaceable item.

TABLE E-6 (con.)

Account No.	Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
06	FISH AND WILDLIFE FACILITIES (con.)					
	* Auxiliary Power 50 kW	JOB	1	L.S.		26,000
	* Miscellaneous Mechanical	JOB	1	L.S.		660,000
	* Miscellaneous Electrical	JOB	1	L.S.		330,000
	* Visitor Facility	JOB	1	L.S.		100,000
	* Hatchery Water Distribution	JOB	1	L.S.		478,000
	Mobilization and Preparation	JOB	1	L.S.		100,000
						1,597,155
	Water Supply Line					
	Excavation Common	C.Y.	22,400	3.50	78,400	
	Pipe 6' diameter	LBS.	17,280	3.50	60,480	
	Pipe 5' diameter	LBS.	368,000	3.50	1,288,000	
	Pipe 12" diameter	L.F.	3,600	27.00	97,200	
	Embankment Gravel	C.Y.	320	10.00	3,200	
	Embankment Common	C.Y.	6,250	3.50	21,875	
	Concrete Supports	EA.	30	1,500.00	45,000	
	Anchors #8 Rebar 10'	EA.	150	20.00	3,000	
						246,500
	River Crossing at Hatchery					
	Cofferdam Diversion	C.Y.	11,500	5.00	57,500	
	Well Points	EA.	160	150.00	24,000	
	Sump Pump	JOB	1	L.S.	6,000	
	Bank Protection	JOB	1	L.S.	159,000	
						83,280
	River Crossing at Powerhouse					
	Cofferdam Division	C.Y.	5,700	5.00	28,500	
	Well Points	EA.	80	150.00	12,000	
	Sump Pump	JOB	1	L.S.	3,000	
	Concrete Incasement	C.Y.	240	150.00	36,000	
	Cement	CWT	1,080	3.50	3,780	
						1,428,570
	* Satellite Fish Stations					
	Collection Facilities	EA.	2	L.S.	491,070	
	Holding/Rearing/Imprint Ponds	EA.	2	L.S.	937,500	
	Subtotal					$12,110,905
	Contingencies 25 Percent ±					3,009,095
	TOTAL					$15,120,000

*Replaceable item.

TABLE E-6 (con.)

Account No.	Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
07	POWERPLANT					
.1	Powerhouse (Underground)					
	Excavation					1,461,800
	Excavation Rock	C.Y.	13,250	100.00	1,325,000	
	Rock Bolts 1" dia. x 15'	EA.	540	140.00	75,600	
	Rock Bolts 1" dia. x 20'	EA.	360	170.00	61,200	
	Access Shaft					610,382
	Excavation Rock	C.Y.	3,175	100.00	317,500	
	Rock Bolts 1" dia. x 15'	EA.	400	140.00	56,000	
	Shotcrete	C.Y.	150	115.00	17,250	
	Concrete	C.Y.	412	250.00	103,000	
	Cement	CWT	2,472	3.50	8,652	
	Resteel	LBS.	62,000	0.45	27,900	
	Stairway	JOB	1	L.S.	2,200	
*	Elevator	JOB	1	L.S.	55,000	
*	House at Surface	S.F.	572	40.00	22,880	
	Tilt-Up Concrete					554,636
	Powerhouse Concrete	JOB	1	L.S.	470,000	
	Shotcrete	C.Y.	406	115.00	46,690	
	Crane Rail Concrete	C.Y.	114	250.00	28,500	
	Cement	CWT	513	3.50	1,796	
	Rebar	LBS.	17,000	0.45	7,650	
	Mobilization and Preparation	JOB	1	L.S.		1,000,000
*	Resident Engineer Facility (1/2 cost)	JOB	1	L.S.		175,000
	Subtotal					$3,801,818
	Contingencies 25 Percent ±					948,182
	TOTAL					$4,750,000

*Replaceable item.

TABLE E-6 (con.)

Account No.	Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
.2	* Turbines and Generators					
	Turbines (3)	JOB	1	L.S.		1,720,000
	Generators (3)	JOB	1	L.S.		1,391,000
	Governor	JOB	1	L.S.		45,000
	Valves	JOB	1	L.S.		80,000
	Subtotal					$3,236,000
	Contingencies 20 Percent ±					644,000
	TOTAL					$3,880,000
.3	* Accessory Electrical Equipment					
	Switchgear, Breakers, and Busses	JOB	1	L.S.		360,000
	Station Service Unit	JOB	1	L.S.		50,000
	Control System	JOB	1	L.S.		150,000
	Miscellaneous Electrical Systems	JOB	1	L.S.		154,000
	Subtotal					$714,000
	Contingencies 20 Percent ±					146,000
	TOTAL					$860,000
.4	* Miscellaneous Powerplant Equipment					
	Heating and Ventilating	JOB	1	L.S.		15,000
	Station, Breaker and Governor Air	JOB	1	L.S.		5,000
	Unwatering and Drainage System	JOB	1	L.S.		36,000
	Miscellaneous Mechanical Systems	JOB	1	L.S.		29,000
	Bridge Crane	JOB	1	L.S.		80,000
	Subtotal					$165,000
	Contingencies 20 Percent ±					35,000
	TOTAL					$200,000

*Replaceable item.

TABLE E-6 (con.)

Account No.		Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
.5		Tailrace					
		Rock Excavation	C.Y.	3,542	100.00		354,200
		Rock Bolts 1" dia. x 15'	EA.	880	140.00		123,200
		Shotcrete	C.Y.	200	115.00		23,000
		Concrete	C.Y.	725	285.00		206,625
		Cement	CWT	4,350	3.50		15,225
		Resteel	LBS.	17,000	0.45		7,650
		Steel Pipe	LBS.	31,000	3.50		108,500
	*	Gates 12' x 20'	EA.	2	36,000.00		72,000
		Hydropower Outlet/Fish Hatchery Intake Structure					477,034
		Excavation Rock	C.Y.	3,465	100.00	346,500	
		Concrete	C.Y.	258	275.00	70,950	
		Cement	CWT	1,161	3.50	4,064	
		Rebar	LBS.	22,000	0.45	9,900	
	*	Trashracks	LBS.	2,660	2.00	5,320	
	*	Gate 9' x 16'	EA.	1	22,800.00	22,800	
	*	Stoplogs	JOB	1	L.S.	10,000	
	*	Guides	LBS.	1,000	3.50	3,500	
	*	Flap Gate	EA.	1	4,000.00	4,000	
		Pipe from Existing Weir					46,640
		Excavation Common	C.Y.	60	4.00	240	
		Excavation Rock	C.Y.	25	100.00	2,500	
		Pipe	LBS.	12,000	3.50	42,000	
		Cut Out Existing Weir	C.Y.	9	100.00	900	
		Grout in Pipe	JOB	1	L.S.	1,000	
		Work Area					73,509
		Excavation Rock	C.Y.	112	100.00	11,200	
		Concrete	C.Y.	38	275.00	10,450	
		Cement	CWT	171	3.50	599	
		Resteel	LBS.	2,800	0.45	1,260	
	*	Jib Crane, 2 Ton	EA.	1	L.S.	50,000	
		Access					5,117
		Excavation Common	C.Y.	29	100.00	2,900	
		Crushed Rock	C.Y.	12	15.00	180	
		Concrete Stairs	C.Y.	7	275.00	1,925	
		Cement	CWT	32	3.50	112	

*Replaceable item.

TABLE E-6 (con.)

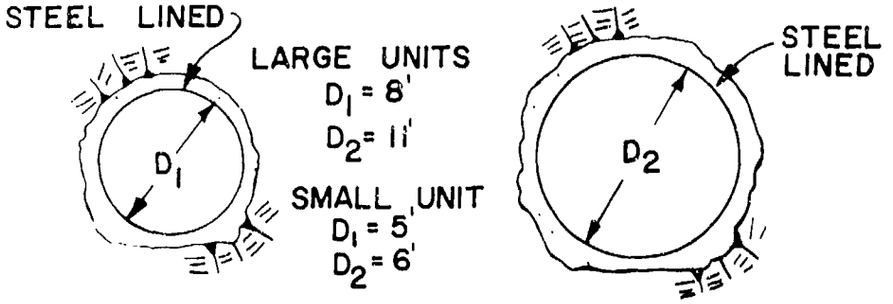
Account No.	Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
.5	Tailrace (con.)					
	Dewater Area	JOB	1	L.S.		100,000
*	6.5' dia. Butterfly Valve	EA.	1	20,000.00		20,000
*	10.0' dia. Butterfly Valve	EA.	1	40,000.00		40,000
	Subtotal					$1,672,700
	Contingencies 25 Percent ±					417,300
	TOTAL					$2,090,000
.6	* Switchyard					
	Power Transformer	JOB	1	L.S.		150,000
	Disconnects and Electrical Equipment	JOB	1	L.S.		24,000
	Subtotal					174,000
	Contingencies 20 Percent ±					36,000
	TOTAL					$210,000
19	* BUILDINGS, GROUNDS, AND UTILITIES (Hydropower)					
	Administration Building	S.F.	500	55.00		27,500
	Maintenance Building	S.F.	3,000	40.00		120,000
	Standby Power			L.S.		20,000
	Fencing	L.F.	1,500	15.00		22,500
	Gates	EA.	3	3,000.00		9,000
	Lights	EA.	10	200.00		2,000
	Subtotal					$201,000
	Contingencies 25 Percent ±					49,000
	TOTAL					$250,000

*Replaceable item.

TABLE E-6 (con.)

Account No.	Feature or Item	Unit	Quantity	Unit Price	Sub Amount	Amount
20	* PERMANENT OPERATING EQUIPMENT					
	Pickup, 1/2 ton			L.S.		6,000
	Flatbed, 2 tons			L.S.		12,000
	Mobile Crane, 15 tons			L.S.		90,000
	Portable Air Compressor			L.S.		25,000
	Hatchery Equipment			L.S.		500,000
	Fish Haul Trucks (2)			L.S.		50,000
	Subtotal					$683,000
	Contingencies 25 Percent ±					167,000
	TOTAL					$850,000

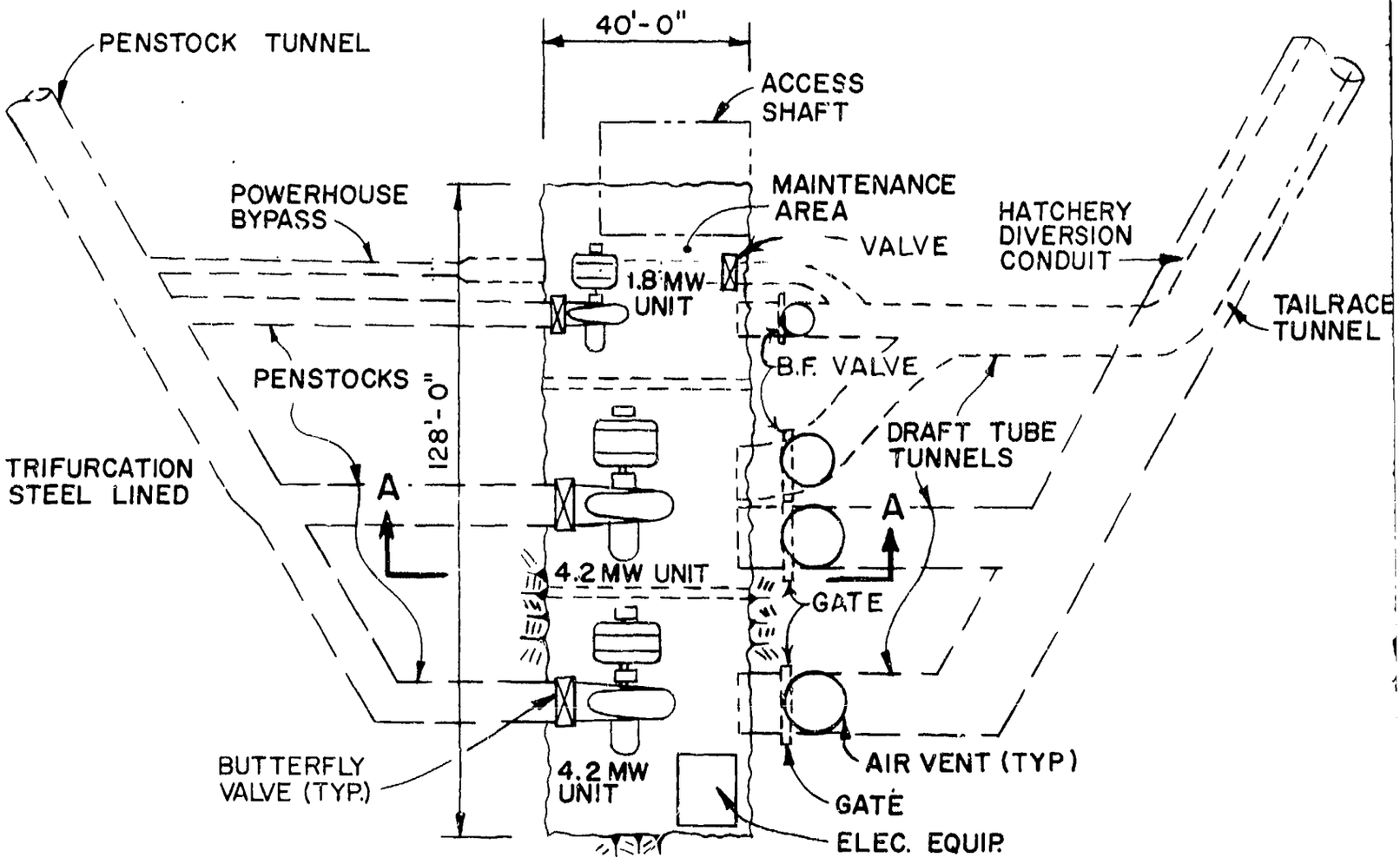
*Replaceable item.



PENSTOCKS
SCALE: 1"=10'-0"

DRAFT TUBE TUNNELS
SCALE: 1"=10'-0"

PENSTOCK TUNNEL
SCALE: 1"=10'-0"



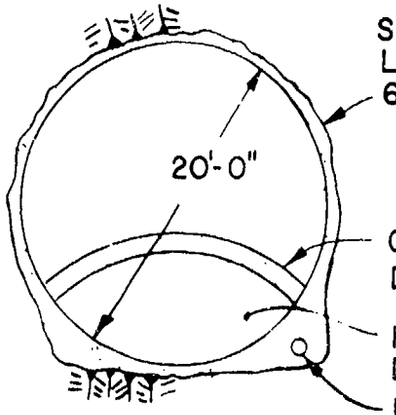
POWERHOUSE
PLAN VIEW
SCALE: 1"=30'-0"

1"= 10'-0" 10' 0' 10
1"=20'-0" 20' 0' 20
1"=30'-0" 30' 0' 30

TE

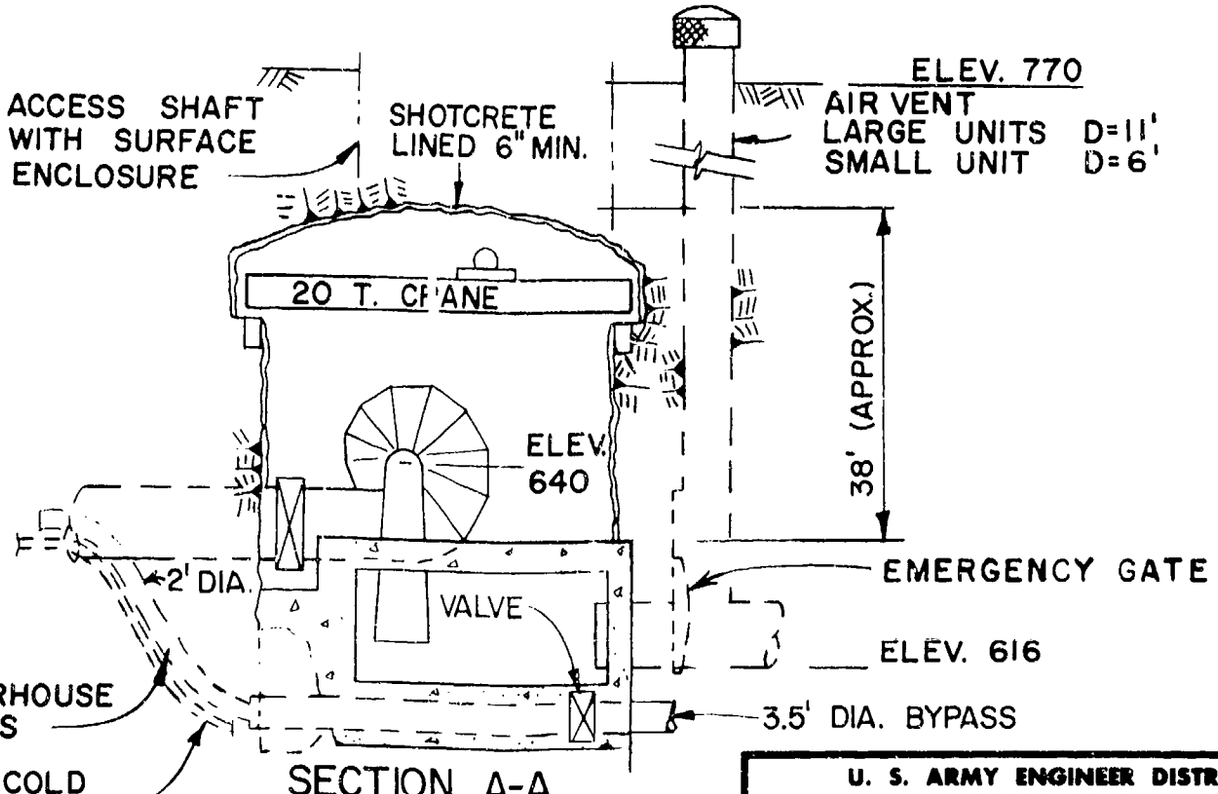
EEL LINING

LD WATER PIPE



TAILRACE TUNNEL

SCALE: 1" = 10'-0"



SECTION A-A
POWERHOUSE

CROSS SECTION
SCALE: 1" = 20'-0"

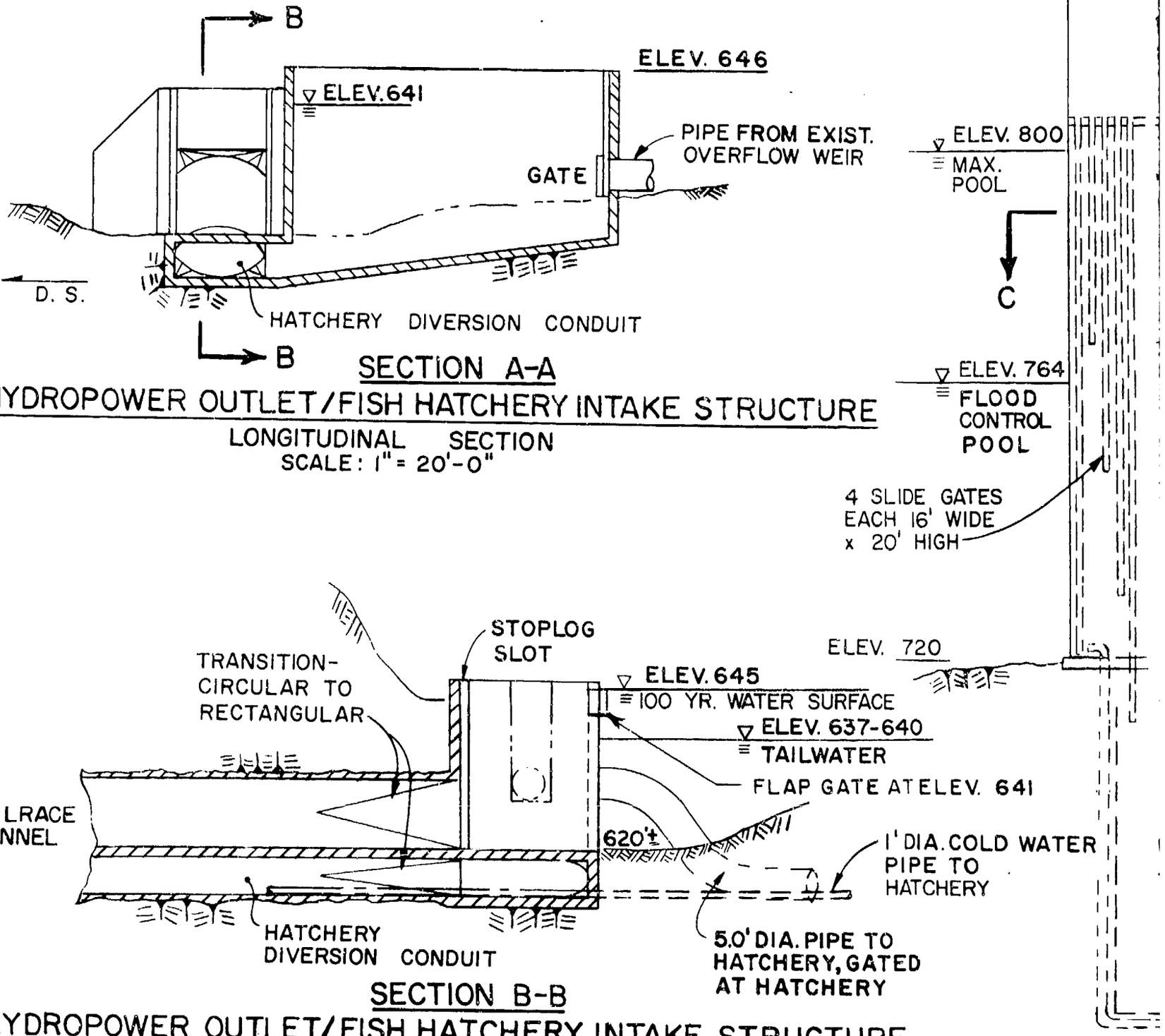
20'

40'

60'

J

U. S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON				
WYNOOCHEE HYDROPOWER/FISH HATCHERY RECOMMENDED PLAN DESIGN DETAILS I WYNOOCHEE DAM WYNOOCHEE RIVER WASHINGTON				
SIZE	INVITATION NO	FILE NO	DATE	PLATE E-1
DSGN. NOYES		CHK. NELSON		SHEET



SECTION A-A

HYDROPOWER OUTLET/FISH HATCHERY INTAKE STRUCTURE

LONGITUDINAL SECTION
SCALE: 1" = 20'-0"

SECTION B-B

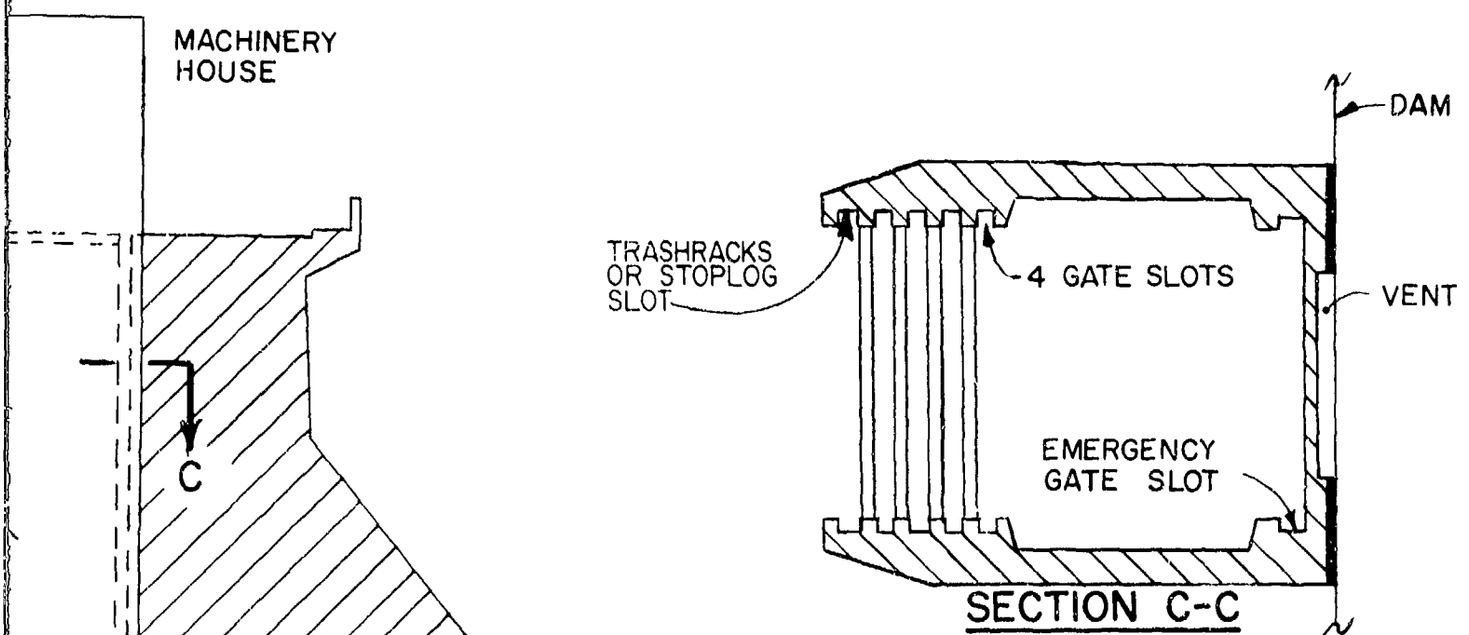
HYDROPOWER OUTLET/FISH HATCHERY INTAKE STRUCTURE

CROSS SECTION
SCALE: 1" = 20'-0"

MULTILEVEL PO

ELEVA

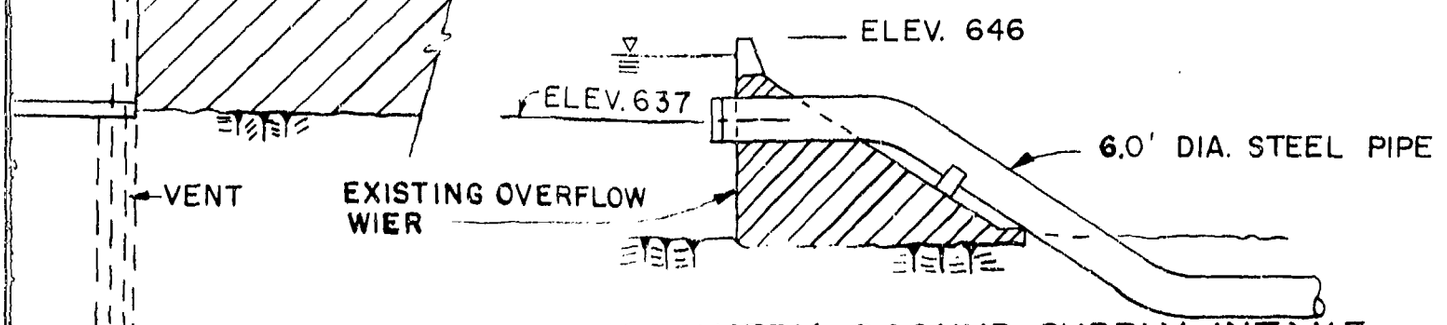
SCALE:



SECTION C-C

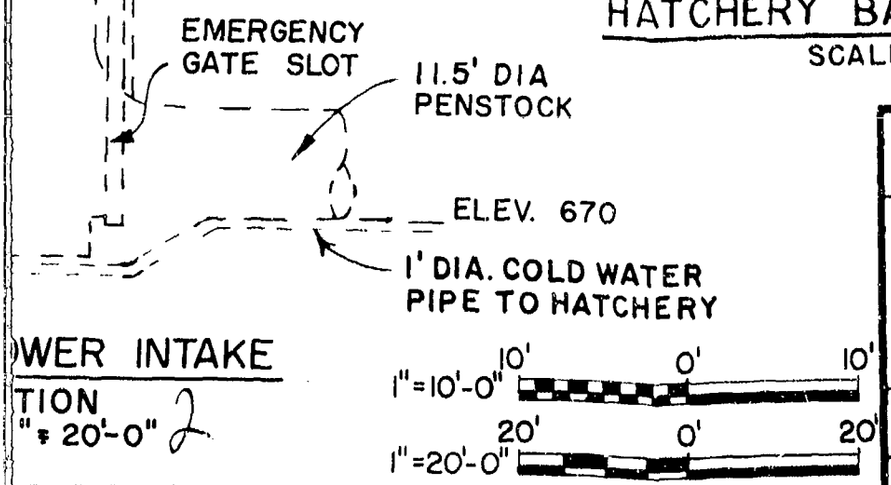
MULTILEVEL POWER INTAKE

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



HATCHERY BACKUP SUPPLY INTAKE

SCALE: 1" = 20'-0"



WER INTAKE

TION
" = 20'-0" 2

1"=10'-0" 10' 0' 10'

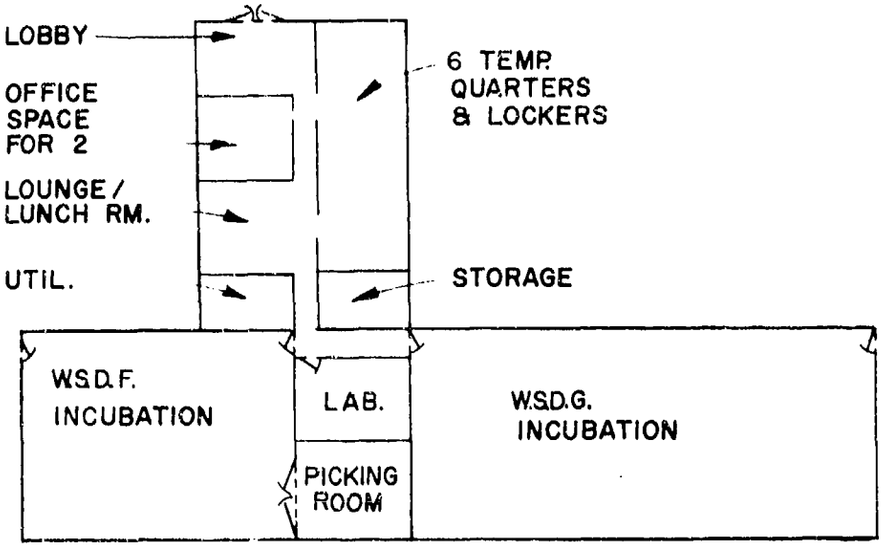
1"=20'-0" 20' 0' 20'

U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

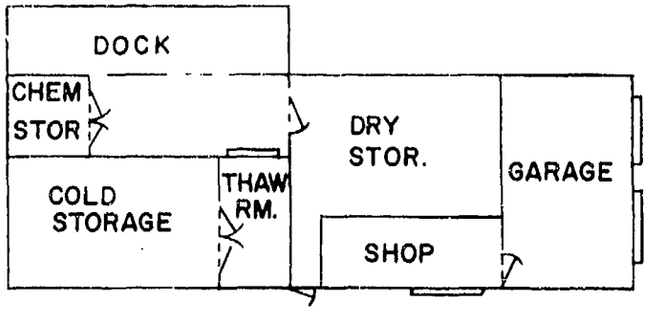
WYNOOCHEE HYDROPOWER/FISH HATCHERY
RECOMMENDED PLAN
DESIGN DETAILS II
WYNOOCHEE DAM

WYNOOCHEE RIVER WASHINGTON

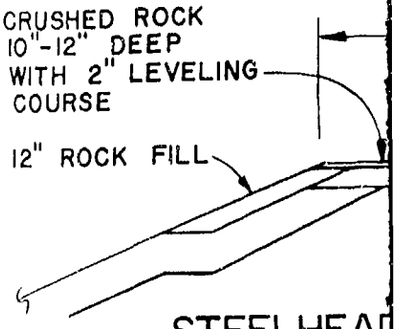
SIZE	INVITATION NO.	FILE NO	DATE	PLATE
				E-2
DSGN. NOYES		CHK. NELSON		SHEET



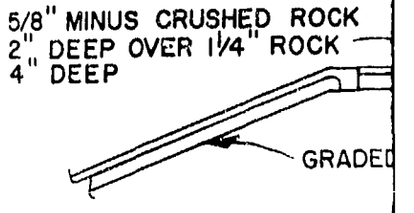
HATCHERY BUILDING
SCALE: 1" = 40'-0"



SERVICE BUILDING
SCALE: 1" = 40'-0"



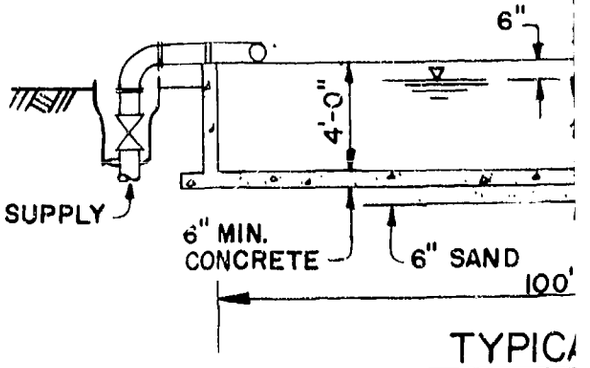
STEELHEA
SC



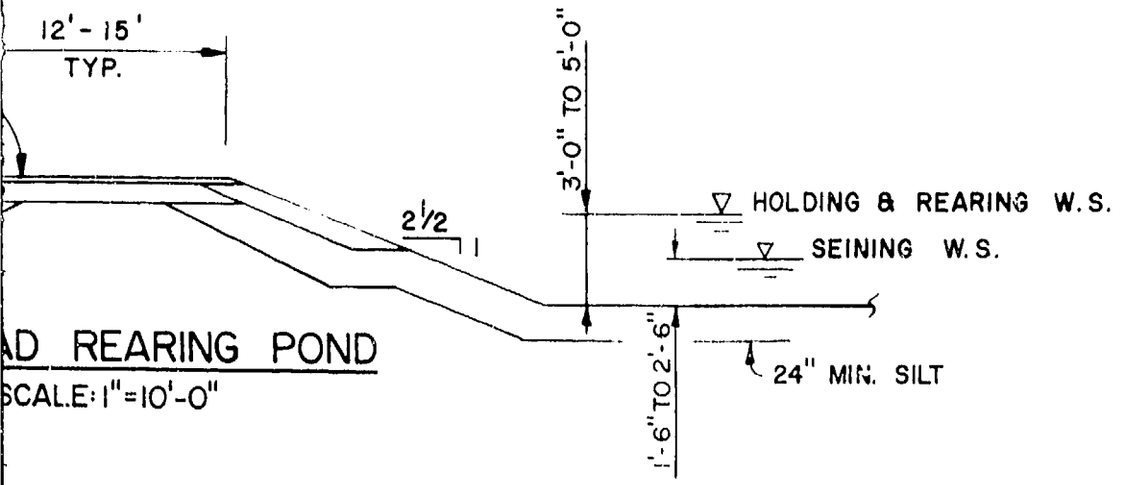
SALMON
SCA



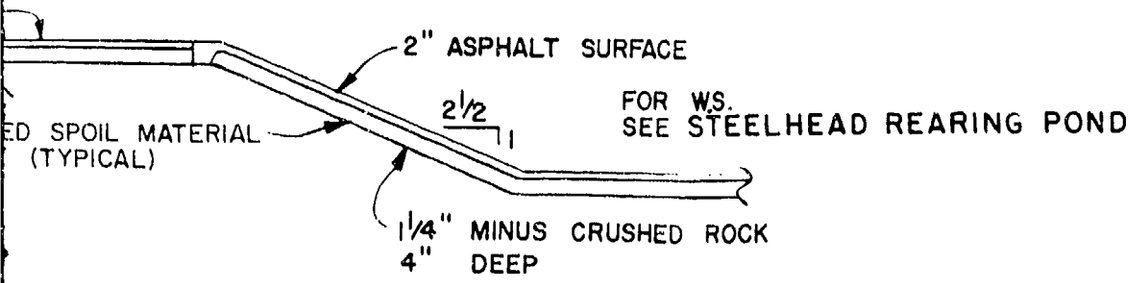
SALMON
SCA



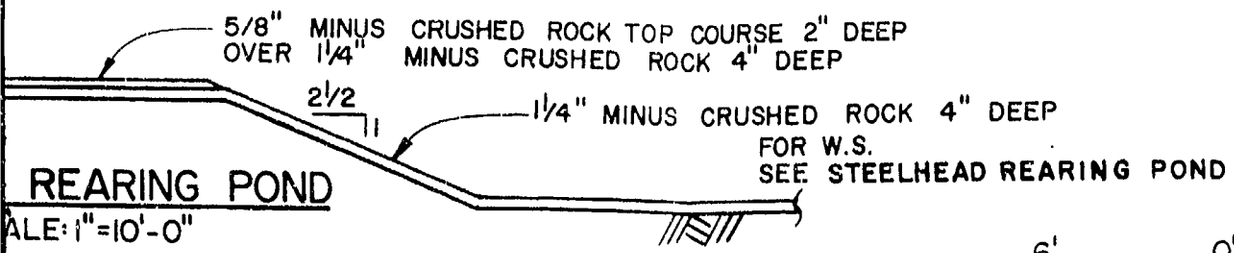
TYPICA
LONGIT
SCA



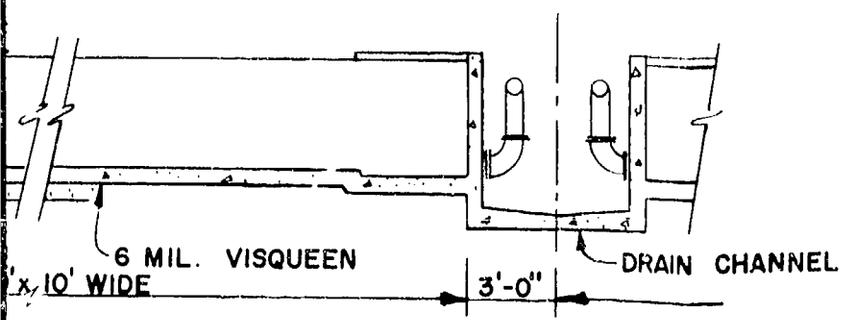
AD REARING POND
SCALE: 1"=10'-0"



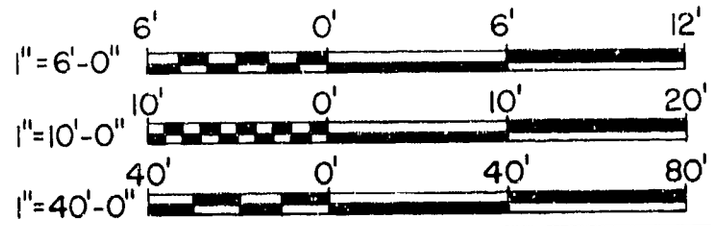
HOLDING POND
ALE: 1"=10'-0"



REARING POND
ALE: 1"=10'-0"



AL RACEWAY
TUDINAL SECTION
ALE: 1"= 6'-0"

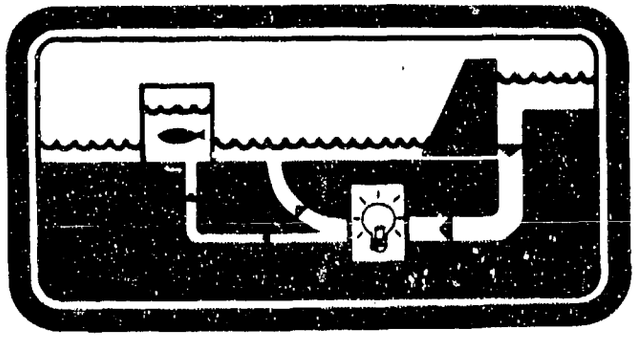


U. S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON				
WYNOOCHEE HYDROPOWER/FISH HATCHERY RECOMMENDED PLAN DESIGN DETAILS III WYNOOCHEE DAM WYNOOCHEE RIVER WASHINGTON				
SIZE	INVITATION NO.	FILE NO.	DATE	PLATE E-3
DSGN. NOYES		CHK. NELSON		SHEET

2

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX F

APPENDIX F

GEOLOGY, SOILS, AND CONSTRUCTION MATERIALS

TABLE OF CONTENTS

Paragraph		Page
1	Geology	F-1
	a. Geologic Setting	F-1
	b. Tectonic and Seismic Setting	F-1
	c. Siting Considerations	F-2
	d. Investigations	F-3
2	Site Geotechnical Considrations	F-3
	a. Bedrock Configuration and Character	F-3
	b. Bedrock Structure	F-4
	c. Ground Water	F-4
	d. Excavation Considerations - Underground Powerhouse and Tunnels	F-5
	e. Foundation Conditions - Surface Powerhouse	F-5
	f. Preliminary Earthquake Design	F-5
	g. Fish Hatchery Pipeline Alinement	F-6
	h. Fish Hatchery Site	F-6
3	Construction Materials	F-6
	a. Concrete Aggregate	F-6
	b. Rock Borrow	F-7
4	Recommended Additional Studies for Advanced Engineering and Design	F-7
	Bibliography	F-8

TABLES

Number		
F-1	General Test Report	F-9

FIGURES

F-1	Borehole Log 65-DD-32	F-11
F-2	Borehole Log 66-DD-118	F-13
F-3	Borehole Log 66-DD-119	F-14
F-4	Borehole Log 66-DD-120	F-15
F-5	Borehole Log 80-RD-101	F-16
F-6	Polar Contour Diagram - Right Bank Canyon Wall Joints	F-18

TABLE OF CONTENTS (con.)

FIGURES (con.)

F-7	Polar Contour Diagram - Borehole 80-RD-101	F-19
F-8	Polar Contour Diagram - Borehole DH-101	F-20
F-9	Polar Contour Diagram - Borehole DH-105	F-21
F-10	Borehole Log DH-101	F-22
F-11	Borehole Log DH-102	F-24
F-12	Borehole Log DH-103	F-25
F-13	Borehole Log DH-104	F-26
F-14	Borehole Log DH-105	F-27

PLATES

F-1	General Layout and Exploration
F-2	Geology
F-3	Aggregate Investigation, Fish Hatchery Site

1. Geology.

a. Geologic Setting.

(1) Wynoochee Dam lies on the southern flank of the Olympic Mountains, part of the coast ranges within the Pacific Border Physiographic Province. Two geologic terrains which comprise the Olympic Mountains are core rocks and peripheral rocks. The peripheral rocks form a large horseshoe pattrn open on the west and consist of folded and faulted volcanic rocks, sandstones, argillites, and conglomerates of the Eocene Crescent Formation. The constrasting metasedimentary core rocks (phyllites, slates, and metasandstones)range in age from Eocene to middle Miocene and are highly deformed. The peripheral rocks are separated from the younger core rocks by a series of thrust faults. Imbricate thrust blocks underwent complex folding and doming during the middle to late Miocene. The project lies within the belt of peripheral rocks.

(2) Most of the central part of the Olympics has been modified by alpine glaciation with cirques at the heads of deep, U-shaped main valleys. Alpine glaciers still occupy areas around several peaks in the central Olympics. The Wynoochee River flows southwesterly in what appears to be a structurally controlled, U-shaped valley partly filled with glacial drift including morainal deposits, glaciofluvial, and glaciolacustrine stratified deposits consisting of sand, gravel, silt, and clay, ususlly mantled by recent alluvium or colluviium. In Pleistocene time the upper and middle reaches of the Wynoochee Valley were repeatedly glaciated. The repetitive glacial deposition combined wit interglacial stream erosion has left a complex valley characterized by mid-valley basalt rock knobs largely coverd by glacial drift. Wynoochee Dam spans a narrow canyon cut through the high point of one of these rock knobs.

(3) In the vicinity of the dam, Wynoochee Valley is 2 miles wide and is bounded by rock ridges which rise to 2,000 feet above the valley floor. From 8 miles upstream to 10 miles downstream of the dam the rocks were dominantly basaltic lava flows. The flows strick west to northwest and dip steeply to the south and are well exposed in the narrow canyon. The black to dark greenish gray basalt flows are characterized by closely spaced random joints and locally are columnar jointed or more rarely hae pillow structures characteristic of the submarine lava flows. Pockets of brown or gray clay are found in flow contact zones. Locally the lavas are intruded by small, dark gray, moderately jointed crystalline diorite bodies.

b. Tectonic and Seismic Setting.

(1) The project lies within the Coast Range tectonic province and is adjacent to the tectonic provinces of the Puget-Willamette Trough and the Continental Shelf-Slope. The Coast Range tectonic province is subdivided into Olympic Mountains, Willapa Hills, and Oregon Coast Range. Dominant tectonic elements developed during the Pleistocene and consist of major basement uplifts and minor faults.

(2) The Olympic Mountains are a tectonic province of extremely complex geology and deformation. The deformation climaxed during the middle to late Miocene. The structures observed in the Olympics are considered to be the results of continental rise sedimentation being carried against and welded onto the subduction zone beneath the continental edge. One documented, potentially capable fault, the Saddle Mountain fault near Lake Cushman, is recognized in this province, though more recent remote sensing data suggest others may be present. The minor seismicity present within the Olympic Mountains is, however, associated with major fault systems present on its northern flank.

(3) The Puget Sound subprovince of the Puget-Willamette Trough is the most seismically active portion of the region. Tertiary bedrock of the Puget Trough is concealed under thick sequence of the Pleistocene and recent deposits. Faults are not generally expressed in the cover due to deep hypocenter for the large seismic events. Gravity, magnetic, and hypocentral location studies infer numerous faults within the bedrock. These faults are conceptionalized as composing rectilinear blocks which are similar in dimension to portions of Puget sound currently undergoing differential subsidence. Major events in 1949 and 1965 (magnitude 7.1 and 6.5, respectively) are spatially restricted to blocks in the southern end of Puget Sound. These blocks are adjacent to the Southern Olympic ara and are 35 miles east of the dam. Strong linear trends with the southern blocks, apparent on gravity and magnetic maps and SLAR (sidelooking airborne radar) imagery, provide a basis to localize future strong events.

(4) The Willapa Hills extend from the Chehalis Valley south of the Olympic Mountains to the Columbia Velley and are an area o low seismicity. The Continental Slope and Shelf province contains moderate events which are localized on fracture zones and transform faults far offshore.

c. Siting Considerations. Consideration was given to two powerhouse locations on the right bank: an underground location and a surface location. A conservative approach was used in siting the underground powerhouse about 200 feet downstream of the dam and 200 feet behind the canyon wall. Considerations included the length of existing rock bolts which stabilize stress relief joints in the canyon wall, possible margin of safety for tunnel blasting. The exact location of the underground powerhouse will be finalized during advanced engineering and design studies. A surface powerhouse site was also considered. Th site considered was located about 900 feet downstream of the dam on the right bank at the lower end of the bedrock canyon and at the toe of a slide in the overburden material (see plate F-1 for slide configuration). Foundation preparation for the surface powerhouse site would require excavation of both bedrock and overburden, leading to a potentially unstable slide condition and the possibility of requiring potentially expensive remedial measures not included in the cost estimates. Further downstream, the bedrock surface drops rapidly and a bedrock foundation is not available.

d. Investigation.

(1) Approximately 45 exploratory borings were drilled using cable tool, rotary, and diamond drills during exploration for Wynoochee Dam at river mile 51.8 between 1964 and 1968. Four of these borings are appropriately located to give useful information on rock character pertaining to the underground powerhouse and associated structures. See logs, figures F-1 through F-4. Of the four borings only core from boring 65-DD-32 has been retained. Investigation included backhoe pits and trenches, dozer cuts, and natural exposure mapping.

(2) The Corps' feasibility investigations for the proposed powerhouse have been limited to more detailed geologic mapping of natural exposures, one diamond drill borehole (figure F-5) in the underground powerhouse site, borehole camara photography, and refraction seismic work. Locations of borings and rock exposures are shown on plate F-2. Concrete aggregate investigation consists of eight backhoe holes in the right bank meander bench approximately 3,000 feet downstream of the dam. Logs of the backhoe excavations are shown on plate F-3, and locations are shown on plate F-1.

(3) Converse, Ward, Davis, Dixon, Geotechnical Engineers, supervised the exploration program for R.W. Beck and Associates, design engineers for Grays Harbor PUD. Five boreholes were drilled and completed during October - November 1980. Locations of the borings DH-101 through DH-105 are shown on plate F-1. The Corps completed borehole photography for borings DH-101 and DH-105.

2. Site Geotechnical Considerations.

a. Bedrock Configuration and Character.

(1) Downstream from the dam for about 800 feet, the Wynoochee River flows through a narrow, steep-walled rock canyon. The rock canyon is approximately 20 feet wide at river level, elevation 635 feet, and 100 to 150 feet wide at elevation 750 feet. On the left bank of the river and bedrock surface reaches an elevation of 770 feet before dropping abruptly into an adjacent buried valley. On the right bank the rock rises to an elevation of about 790 feet and maintains that general elevation for a minimum distance of several hundred feet from the canyon wall. Contours on the bedrock surface are shown on plate 5-2.

(2) Submarine, pillow basalt flows represent most of the bedrock at the site. The rock is closely jointed and finely crystalline with carbonate veinlets and zones of palagonite. Palagonite hydrous glass forms 1-inch rinds on pillows and 1-foot zones at flow contacts and along zones of internal shear in a flow. Most joint surfaces are coated with unweathered dark chlorite which acts as a friction reducer. Thin clay and fine sandy interbeds occasionally are present at flow contacts. An altered, coarse grained basaltic rock body about 20 feet

thick is mapped as a basalt intrusion in the dam foundation of monoliths 1 and 2. This rock body follows the general attitude of basaltic flows in the site area, probably represents a spilitic rock type, and is no more than a coarse grained flow.

b. Bedrock Structure.

(1) The rock is characterized by many discontinuous randomly oriented joints (see plate F-2). Contraction (cooling) joints, tectonic joints, stress relief joints, and joints along flow contacts cause a highly variable degree of rock competency throughout the area. Joint sets were mapped on the right bank canyon wall, over its length from the dam to 800 feet downstream. Significant joint-pole clusters are shown on the summary polar contour diagram, figure F-6. Highs on the contour diagram represent preferred orientations of systems of structural discontinuities. The diagram shows two significant joint set trends. The canyon wall joint density varies from one to an excess of 10 joints per foot. Flow contacts are irregular, strike roughly northwest, and dip between 30 and 80 degrees to the southwest. Stress relief joints with uneven and rough surfaces dip toward the river in both canyon walls. A few tectonic joints strike northeast and are near vertical. Discontinuous, incipient, chlorite-coated joints at 1/2-inch intervals present in borings 65-DD-32, figure F-1, and 80-RD-101, figure F-5, suggest that samples of the bedrock might be expected to have a low unconfined compressive strength. However discontinuity of the joints gives the rock mass a moderately high shear strengthe which is reflected in the 100-foot-high, near-verticle canyon walls.

(2) Rock Quality Designtion (RQD) was completed on the core for borings DD-32 and RD-101. In boring DD-32 the rock is dominantly poor to very poor from elevaton 639 feet to 737 feet and fair quality between elevations 600 and 639 feet. In boring RD-101 the rock varies from excellent to very poor throughout the hole. Between elevations 615 and 675 feet, the area selected for the powerhouse cavern, the RQD is generally fair. RQD is a tool for obtaining information about qualities of a rock mass and should be used in conjunction with seismic surveys, core logging techniques, and borehole camera to best achieve an index to rock mass quality. Joint plane attitudes were photographed and measured in boring RD-101 using a borehole camera. Refer to figure F-7 for the summary polar contour diagram. Figures F-8 and F-9 represent joint sets found in DH-101 and DH-105, respectively, drilled during exploration supervised by Converse, Ward, Davis, Dixon, Geotechnical Engineers. Significant concentrations are shown on the figure. Only one joint cluster ranging N20-35E, 35-45 NW appears to be common to figures F-6, F-7, and F-8. No correlation is seen in the downstream boring DH-105, figure F-9.

c. Ground Water. The submarine pillow basalt flows are characteristically impervous. Pressure tests in boring RD-101 showed no inflow below elevaton 730 feet, and no weathered joints were noted below the first 14 feet of rock drilled. The rock is generally competent and

impermeable even though closely jointed and fractured. In boring RD-101 the static water level appears to be stable at elevation 754 feet as measured on 25 June 1980. On this same date, Wynoochee Lake elevation was at elevation 790 feet. Ground water seepage in boring RD-101 probably has occurred through overburden sand and fractures in the basalt in the upper 22 feet of the boring. Springs emerging along fracture planes are present on the canyon wall between elevations 640 and 700 feet for a distance of 800 feet downstream from the dam axis. These springs are probably related to the more open stress relief joints near the canyon wall and are not characteristic of rock character away from the canyon.

d. Excavation Considerations - Underground Powerhouse and Tunnels. The underground powerhouse and related structures will be excavated in closely jointed basalt. The intake structure will be founded on competent rock adjacent to monolith 5. Overbreak could be substantial unless closely controlled. Controlled blasting patterns using cushion and zone procedres and limited explosive charges will be required during excavation in the closely jointed basalt to minimize damage to excavated chambers and slopes and to insure integrity of the existing dam and canyon walls. In rock of this nature, rock reinforcement is necessary to prevent progressive looosening of the jointed material. A combination bolting pattern is recommended and should consist of long bolts firmly anchored in sound rock supplemented by short bolts. Overhead areas will require installation of wire mesh. Bolt diameter should be on the order of 1 inche and closely spaced, say a 5- by 5-foot parallel pattern in the tunnels, a 4- by 4-foot staggered pattern for the powerhouse roof, and a 5- by 6-foot staggered pattern for the powerhouse and access shaft walls. The roof of the powerhouse will be lined with approximately 6 inches of shotcrete. The tunnels will be lined with steel or shotcrete. In mining the tunnels, a circular section will provide optimum natural support. No major problems are anticipated with either seepage or stability on the project. Tunnel muck may be wasted in the old clay pit or in the fish hatchery area utilizing the concrete aggregate borrow excavation if compatible with construction schedules. See plate F-1 for location of proposed fish hatchery area.

e. Foundation Condition - Surface Powerhouse. Basalt flows at the site strike N35°W and dip about 55° south, wit the bedrock surface dropping rapidly downstream. Details f the concealed rock surface require confirmation. Several small faults exist, having no preferred orientation, and many joints contain calcite. Flow contracts are locally characterized by clay or sandy interbeds up to 4 inches thick.

f. Preliminary Earthquake Design. A static seismic factor of 0.1g was used in stability analysis of slope and embankments for the existing dam prior to construction. This was determined by state-of-the-art knowledge in existence at the time. Earthquake risk and design is modified by constant changes in the development of the art. New engineering at Wynoochee Dam should be designed to standards reflected in current state-of-the-art in earthquake engineering. Existing structures are

being reanalyzed in accordance with ER 1110-2-1806. New structures will be analyzed accordingly during the advanced engineering and design studies. A preliminary examination of the seismic environment indicates that structues should be designed to withstand stress caused by dynamic earthquake foces of 0.35g base rock acceleration. This force is estimated to result from a magnitude 7.5 event originating in Puget Sound near the southern end of Hood Canal. A site intensity of Modified Mercalli VIII should be expected.

g. Fish Hatchery Pipeline Alinement. The proposed hatchery pipelie will consist of a 5.0-foot-diameter pipe extending from the hydropower outlet/fish hatchery intake structure to the fish hatchery site, a distance of 2,400 feet (see plate F-1). Between the intake structure and where the pipeline exists the rock canyon onto the left bank, the proposed pipeline would be encased in concrete and founded on the bottom of the rock gorge. On the left bank, the pipeline will be fouded on a thin bed of gravel placed in a trench excavated to a depth of 7 feet in common material. Overburden here consists of about 5 feet of sandy gravel overlying glaciolacustrine clay, silt, and sand beds. Significant quantities of ground water, several hundred gallons per minute, are expected in excavation in two segments along the pipe alinement: from 1,700 to 1,900 feet and 2,400 to 2,700 feet downstream of the dam. At the downstream river crossing the top of the pipe is to be buried an appropriate depth beneath the streambed to allow for scour under controlled river conditions. The last 75 feet of pipeline will be excavated through a 35-foot-high bank composed of about 10 feet of sandy gravel overlying glaciolacustrine clay, silt, and sand beds. The pipeline empties ino a distribution box at the northern portion of theeefish hatchery site.

h. Fish Hatchery Site. The hatchery site is located on a river terrace lying 5 to 10 feet above the present river channel. A stagnating oxbow pond occupies part of the inner terrace margin. the terrace surface is underlain by 3 feet of overbank silt and sand underlain by up to 8 feet of sand and gravel. Portions of the material will be removed for concrete aggregate, and waste from rock excavation would be placed and graded prior to construction of hatchery facilities.

3. Construction Material.

a. Concrete Aggregate.

(1) Preliminary investigations of a potential source of concrete aggregate was conducted in July 1980. This source is a river terrace deposit (fish hatcher site) located approximately 3,000 feet downstream of Wynoochee Dam on the right bank. The source is upstream of the area identified as the Simpson Pit, which was investigated as a source of concrete aggregate for Wynoochee Dam and reported in Design Memorandum 2, Construction Material, dated April 1966. The source of aggregate for Wynoochee Dam has been inundated by the reservoir.

(2) Eight backhoe trenches varying from 8 to 10-1/2 feet in depth were excavated to ascertain the general nature and extent of the deposit and to obtain samples for petrographic examination. These trenches are identified as 80-BH-102 through 80-BH-109, and locations are shown on plate F-1. Materials in the trenches were visually classified and logs of the explorations are shown on plate F-3. Materials encoundtered appeared similar to those in the vicinity investigated for concrete aggregate for the dam. Particle sizes varied throughout the area from zones of moderately clean sandy gravel to silty, gravelly sand, with lenses of silty sand and areas with cobbles and boulders. Samples of a sandy gravel zone were taken from several trenches and consolidated for shipment to the North Pacific Division Laboratory for petrographic examination. Results of this examination are gien in the GEneral Test Report (table F-1). Adequate quantities of materials for the production of concrete aggregate for the proposed hydrpower facilities cna be obtained from the meander bench. The maximum size aggregate required will be 1-1/2 inches. It is expected that this source may contain a high percentage of soft constituents in the sand sizes, as was evidenced in sources investigated for the dam. Benefication processing or use of manufactured sand may be necessary. further investigations and testing will be conducted upon future authorization.

(3) The Wynoochee gravels are derived from an upstream area of hard graywacke, siltstone, and argillite and from a middle-reach belt of moderately altered basaltic rocks. Gravels downstream from the damsite in the right bank meander bench are dominantly altered basalt with appreciable amounts of graywacke and argillite. By contrast, these recent river gravels are fresher and cleane than the Pleistocene valley fill gravels which tend to show a weathered rind and are commonly silt covered.

b. Rock Borrow. Rock borrow may be obtained from an existing quarry in prophyritic basalt 1.5 miles northwest of the damsite. The rock mass is about 100 feet thick and dips near verticle. Joint spacing limits the maximum rock size to about 24 inches. This source will be used for riprap on the north side of the fish hatchery site. This source was used for riprap at the dam on the upstream embankment slopes and at the toe of the downstream left abutment slope treatment area.

4. Recommended Additional Studies for Advanced Engineering and Design. Data on ground water and seepage conditions are minimal for the powerhouse site. Specific attention should he directed to the hydrogeologic conditions in the selected intake area, powerhouse site, and intake and outlet tunnels by drilling additional borings and installign piezometers. The additional borings should be located such that they give structural geologic data as well as rock surface configuration int he intake and surface powerhouse area. A more deailed aggregatre investigation is needed in th fish hatchry area to determine the contact overburden slide on the right bank, located between 600 and 1,000 feet downstream, requires additional exploration and may require installation of instrumentation for safety monitoring.

Bibliography

U.S. Army Corps of Engineer, Office of the Chief of Engineers, Tunnels and Shafts in Rock, Engineer Manual 1110-2-2901, September 1978.

U.S. Army Corps of Engineers, Seattle District, Construction Materials, Wynoochee Reservoir, Design Memorandum 10, Volume 1, May 1967.

U.S. Army Corps of Engineers, Seattle District, DAM - Basis of Design, Wynoochee Reservoir, Design Memorandum 10, Volume 1, May 1967.

U.S. Army Corps of Engineers, Seattle District, Site Selection, Wynoochee Reservor, Design Memorandum No. 1, July 1965.

U.S. Army Corps of Engineers, Seattle District, General Design Memorandum, Wynoochee Reservoir, Design Memorandum No. 3, April 1966.

U.S. Army Corps of Engineers, Seattle District Foundation Report, Wynoochee Reservoir, Unpublished Rough Draft.

U.S. Geological Survey, Department of the Interior, "The Structure of the Olympic Mountains, Washington, Analysis of a Subduction Zone" by R. W. Tabor and W. M. Cady, Geological Survey Professional Paper 1033, 1978.

Washington Pubic Power Supply System, Preliminary Safety Analysis Report WNP-3, Satsop. Chapter 2.5.

GENERAL TEST REPORT	DATE 25 MAR 80 DISTRICT NPDL	SPD LABORATORY CORPS OF ENGINEERS, US ARMY SAUSALITO CALIFORNIA 94966
PROJECT WYNOOCHEE POWERHOUSE WASHINGTON	CONTRACT No.	WORK ORDER No. & DATE 22 OCTOBER 1979 E85809505
UNIT COST $ 900	DATE SAMPLE RECEIVED 13 AUGEST 1980	LABORATORY No. NPDL No. 1424
DESCRIPTION PIT-RUN SAND AND GRAVEL +1 1/2in to PAN, FROM 6'TO 8'		SOURCE COMPOSITE HOLES 80-BH-102, 103, 105, 106 & 107

Summary:

1. The coarse aggregate was composed of generally hard sound, slightly weathered subround to subangular particles. The approximate composition was 58 percent basalt, 16 percent metasediment, 13 percent basic igneous, 8 percent metabasalt and 5 percent andesite.

2. The sand was composed of subround rock particles and angular mineral grains which were generally hard and sound. Approximate composition was 42 percent basalt, 18 percent basic igneous, 15 percent quartzite, 7 percent metabasalt, 4 percent andesite, 6 percent quartz, 4 percent feldspar, 2 percent amphibole, 2 percent olivine.

3. No previous data was available, but this material was similar to aggregate that was potentially reactive. Chemical and mortar bar tests should be run to determine reactivity.

Rock Type

4. Basalt. This type was comprised of generally fine, dense, hard basalts which were slightly weathered with 2 percent soft weathered grains.

5. Quartzite. This rock type was mostly medium to fine grained metamorphosed quartz sandstone with some metagraywackes present. All particles were fresh, hard and sound.

6. Basic Igneous. This category included all medium grained igneous rock composed principally of pyroxenes with minor calcic feldspar. All particles were hard, fresh and sound.

7. Metabasalt. These were metamorphosed fine to medium grained basalts. Most particles were slightly to moderately weathered.

8. Andesite. All the rocks included in this category were andesitic in composition, but varied in texture from fine to medium grained.

TABLE F-I

SPD Form 40

GENERAL TEST REPORT	DATE 25 MAR 80 DISTRICT NPDL	SPD LABORATORY CORPS OF ENGINEERS, US ARMY SAUSALITO CALIFORNIA 94966
PROJECT WYNOOCHEE POWERHOUSE WASHINGTON	CONTRACT No.	WORK ORDER No. & DATE 22 OCTOBER 1979 E85809505
UNIT COST $ 900	DATE SAMPLE RECEIVED 13 AUGEST 1980	LABORATORY No. NPDL No. 1424
DESCRIPTION PIT-RUN SAND AND GRAVEL +1 1/2in to PAN, FROM 6'TO 8'	SOURCE COMPOSITE HOLES 80-BH-102, 103, 105, 106 & 107	

COARSE AGGREGATE

Rock Type, Percent	Sieve Size +1½"	1"	3/4"	1/2"	3/8"	No. 4
Basalt	49	59	57	59	58	57
Quartzite	20	18	17	16	15	14
Basic Igneous	19	14	13	12	12	14
Metabasalt	12	7	9	8	9	8
Andesite		2	4	5	6	7

FINE AGGREGATE

Rock and Mineral Types, Percent	Sieve Size No. 8	No. 16	No. 30	No. 50	No. 100	Pan
Basalt	54	51	49	39	28	20
Basic Igneous	17	19	21	16	10	8
Quartzite	15	16	16	15	13	12
Metabasalt	8	8	7	6	5	5
Andesite	6	5	4	3	3	1
Quartz		1	2	9	17	21
Feldspar			1	6	11	13
Amphibole				3	8	12
Olivine				3	5	7
Mica						1

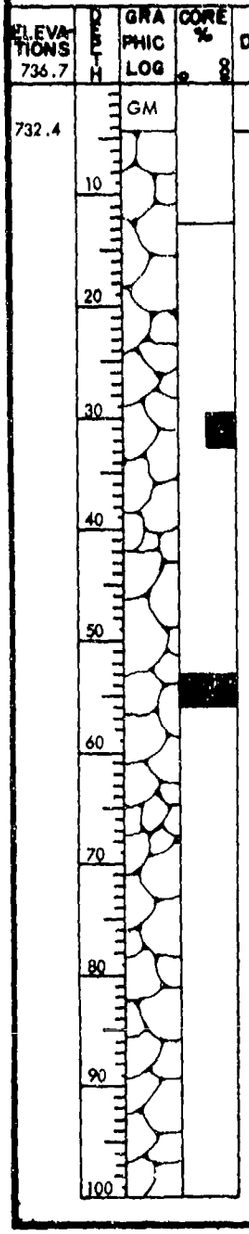
TABLE F-1 cont.

SPD Form 48

WYNOOCHEE DAM PROJECT MILE 51.8, WYNOOCHEE RIVER

DEPTH OF HOLE 132.5 DIAMETER OF HOLE NX
DEPTH OF O.B. 4.3 DATE STARTED 2 Sept 1965
ROCK DRILLED 132.2 DATE COMPLETED 10 Sept 1965
% CORE RECOVERED 96.3 CONTRACTOR KOR-IT CO., INC.

SURFACE EL 736.7 HOLE NO 65-DD-32 N 763,543 E 1,231,075



DESCRIPTION OF MATERIALS	REMARKS
Sandy Silty GRAVEL, brown Top Rock 4.3'	Tricone 3-7/8" w/ water & no mud to depth 12.5
BASALT, pillow structure, amygdaloidal, gray to near - black, mod. hard to hard Jointed at 1/2" to 8" intervals from 12.5 to 25.7; brown stains on some joints to depth 16.6'	NX casing to 12.3 partial brown water return NX core bbl. 100% water return
Jointed at 1/2" to 9" intervals from 25.7' to 63.5'	Core loss of 1.7' w/ high R.P.M. in closely jointed zone.
	Core lifter slipped & no recovery.
Jointed at 1" to 12" intervals from 63.5' to 85.0'	
Jointed at 1" to 6" intervals from 85.0' to 103.0'	

FIGURE F-I

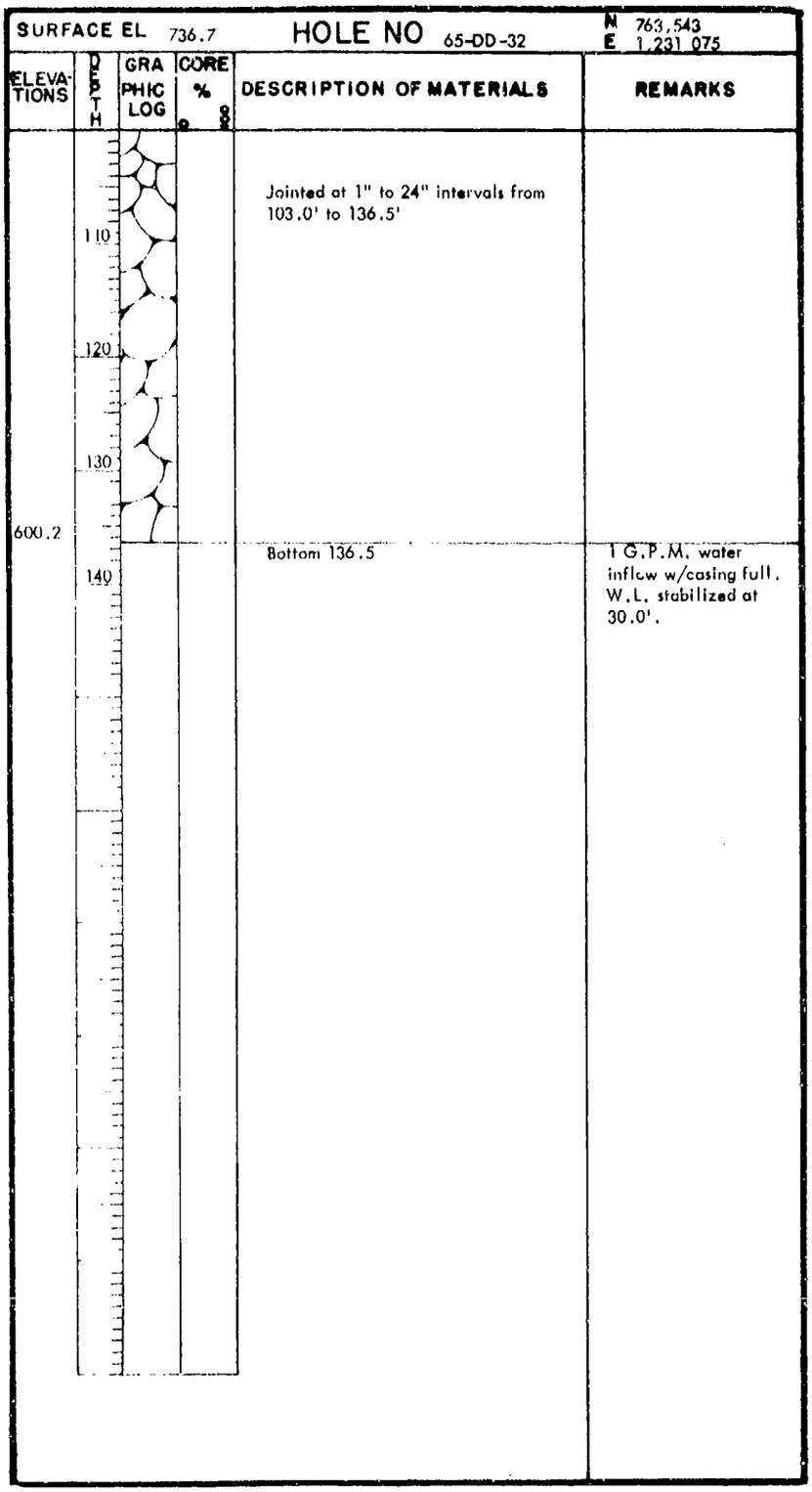


FIGURE F-1 cont.

WYNOOCHEE DAM PROJECT MILE 51.8 WYNOOCHEE RIVER

DEPTH OF HOLE 47.1 DIAMETER OF HOLE NX
DEPTH OF O.B. 3.5 DATE STARTED 8 November 1966
ROCK DRILLED 43.6 DATE COMPLETED 16 November 1966
% CORE RECOVERED 89% CONTRACTOR USAED Seattle

SURFACE EL 746.4 HOLE NO 66-DD-118 N 763,289 E 1,230,928

ELEVATIONS 746.4	DEPTH	GRAPHIC LOG	CORE %	DESCRIPTION OF MATERIALS	REMARKS
		GM		Silty Sandy GRAVEL, brown	Tricone to 4.9'
742.9				BASALT, hard, fine grained, weathered joints every 0.05 - 0.4'	Top of rock 3.5 Bottom casing @ 4.9 NX core below 4.9
738.4	10			Pillow BASALT, mod hard, dark gray, joints 0.05 - 1.0 Jt dip 40 degrees, open 1" @ 7' *	
				Jts open 1/8" - 1/16" @ 7.9 & 10.7	
	20			Jt trace clay @ 12.9	
				Jt dip 45 degrees, open 1/8" @ 26.2 **	Core losses all due to grinding
	30				
				Jts slightly stained @ 19.9 34.6, 35.1, 35.3, 35.6, 35.9	
	40				
				Joints 0.05 - 0.1, stained brown	
699.3	50				Bottom @ 47.1 Water level @ 28.0 w/water entering hole @ 4.9 17 Nov 66 Hole bailed to 46.1 & water level rose 2'/hr 19 Nov 66

* Joint dips riverward (southeast)

** Joint dips toward and away from river (southeast and northwest)

Hole examined with light and mirror to 44.0'

All pillow basalt core pieces flawed by minor incipient cooling cracks at 1/2" to 1" intervals

FIGURE F-2

WYNOOCHEE DAM PROJECT MILE 51.8 WYNOOCHEE RIVER

DEPTH OF HOLE 62.1 DIAMETER OF HOLE NX
DEPTH OF O.B. 8.0 DATE STARTED 17 November 1966
ROCK DRILLED 54.0 DATE COMPLETED 18 November 1966
% CORE RECOVERED 100% CONTRACTOR USAED Seattle

SURFACE EL 749.5 HOLE NO 66-DD-119 N 763,271 E 1,230,894

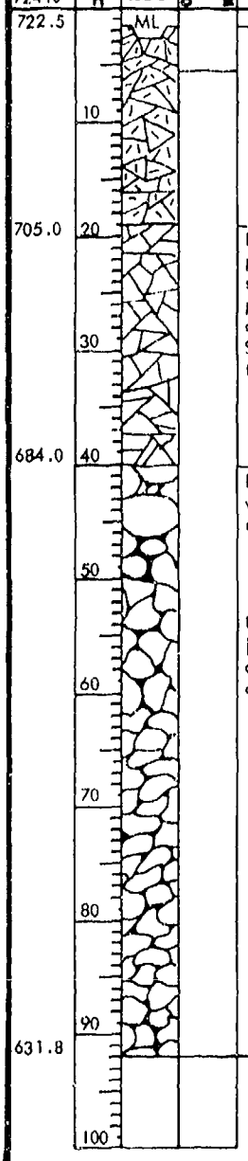
ELEVATIONS 749.5	DEPTH	GRAPHIC LOG	CORE %	DESCRIPTION OF MATERIALS	REMARKS
748.5		ML		SILT, brown	Tricone to 8.0
		GP & GM		Sandy GRAVEL and Silty Sandy GRAVEL	Overburden classification by drill action and observation of water return
741.5	10			Pillow BASALT, mod hard, dark gray, joints, stained brown, 0.05 - 1.1 spacing.	Top of rock 8.0 NX core below 8.0
735.5				BASALT, hard, fine-grained, dark gray, joints 0.05-1.2 apart, all stained brown	Bottom casing @ 12.4
	20			Jt 80 degree dip, open 1/8", weathered 1" @ 13.2 *	
	30			Jt open 1/8", w/clay @ 13.8	
				Jts 20-25 degree dip, open 1/8" 19.0 and 32.0 *	
	40			Jt 40 degree dip open 1/2" *	
				BASALT, (as above) joints 0.1 - 0.9 spacing with most stained brown from 24.5' to 62.1'	
	50				
	60				
687.4					Bottom @ 62.1
				* Joints dip riverward (southeast)	Water level 35.7' 19 Nov 66
				Hole examined with light and mirror to 36.2	Hole bailed to 36.2 Water pouring into hole from jt @ 36.2

FIGURE F-3

WYNOOCHEE DAM PROJECT MILE 51.8 WYNOOCHEE RIVER

DEPTH OF HOLE 92.2 DIAMETER OF HOLE NX
DEPTH OF O.B. 1.5 DATE STARTED 14 November 1966
ROCK DRILLED 90.7 DATE COMPLETED 28 November 1966
% CORE RECOVERED 100% CONTRACTOR U.S.A.E.D. Seattle

SURFACE EL 724.0 HOLE NO 66-DD-120 N 763,596 E 1,231,126



DESCRIPTION OF MATERIALS	REMARKS
SILT, soft, brown	Triconed to 5.4' cased to 2.0' NX core below 5.4
Top of Rock @ 1.5'	
BASALT, gray, hard w/feldspar and mafic phenocrysts, CO_3 veinlets Stained joints at 0.1' to 0.6' intervals to depth 19.0'	
Gradational contact 19'	Traces of clay on some joints to depth 36'
BASALT, dark-gray, hard w/mafic phenocrysts, curved CO_3 veinlets suggestive of pillow structure. Mafic phenocrysts decrease in size and abundance to depth 40'. Stained joints at 0.1' to 0.8' intervals to depth 44.0'	With surface water running into the hole below casing, the lowest measured water level was 20.0'
Gradational contact @ 40'	
BASALT, dark-gray, moderate hard w/curved CO_3 veinlets and altered glass rinds indicative of pillow basalt flow	
Unstained joints at 0.05' to 1.2' intervals joints coated with chloritoid film showing a mirror polish. Incipient cooling cracks at 0.05' to 0.1' intervals.	
Bottom @ 92.2'	

FIGURE F-4

PROJECT	WYNOOCHEE HYDROPOWER STUDY	HOLE NO.	80-RD-101
LOCATION	DOWNSTREAM - RIGHT BANK	INSPECTOR	SATTER
DEPTH OF HOLE	182.1 ft	CONTRACTOR	GOVERNMENT
DEPTH OF O.B.	8.0 ft	DATE STARTED	12 June 1980
ROCK DRILLED	174.1 ft	DATE COMPLETED	18 June 1980
% CORE RECOVERED	99.2	SURFACE EL.	774 ft (topo)
DIAM. HOLE	4" - NHR Wireline	N 763,475	E 1,230,795
EQUIPMENT	Diamond Skid - Mount Hydraulic Rotary		

ELEVATIONS	DEPTH	GRAPHIC LOG	CORE % 0-100 / BLOWS/FT	DESCRIPTION OF MATERIALS (Soils Classification, Plasticity, Condition, Moisture, Color)	REMARKS (Casing Depth, Depth of Hole at Start & End of Shift, Water level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, % Water Loss or Return, Water Color, Drilling Fluid Data, etc.)
		SP		SAND, fine to medium brown	Tricone to 8.0 ft
768				Top of Rock @ 8'	RQD INTERVAL — QUALITY 8'-65.2' Very Poor 65.2'-123.8' Poor to Fair 123.8'-132.8' Excellent 132.8'-141.8' Fair 141.8'-146.2' Good 146.2'-168.6' V. Poor to Poor 168.6'-173.1' Fair 173.1'-182.1' V. Poor to Poor
	10			BASALT, highly fractured yielding ¼" to 2" core, chlorite and calcite mineralization, joints with occasional slicken sides. Dips of major joints were recorded and are shown below	
752	20			Base of weathered rock	
				Joints dip 30°, w/slickenslides Jt dip 35°, w/slickenslides	
	30			Jt dip 15°, w/slickensides	Water Level 28.3 ft. measured 18 June 1980
					Pressure Tests taken in overlapping intervals as shown below
	40				
	50				Test 1 Gage = 50 psi Packer = 140 psi No Water Take
713	60			From 60.8 to 182.1 ft BASALT same as above except core to 14" in length.	
				Jt dip 35°	Test 2 Gage = 50 psi Packer = 170 psi No Water Take
	70			Jt dip 60°, w/slickensides Jt dip 50°	
	80			Jt dip 70°, w/slickensides	
				Jt dip 20°, rehealed w/calcite	Test 3 Gage = 50 psi Packer - 170 psi No Water Take
	90			Jt dip 20°, rehealed w/calcite	
				Jt dip 20°, rehealed w/calcite	
664	100			Jt dip 60°, rehealed w/calcite	

NPS Form 101 (Rev.) AC 55

FIGURE F-5

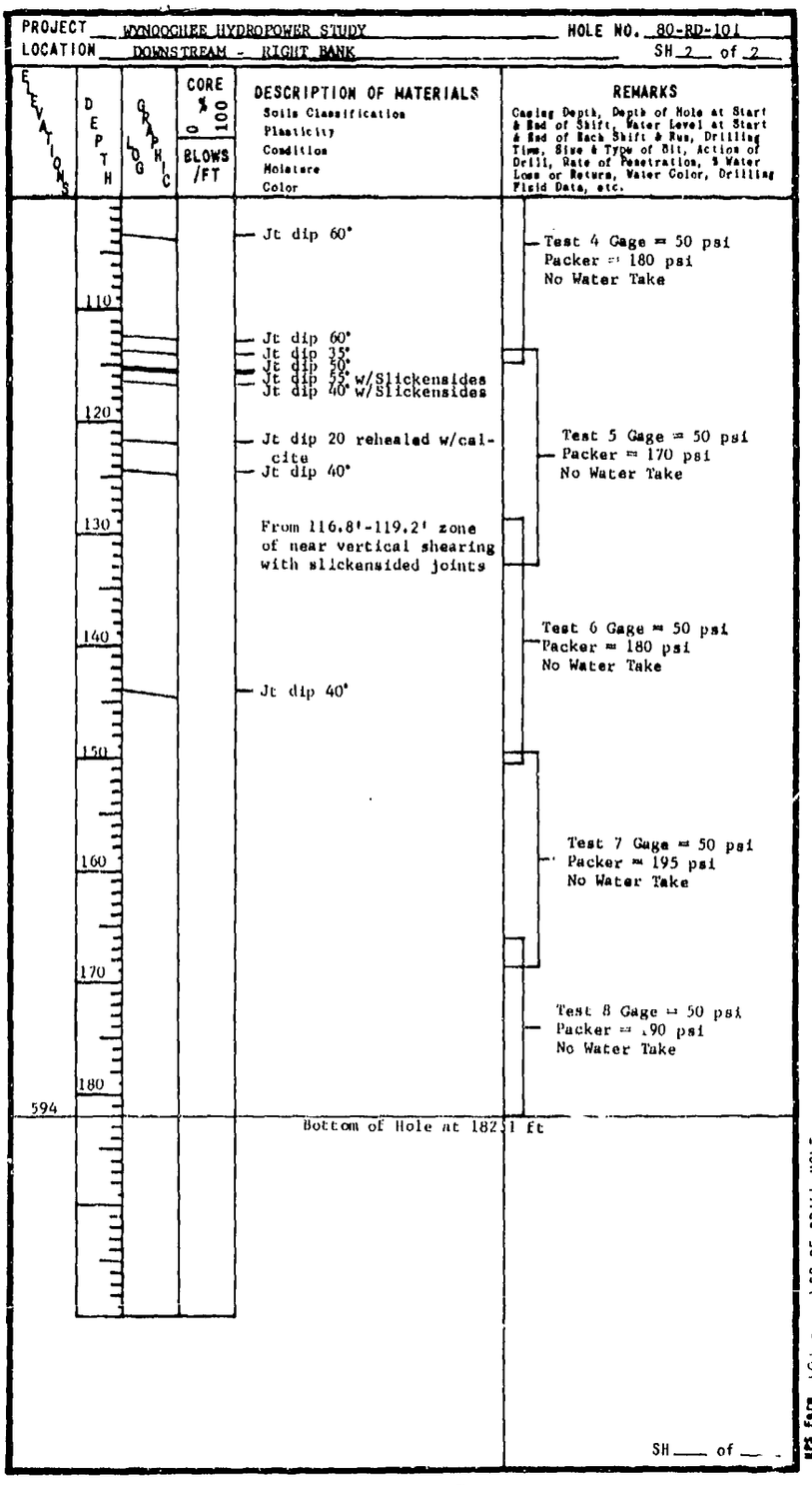


FIGURE F-5 cont.

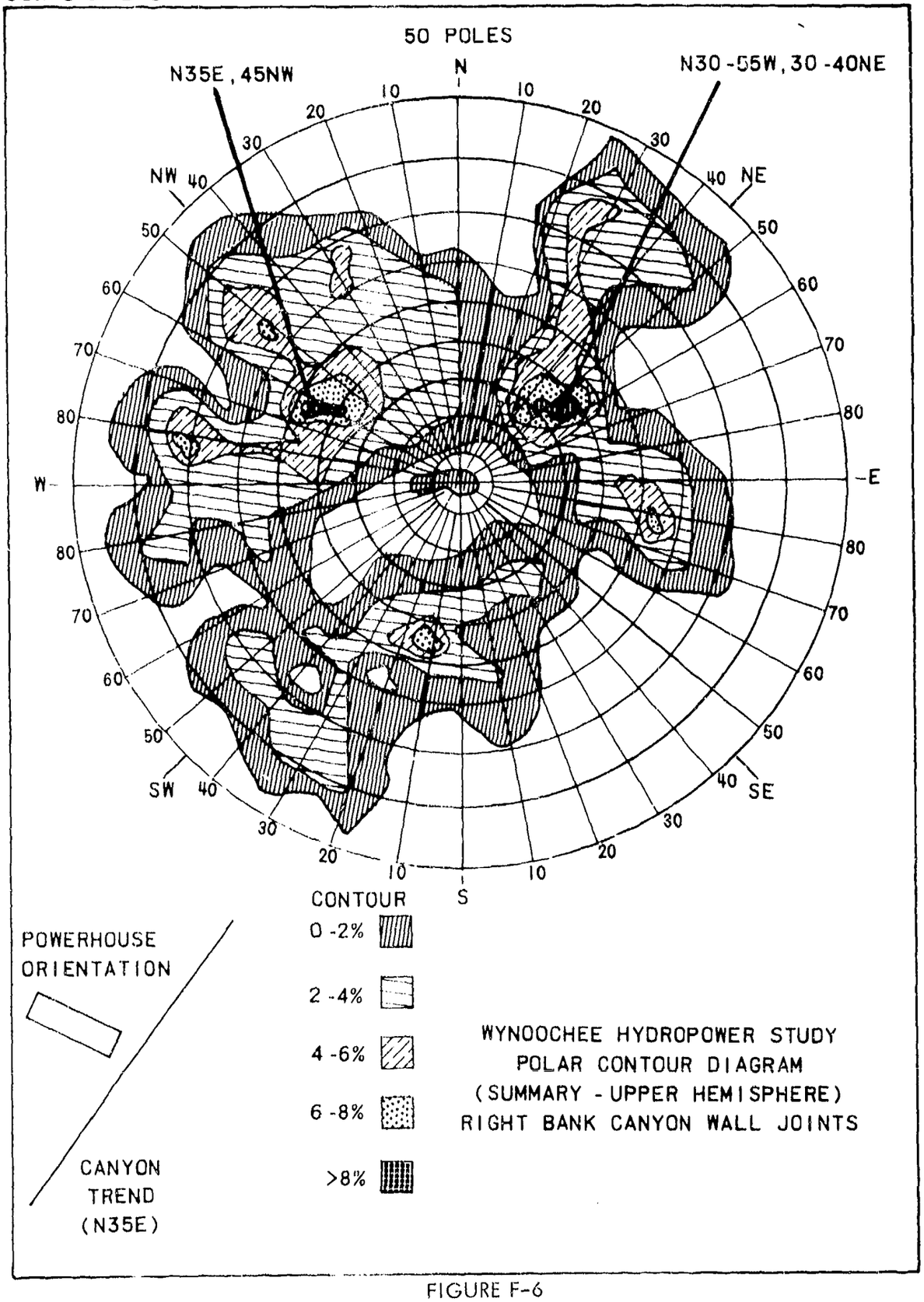

50 POLES
N35E, 45NW
N30-55W, 30-40NE
N
NE
E
SE
S
SW
W
NW
10
20
30
40
50
60
70
80
CONTOUR
0-2%
2-4%
4-6%
6-8%
>8%
POWERHOUSE ORIENTATION
CANYON TREND (N35E)
WYNOOCHEE HYDROPOWER STUDY
POLAR CONTOUR DIAGRAM
(SUMMARY - UPPER HEMISPHERE)
RIGHT BANK CANYON WALL JOINTS

FIGURE F-6

CORPS OF ENGINEERS

U. S. ARMY

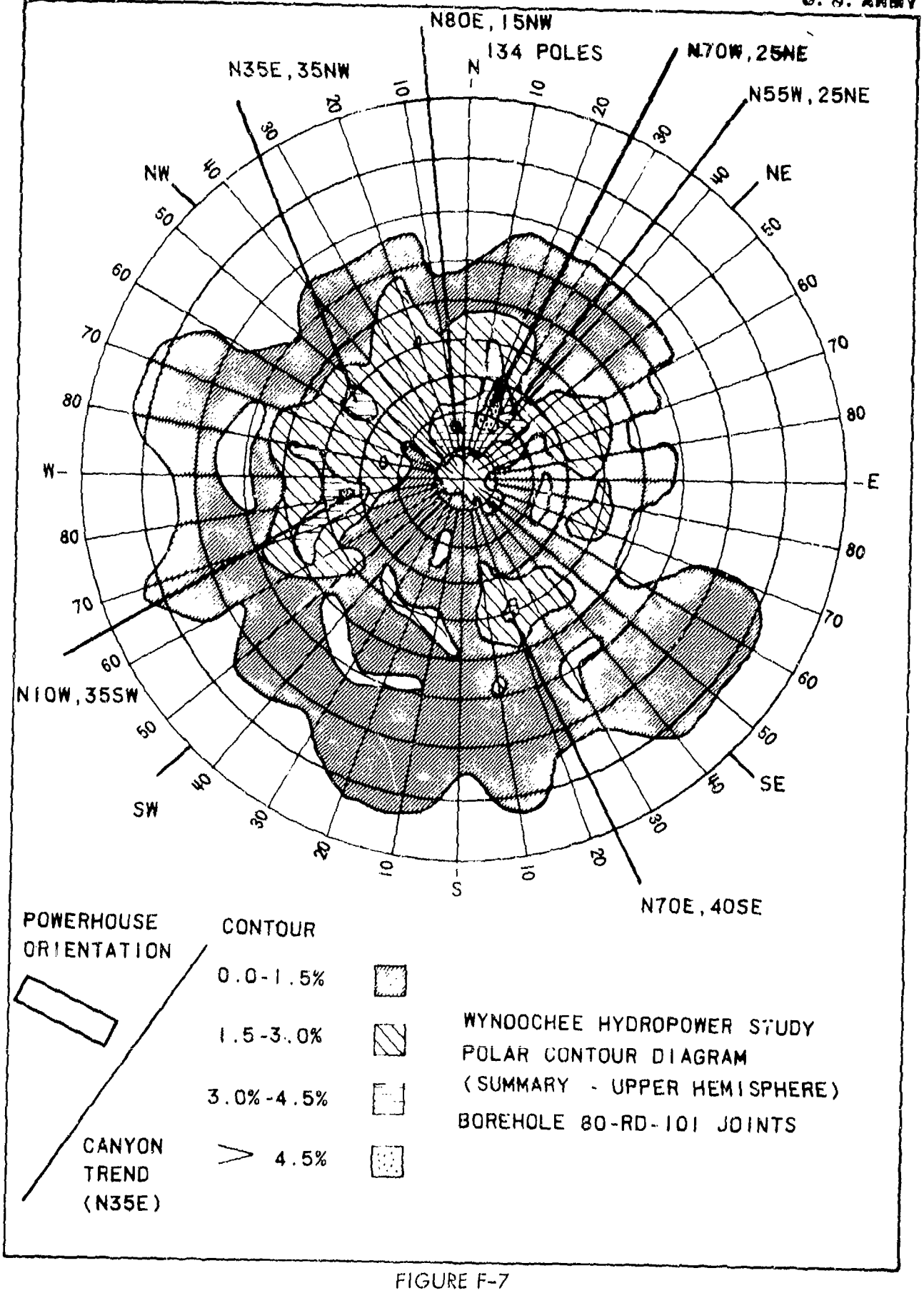


FIGURE F-7

CORPS OF ENGINEERS

U. S. ARMY

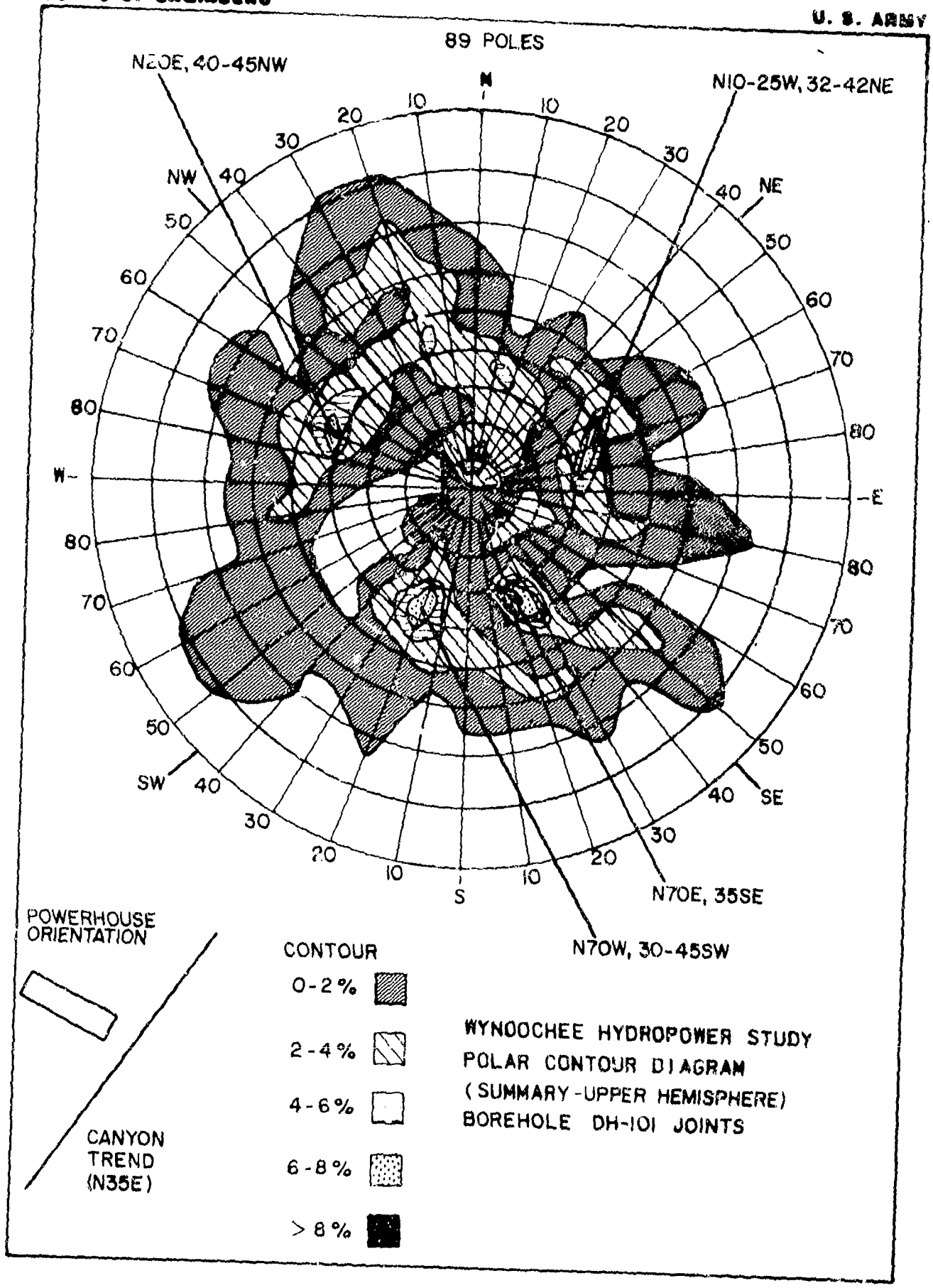


FIGURE F-8

CORPS OF ENGINEERS U. S. ARMY

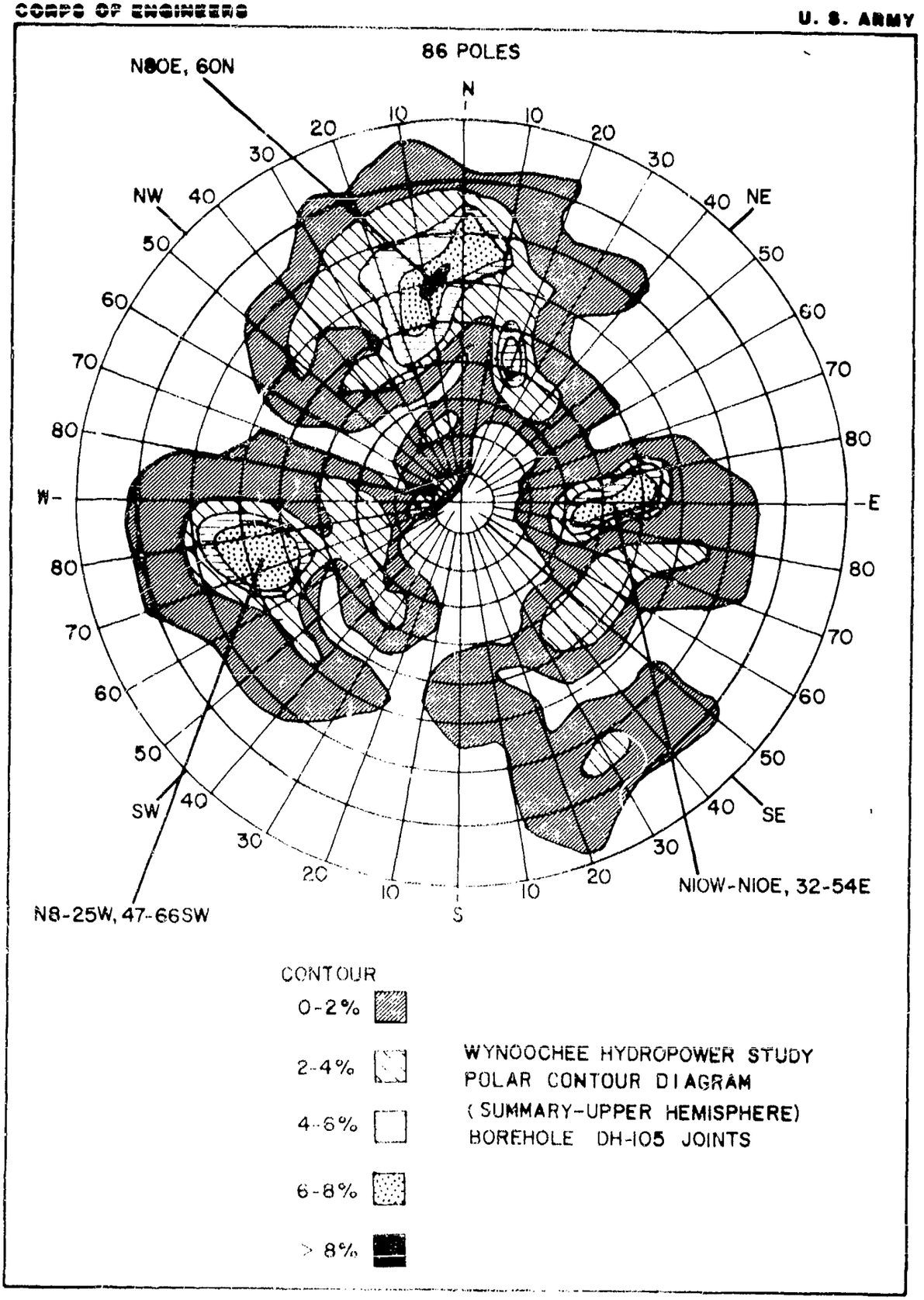


FIGURE F-9

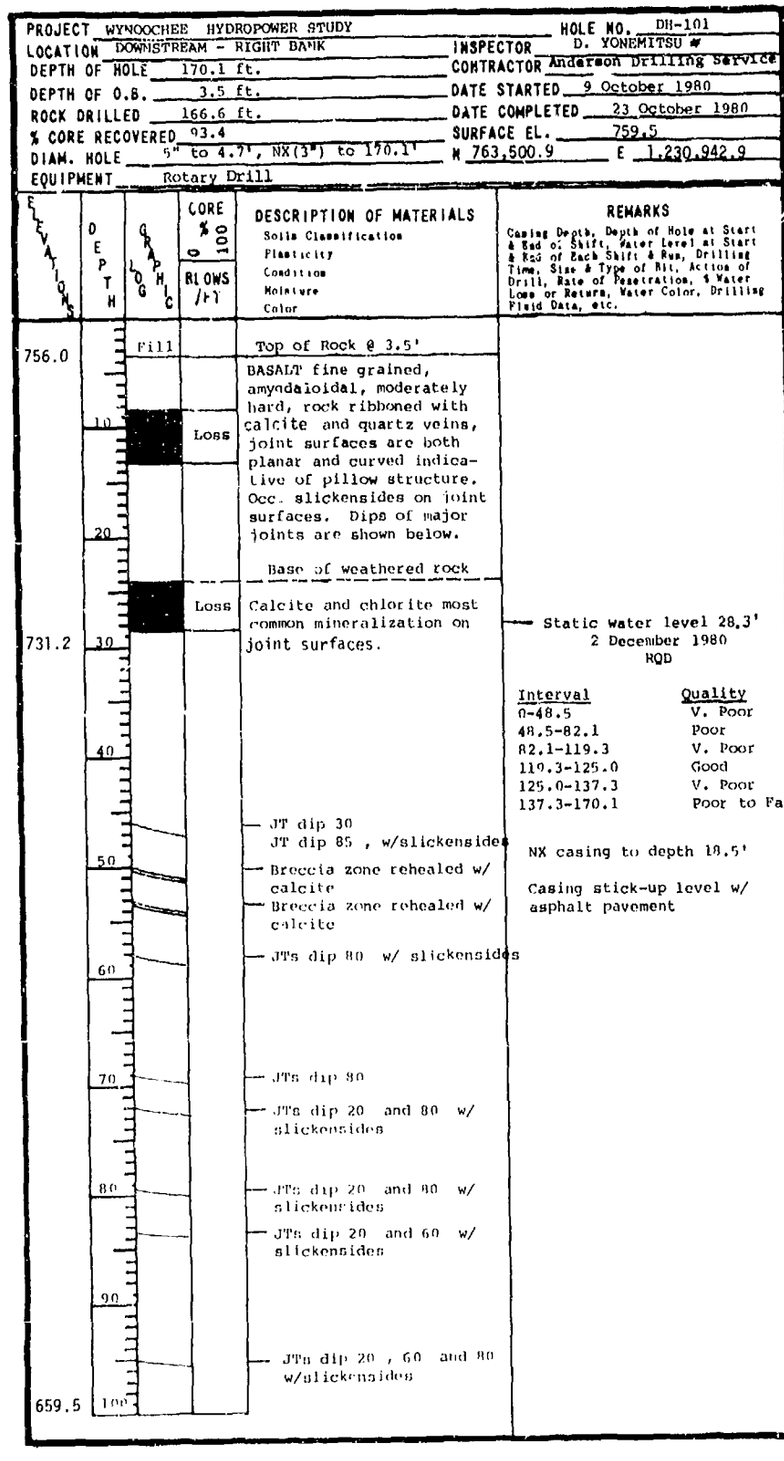

PROJECT WYNOOCHEE HYDROPOWER STUDY
HOLE NO. DH-101
LOCATION DOWNSTREAM - RIGHT BANK
INSPECTOR D. YONEMITSU
DEPTH OF HOLE 170.1 ft.
CONTRACTOR Anderson Drilling Service
DEPTH OF O.B. 3.5 ft.
DATE STARTED 9 October 1980
ROCK DRILLED 166.6 ft.
DATE COMPLETED 23 October 1980
% CORE RECOVERED 93.4
SURFACE EL. 759.5
DIAM. HOLE 5" to 4.7', NX(3") to 170.1'
N 763,500.9 E 1,230,942.9
EQUIPMENT Rotary Drill
ELEVATIONS
DEPTH
GRAPHIC LOG
CORE % 0 100
BLOWS /FT
DESCRIPTION OF MATERIALS
Soils Classification
Plasticity
Condition
Moisture
Color
REMARKS
Casing Depth, Depth of Hole at Start & End of Shift, Water Level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, % Water Loss or Return, Water Color, Drilling Fluid Data, etc.
756.0
Fill
Top of Rock @ 3.5'
BASALT fine grained, amygdaloidal, moderately hard, rock ribboned with calcite and quartz veins, joint surfaces are both planar and curved indicative of pillow structure. Occ. slickensides on joint surfaces. Dips of major joints are shown below.
Loss
Base of weathered rock
Loss
Calcite and chlorite most common mineralization on joint surfaces.
731.2
Static water level 28.3'
2 December 1980
RQD
Interval Quality
0-48.5 V. Poor
48.5-82.1 Poor
82.1-119.3 V. Poor
119.3-125.0 Good
125.0-137.3 V. Poor
137.3-170.1 Poor to Fair
NX casing to depth 18.5'
Casing stick-up level w/ asphalt pavement
JT dip 30
JT dip 85 , w/slickensides
Breccia zone rehealed w/ calcite
Breccia zone rehealed w/ calcite
JTs dip 80 w/ slickensides
JTs dip 80
JTs dip 20 and 80 w/ slickensides
JTs dip 20 and 80 w/ slickensides
JTs dip 20 and 60 w/ slickensides
JTs dip 20 , 60 and 80 w/slickensides
659.5
10
20
30
40
50
60
70
80
90
100
BPS Form 101 (Rev. Apr 65)

FIGURE F-10

PROJECT WYNOOCHEE HYDROPOWER STUDY HOLE NO. DH-101

LOCATION Downstream Right Bank SH 2 of 2

ELEVATIONS	DEPTH	GRAPHIC LOG	CORE % 0 100 / BLOWS/FT	DESCRIPTION OF MATERIALS Soils Classification Plasticity Condition Moisture Color	REMARKS Casing Depth, Depth of Hole at Start & End of Shift, Water Level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, % Water Loss or Return, Water Color, Drilling Fluid Data, etc.
	110			JT d.p 45	
				JT dip 80	
	120			JT dip 35	
	130				
	140			JTs dip 60 and 80	
	150				
	160			JT dip 90	
589.4	170			JT dip 70	
				Bottom of Hole @ 170.1 Ft.	

* Employee of Converse, Ward, Davis, Dixon, Geotechnical Engineers, who supervised exploration program for R.W. Beck and Associates, design engineers for Grays Harbor, P.U.D.

Original log modified by R. Eckerlin June, 1981 from independent logging.

SH 2 of 2

ENG FORM 1836 LOG OF DRILL HOLE

FIGURE F-10 cont.

PROJECT	WYNOOCHEE HYDROPOWER STUDY	HOLE NO.	DH-102
LOCATION	Downstream Right Bank	INSPECTOR	D. Yonemitsu *
DEPTH OF HOLE	60.1 ft.	CONTRACTOR	Anderson Drilling Service
DEPTH OF O.B.	60.1 ft.	DATE STARTED	10 Oct 80
ROCK DRILLED	None	DATE COMPLETED	17 Oct 80
% CORE RECOVERED	-	SURFACE EL.	746.0 ft.
DIAM. HOLE	5 inch	N	762,877.1 E 1,230,471.4
EQUIPMENT	Rotary Drill		

ELEVATIONS	DEPTH	GRAPHIC LOG	CORE % 0-100 / SAMPLE NO.	DESCRIPTION OF MATERIALS (Soils Classification, Plasticity, Condition, Moisture, Color)	REMARKS (Casing Depth, Depth of Hole at Start & End of Shift, Water Level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, % Water Loss or Return, Water Color, Drilling Fluid Data, etc.)
744.5		OL		Organic Soil	
741.5		ML		Sandy SILT, w/gravel, med. dense, moist	
	10	SP	1, 2	Gravelly SAND, fine to med. w/occ. cobbles, moist, gray to brown	
			3		Sampled w/300 pound downhole hammer and ring sampler.
725.2	20	ML, CL	4, 5	Clayey SILT w/laminations of silty CLAY & occ. sand & gravel, stiff, moist, brown to gray to blue gray at 25'	Sample No. / Blows/6 in.: 1 — 17, 33, 34; 2 — 32, 39, 46; 3 — 21, 31, 44; 4 — 20, 25; 5 — 12, 18, 25; 6 — 16, 19, 42; 7 — 100/2" refusal; 8 — 39, 50/2" ref.; 9 — 32, 72; 10 — 65, 100/3" ref.; 11 — 59, 100/3" ref.; 12 — 100/2" ref.
715.5	30		6		
			7	Silty SAND, fine w/occ. gravel, cobbles and boulders, rust brown to gray.	
	40	SM	8		
			9		
696.5	50		10	SAND, fine to med., w/thin interbeds of gravelly sand, very dense, moist, brown.	
		SP	11		
685.9	60		12	Bottom of Hole @ 60.1 ft.	
	70				Piezometer installed w/tip @ 53.0' Back filled w/gravel to 30' bentonite seal 27-30; surface to 27' backfilled with cuttings. Hole dry 11 Nov 80

* Employee of Converse, Ward, Davis, Dixon, Geotechnical Engineers, who supervised exploration program for R.W. Beck and Associates, design engineers for Grays Harbor, P.U.D.

Original log modified by R. Eckerlin, June 1981, from independent logging.

EPS Form 101 (Rev. 12-77)

FIGURE F-11

PROJECT	WYNOOCHEE HYDROPOWER STUDY	HOLE NO.	DH-103
LOCATION	Downstream Right Bank	INSPECTOR	D. Yonemitsu *
DEPTH OF HOLE	41.5 ft	CONTRACTOR	Anderson Drilling Service
DEPTH OF O.B.	41.5 ft	DATE STARTED	22 Oct 1980
ROCK DRILLED	None	DATE COMPLETED	23 Oct 1980
% CORE RECOVERED	-	SURFACE EL.	710.7
DIAM. HOLE	5 inch	N	762,387.4 E 1,230,538.7
EQUIPMENT	Rotary Drill		

ELEVATIONS	DEPTH	GRAPHIC LOG	CORE % / SAMPLE NO.	DESCRIPTION OF MATERIALS (Soils Classification, Plasticity, Condition, Moisture, Color)	REMARKS (Casing Depth, Depth of Hole at Start & End of Shift, Water Level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, % Water Loss or Return, Water Color, Drilling Fluid Data, etc.)
	10	SM	1 2 3	Silty SAND, fine w/gravel and laminations of silt dense, moist, brown to gray	Sampled w/300 pound downhole hammer and ring sampler. Sample No. — Blows/6in 1 — 30,30 2 — 29, 39, 46 3 — 39, 52 4 — 39, 54 5 — 46, 100/5" ref. 6 — 22, 50, 50/3" refusal 7 — 42, 49, 63/3" refusal 8 — 80, 100
	20		4	At about 20' lenses of coarse sand, very dense	
684.2			5		
	30	ML	6 7	SILT, w/fine sand and interbeds of gravelly silt, very dense, gray, wet.	100% water loss at 9.5 ft.
671.7	40	▽			water level 39' 11 Nov 80
669.2			8	Bottom of Hole @ 41.5'	
	50				Piezometer installed w/3/4" pvc slotted pipe from 35'-40' backfilled w/gravel to 29.0'; bentonite seal 27.2-29.0'; from surface to 27.2' backfill w/cuttings.

* Employee of Converse, Ward, Davis, Dixon, Geotechnical Engineers, who supervised exploration program for R.W. Beck and Associates, design engineers for Grays Harbor, P.U.D.

Original log modified by R. Eckerlin, June 1981, from independent logging.

USBR Form 101 (Rev. Apr 65)

FIGURE F-12

PROJECT WYNOOCHEE HYDROPOWER STUDY — HOLE NO. DH-104
LOCATION Downstream Right Bank — INSPECTOR D. Yonemitsu *
DEPTH OF HOLE 59.3 ft — CONTRACTOR Anderson Drilling Service
DEPTH OF O.B. 7.0 — DATE STARTED 28 Oct 80
ROCK DRILLED 52.3 ft — DATE COMPLETED 3 Nov 80
% CORE RECOVERED 100% — SURFACE EL. 648.1 ft
DIAM. HOLE 5" to 9', NX(3") to 59.3' — N 762,795.9 E 1,230,646.0
EQUIPMENT Skid Mount Rotary Drill (Wireline)

ELEVATIONS	DEPTH	GRAPHIC LOG	CORE % (ø 100) / BLOWS /ft	DESCRIPTION OF MATERIALS (Soils Classification, Plasticity, Condition, Moisture, Color)	REMARKS (Casing Depth, Depth of Hole at Start & End of Shift, Water Level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, & Water Loss or Return, Water Color, Drilling Fluid Data, etc.)
		SM		Silty SAND, trace gravel organics and wood, med. dense, brown, wet	
641.1				Top of Rock @ 7.0'	
	10			BASALT, gray-green, fine grained amygdaloidal, mod. hard to hard, slightly weathered to fresh. Dips of major jts shown below.	From 11.5 to 17.0' had up to 80% water loss during drilling
				JT dip 60 , clay seam	
	20			JT dip 65 , clay traces	RQD: Interval 9.0-32.9 Quality Poor to fair; 32.9-46.5 Fair; 46.5-51.1 V. Poor; 51.1-59.3 Fair to Good
				JT dip 40 , clay traces	
	30			Most joints coated or infilled w/calcite & chlorite & clay near surface.	
	40				
	50				No ground water encountered during drilling
				JT dip 35 , chlorite infilling	
588.8	60				
				Bottom of hole @ 59.3 ft.	
	70				NX casing (3.5") to 9' NX wireline casing (3.0") 9' to 53.9'

* Employee of Converse, Ward, Davis, Dixon, Geotechnical Engineers, who supervised exploration program for R.W. Beck and Associates, design engineers for Grays Harbor, P.U.D.

Original log modified by R. Eckerlin, June 1981, from independent logging.

ENG Form 1836 Apr 65

FIGURE F-13

PROJECT WYNOOCHEE HYDROPOWER STUDY — HOLE NO. DH-105

LOCATION Downstream Right Bank — INSPECTOR D. Yonemitsu *

DEPTH OF HOLE 135.0 ft — CONTRACTOR Anderson Drilling Service

DEPTH OF O.B. 43.5 ft — DATE STARTED 9 Oct 1980

ROCK DRILLED 91.5 ft — DATE COMPLETED 23 Oct 1980

% CORE RECOVERED 99% — SURFACE EL. 752.0

DIAM. HOLE 5.5" to 43.5', NX (3.5") in Rock — N 763,135.3 E 1,230,697.8

EQUIPMENT Rotary Drill

ELEVATIONS	DEPTH	GRAPHIC LOG	SAMPLE NO	CORE % 0–100	DESCRIPTION OF MATERIALS (Soils Classification, Plasticity, Condition, Moisture, Color)	REMARKS (Casing Depth, Depth of Hole At Start & End of Shift, Water Level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, % Water Loss or Return, Water Color, Drilling Fluid Data, etc.)
					Sand, Gravel, Cobbles & Boulders	
	10	Fill	1			
743.0			2		Clayey SILT w/trace sand, v. loose, wet, brown	
		ML	3			
			4			
			5			
732.0	20					
		CL, ML	6		Silty CLAY, thinly bedded, blue gray w/clayey SILT,	
729.5					stiff, moist, brown	NX casing to 52.5'
			7			Casing stick-up 0.3'
	30					
		ML, SP	8		Clayey SILT, thinly bedded v. dense, moist, brown to gray, traces of gravel.	Sampled with 300 pound down hole hammer, 30" drop, ring sampler.
			9		SAND (fine to med.) thinnly bedded, v. dense, moist, brown	
	40		10			
708.5					Top of Rock @ 43.5'	
	50				BASALT, fine grained, amygdaloidal, moderately hard, rock ribboned w/calcite & quartz veins, joint surfaces are both planer curved indicative of pillow structure. Dips of major joints are shown below.	
696.5		▽				
	60				JT dip 35 , 1/16" tan Clay filling	
					Calcite and chlorite most common mineralization on joint surfaces.	
	70					
	80					
	90				JT dip 60 , 3/8" calcite filling	
					JT dip 70 , ½" gouge	
652.0	100					

SAMPLE	BLOWS/6"
1	7, 6, 3
2	7, 2, 4
3	2, 4, 6
4	11, 7, 8
5	7, 12, 12
6	4, 7, 21
7	49, 100, refusal
8	100, refusal
9	100, refusal
10	100/3" refusal

Static water level 55.5' 3 Dec 1980

RQD

Interval	Quality
45.0–54.1	V. Poor
54.1–128.3	Fair to Good
128.3–135.0	Excellent

EPS Form 101 (Rev. Aug 65)

FIGURE F-14

PROJECT WYNOOCHEE HYDROPOWER STUDY HOLE NO. DH-105

LOCATION Downstream Right Bank SH 2 of 2

ELEVATIONS	DEPTH	GRAPHIC LOG	CORE % 0 100 / BLOWS /FT	DESCRIPTION OF MATERIALS Soils Classification Plasticity Condition Moisture Color	REMARKS Casing Depth, Depth of Hole at Start & End of Shift, Water Level at Start & End of Each Shift & Run, Drilling Time, Size & Type of Bit, Action of Drill, Rate of Penetration, % Water Loss or Return, Water Color, Drilling Field Data, etc.
	110			Bedrock, BASALT (Cont.)	
	120			JT dip 30 , w/slickensides	
	130			JT dip 45 , w/slickensides JT dip 75 , w/slickensides	
617.0	140			Bottom of hole @ 135.0 ft.	

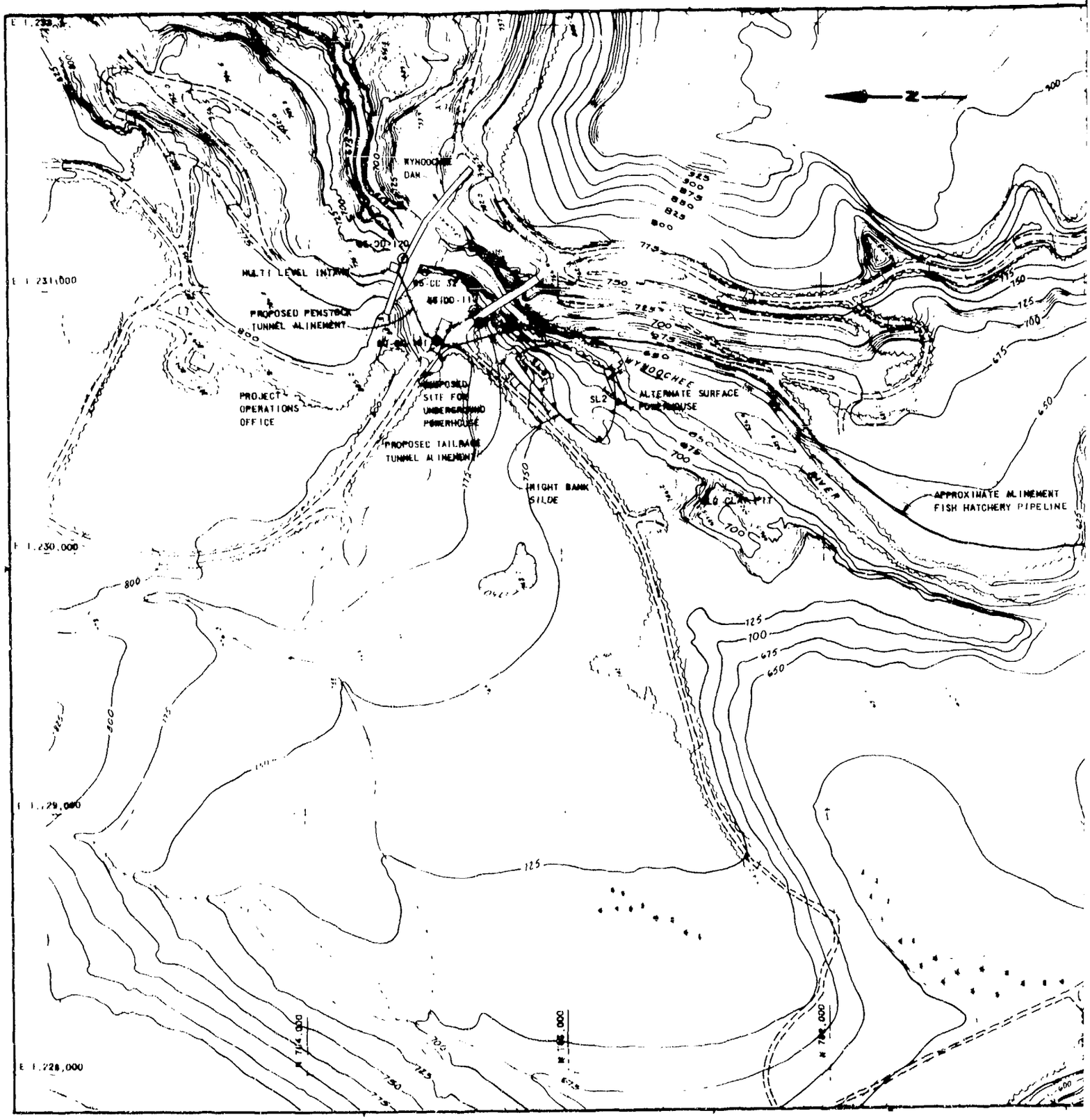
* Employee of Converse, Ward, Davis, Dixon, Geotechnical Engineers, who supervised exploration program for R.W. Beck and Associates, design engineers for Grays Harbor, P.U.D.

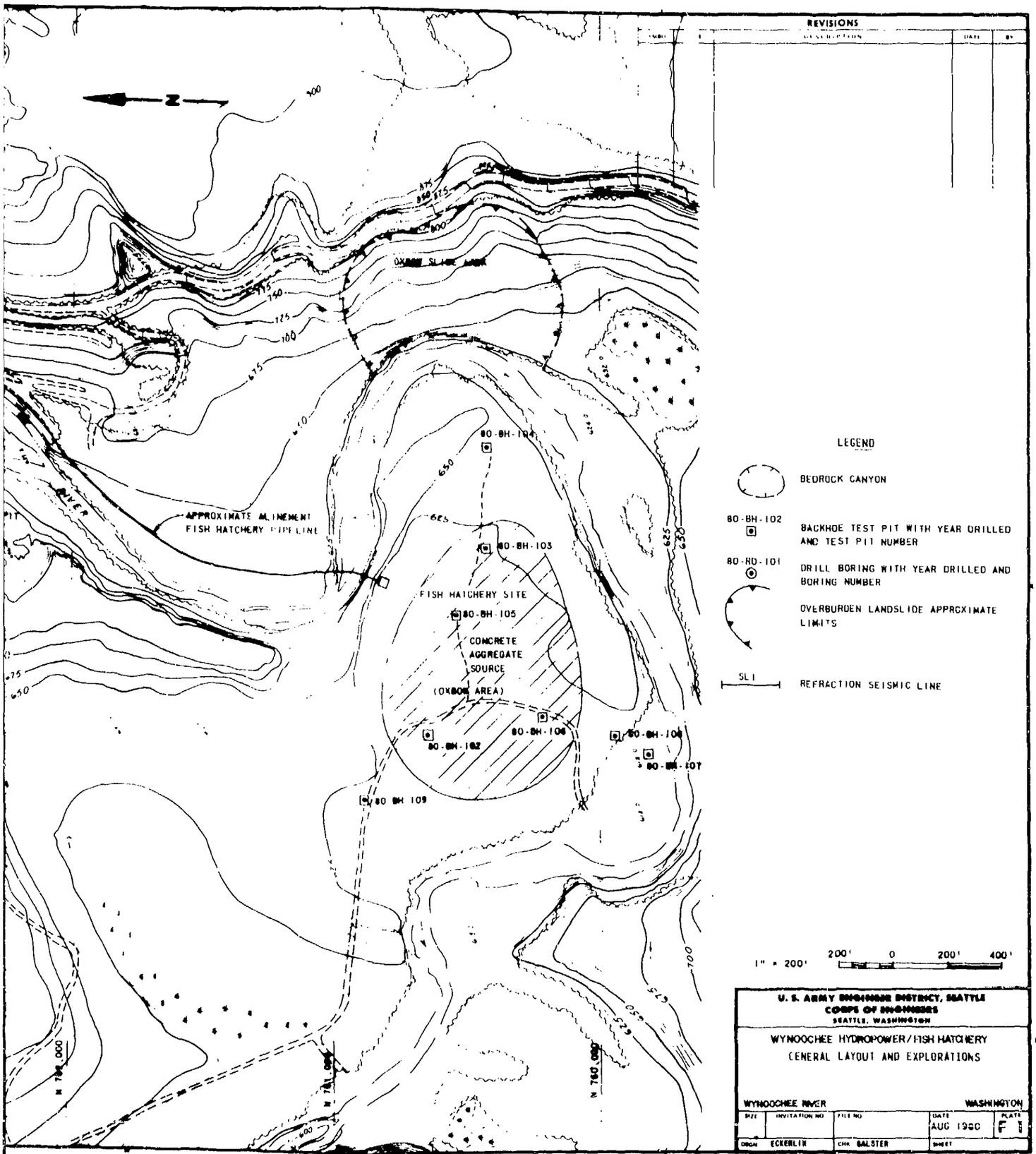
Original log modified by R. Eckerlin, June 1981, From Independent logging.

SH 2 of 2

EM Form ... a LOG OF DRILL HOLE

FIGURE F-14 cont.


N
WYNDGHEE DAM
MULTI LEVEL INTAKE
PROPOSED PENSTOCK TUNNEL ALINEMENT
PROJECT OPERATIONS OFFICE
PROPOSED SITE FOR UNDERGROUND POWERHOUSE
PROPOSED TAILRACE TUNNEL ALINEMENT
SL2
WYNDGHEE ALTERNATE SURFACE POWERHOUSE
RIGHT BANK SILDE
BORROW PIT
APPROXIMATE ALINEMENT FISH HATCHERY PIPELINE
E 1,231,000
E 1,230,000
E 1,229,000
E 1,228,000



REVISIONS

SYMBOL	DESCRIPTION	DATE	BY

LEGEND

- BEDROCK CANYON
- 80-BH-102 — BACKHOE TEST PIT WITH YEAR DRILLED AND TEST PIT NUMBER
- 80-RD-101 — DRILL BORING WITH YEAR DRILLED AND BORING NUMBER
- OVERBURDEN LANDSLIDE APPROXIMATE LIMITS
- SL1 — REFRACTION SEISMIC LINE

1" = 200' 200' 0 200' 400'

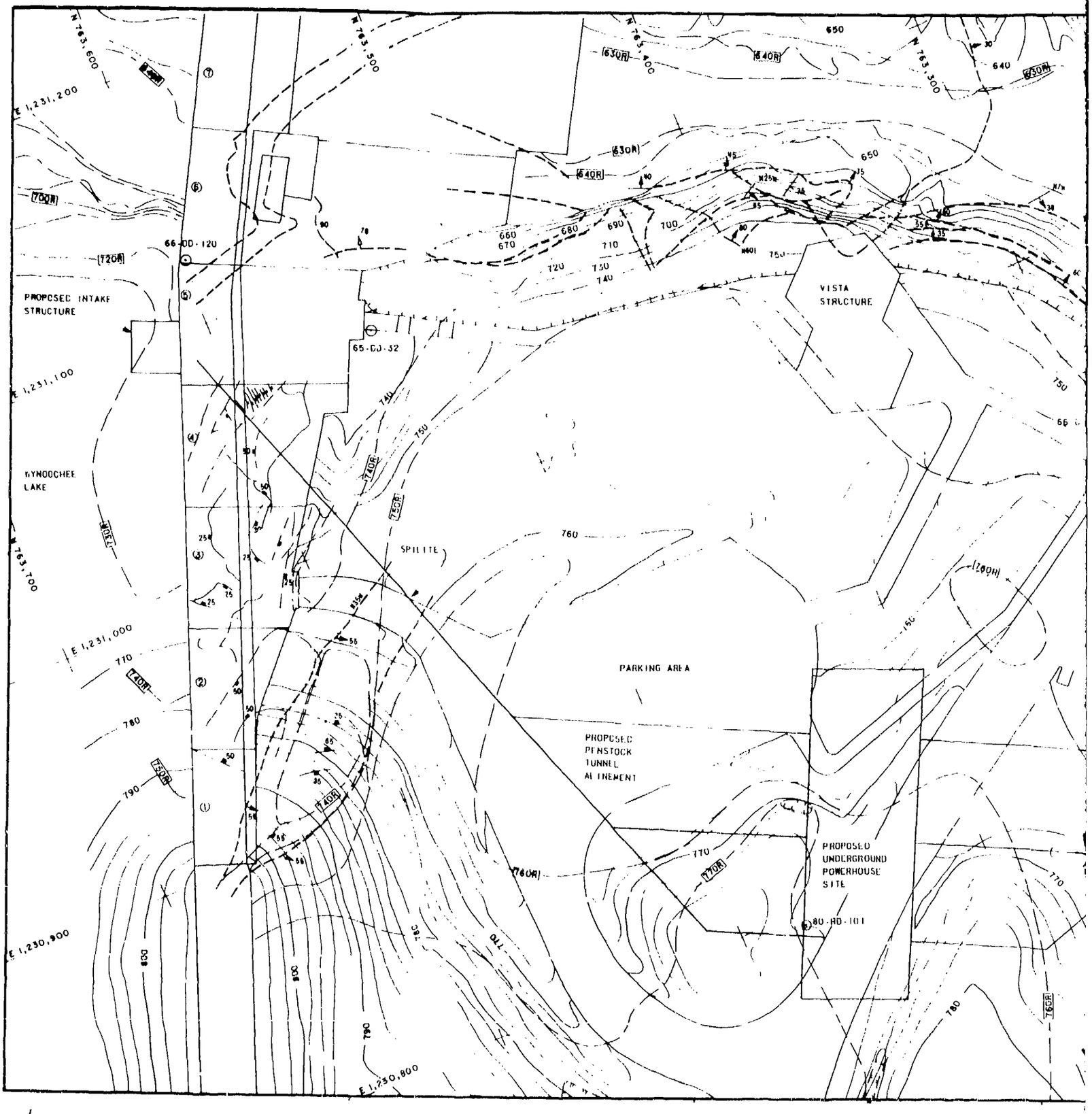
U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

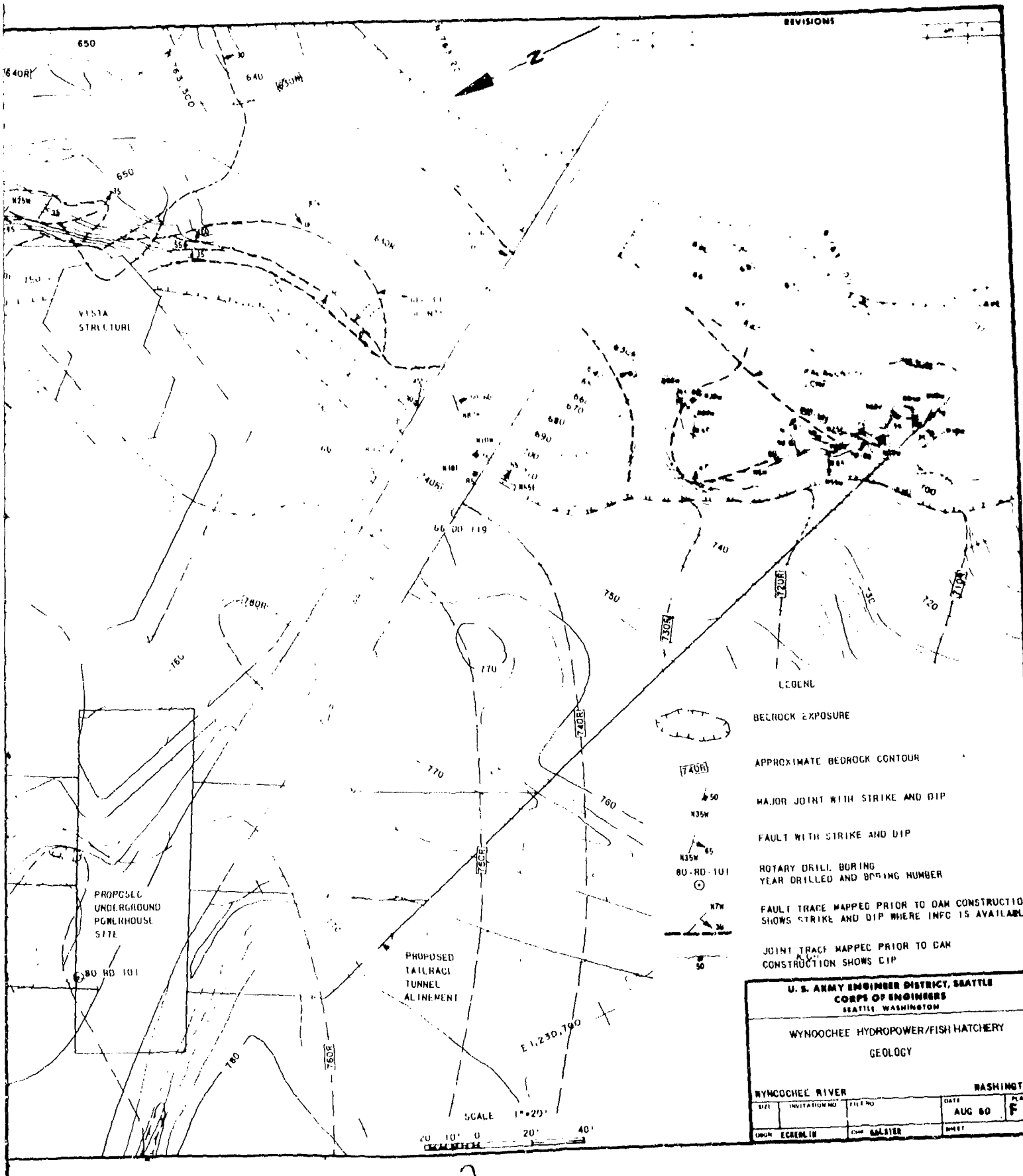
WYNOOCHEE HYDROPOWER/FISH HATCHERY
GENERAL LAYOUT AND EXPLORATIONS

WYNOOCHEE RIVER WASHINGTON

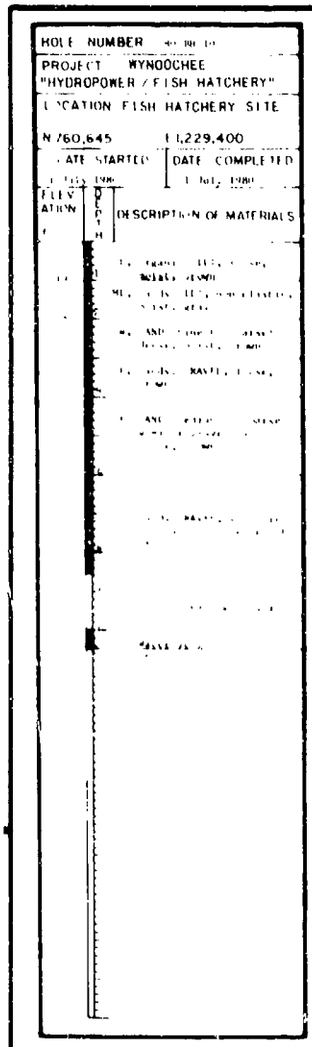
SIZE	INVITATION NO	FILE NO	DATE	PLATE
			AUG 1980	E 1
DRGN ECKERLIN	CHK GALSTER		SHEET	

2

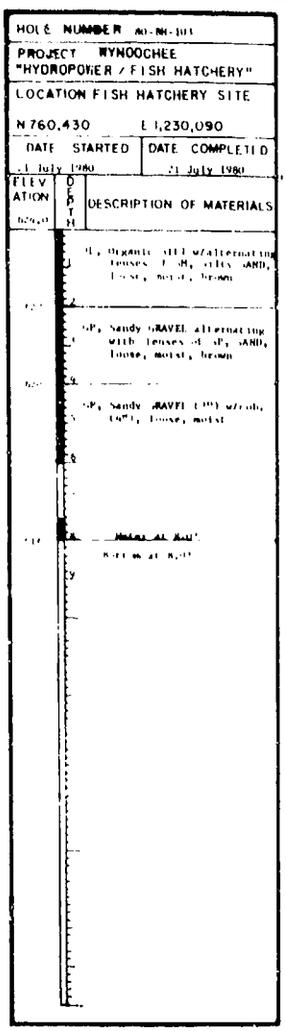

PROPOSED INTAKE STRUCTURE
65-DD-120
65-DD-32
VISTA STRUCTURE
WYNOOCHEE LAKE
SPILLITE
PARKING AREA
PROPOSED PENSTOCK TUNNEL ALIGNMENT
PROPOSED UNDERGROUND POWERHOUSE SITE
80-AD-101
N 763,600
N 763,500
N 763,400
N 763,300
N 763,700
E 1,231,200
E 1,231,100
E 1,231,000
E 1,230,900
E 1,230,800


REVISIONS
650
640R
763.5CD
640
650
N25W
35
VISTA
STRUCTURE
650N
680N
680
690
700
710R
720R
730R
740R
750
760
770
780R
760R
75CR
PROPOSED
UNDERGROUND
POWERHOUSE
SITE
80 RD 101
PROPOSED
TAILRACE
TUNNEL
ALINEMENT
EL 1,230,700
SCALE 1"=20'
20 10' 0 20' 40'
LEGEND
BEDROCK EXPOSURE
APPROXIMATE BEDROCK CONTOUR
MAJOR JOINT WITH STRIKE AND DIP
FAULT WITH STRIKE AND DIP
ROTARY DRILL BORING
YEAR DRILLED AND BORING NUMBER
FAULT TRACE MAPPED PRIOR TO DAM CONSTRUCTION
SHOWS STRIKE AND DIP WHERE INFO IS AVAILABLE
JOINT TRACE MAPPED PRIOR TO DAM
CONSTRUCTION SHOWS DIP
U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON
WYNOOCHEE HYDROPOWER/FISH HATCHERY
GEOLOGY
WYNOOCHEE RIVER
WASHINGTON
DATE AUG 60
PLATE F 2
DRAWN ECHENLIN
CHKD GALSTER

2



HOLE NUMBER [illegible]
PROJECT WYNOOCHEE "HYDROPOWER / FISH HATCHERY"
LOCATION FISH HATCHERY SITE
N 760,645 E 1,229,400
DATE STARTED [illegible] DATE COMPLETED 1 July 1980
ELEVATION | DEPTH | DESCRIPTION OF MATERIALS



HOLE NUMBER 80-BH-101
PROJECT WYNOOCHEE "HYDROPOWER / FISH HATCHERY"
LOCATION FISH HATCHERY SITE
N 760,430 E 1,230,090
DATE STARTED 21 July 1980 DATE COMPLETED 21 July 1980
ELEVATION | DEPTH | DESCRIPTION OF MATERIALS

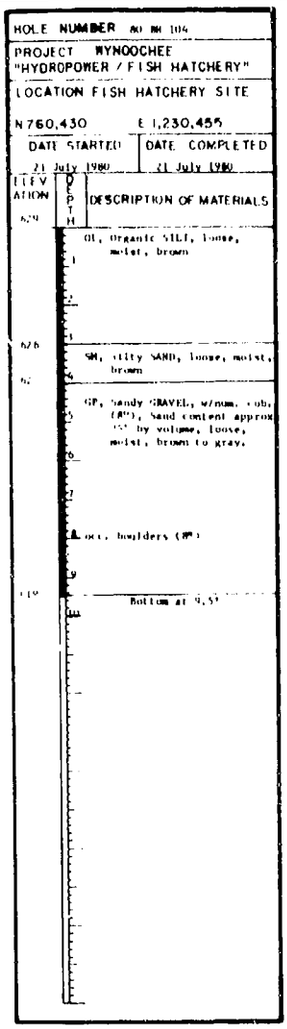
OL, Organic silt w/alternating lenses of SM, silty SAND, loose, moist, brown

GP, Sandy GRAVEL alternating with lenses of SP, SAND, loose, moist, brown

GP, Sandy GRAVEL (3") w/cob. (6"), loose, moist

Water at [illegible]'

Bottom at [illegible]'



HOLE NUMBER 80-BH-102
PROJECT WYNOOCHEE "HYDROPOWER / FISH HATCHERY"
LOCATION FISH HATCHERY SITE
N 760,430 E 1,230,455
DATE STARTED 21 July 1980 DATE COMPLETED 21 July 1980
ELEVATION | DEPTH | DESCRIPTION OF MATERIALS

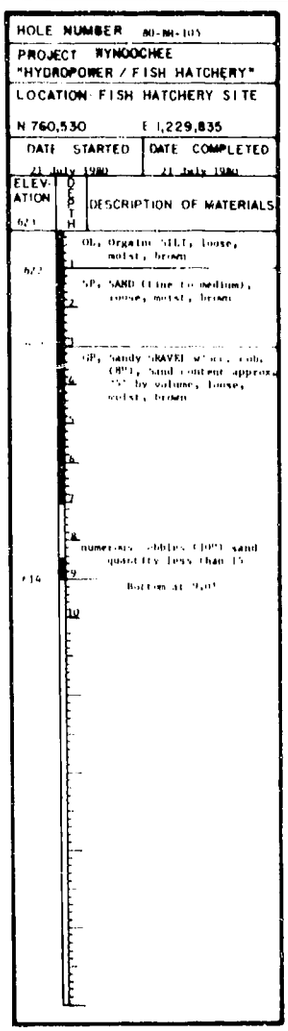
OL, Organic SILT, loose, moist, brown

SM, silty SAND, loose, moist, brown

GP, Sandy GRAVEL, w/num. cob. (8"), Sand content approx. [illegible]% by volume, loose, moist, brown to gray.

occ. boulders (8")

Bottom at 9.5'



HOLE NUMBER 80-BH-103
PROJECT WYNOOCHEE "HYDROPOWER / FISH HATCHERY"
LOCATION FISH HATCHERY SITE
N 760,530 E 1,229,835
DATE STARTED 21 July 1980 DATE COMPLETED 21 July 1980
ELEV-ATION | DEPTH | DESCRIPTION OF MATERIALS

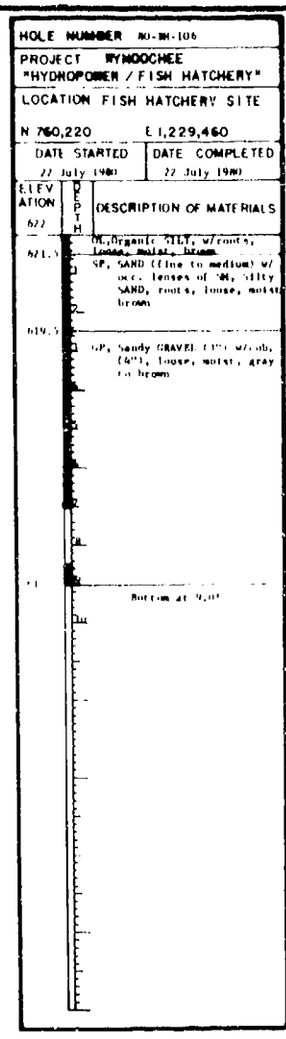
OL, Organic SILT, loose, moist, brown

SP, SAND (fine to medium), loose, moist, brown

GP, Sandy GRAVEL w/occ. cob. (8"), Sand content approx. [illegible]% by volume, loose, moist, brown

numerous cobbles (10") sand quantity less than 15

Bottom at [illegible]'



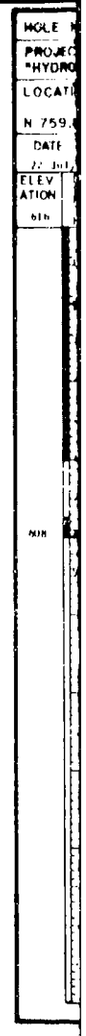
HOLE NUMBER 80-BH-106
PROJECT WYNOOCHEE "HYDROPOWER / FISH HATCHERY"
LOCATION FISH HATCHERY SITE
N 760,220 E 1,229,460
DATE STARTED 22 July 1980 DATE COMPLETED 22 July 1980
ELEV ATION | DEPTH | DESCRIPTION OF MATERIALS

OL, Organic SILT, w/roots, loose, moist, brown

SP, SAND (fine to medium) w/ occ. lenses of SM, silty SAND, roots, loose, moist, brown

GP, Sandy GRAVEL (3") w/cob. (6"), loose, moist, gray to brown

Bottom at 9.0'



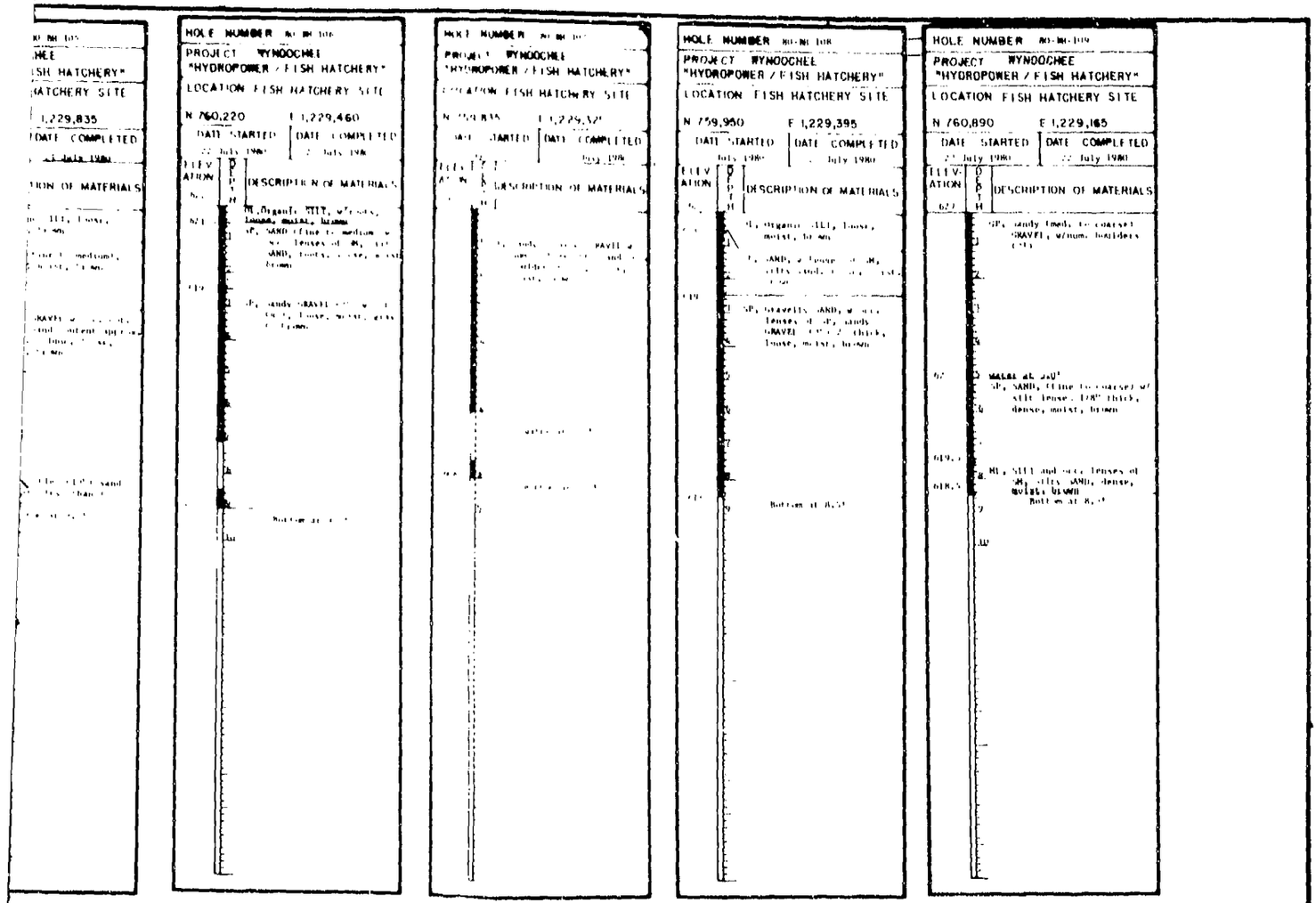
HOLE [illegible]
PROJEC "HYDRO
LOCATI
N 759.
DATE
ELEV ATION
61[illegible]
[illegible]

LEGEND

80-BH-103 YEAR DRILLED AND BACKHOE TRENCH NUMBER

DEPTH RANGE WHERE A COMPOSITE SAMPLE WAS TAKEN

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND

80 BH 103 — YEAR DRILLED AND BACKHOE TRENCH NUMBER

DEPTH RANGE WHERE A COMPOSITE SAMPLE WAS TAKEN

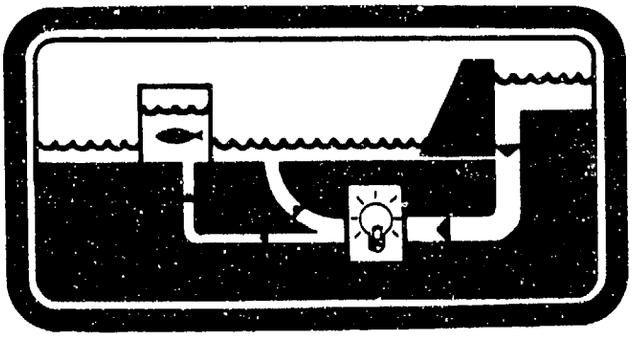
UNIFIED SOIL CLASSIFICATION SYSTEM

U. S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON				
WYNOOCHEE HYDROPOWER/FISH HATCHERY				
AGGREGATE INVESTIGATION				
FISH HATCHERY SITE				
WYNOOCHEE RIVER				WASHINGTON
DATE	INVITATION NO	FILE NO	DATE JULY 1980	PLATE F 3
DESIGN JOHNSON	DRAWN		SHEET 1 OF 1	

8

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX G

APPENDIX G

PLAN FORMULATION

TABLE OF CONTENTS

Paragraph		Page
1	Preliminary Analysis and Screening	G-1
	a. Hydropower at Wynoochee Dam	G-1
	b. Fish Enhancement at Wynoochee Dam	G-4
	c. No Action	G-8
2	Detailed Studies	G-9
	a. Combinations of Design Options	G-9
	b. Design and Cost Estimate Studies	G-9
	c. Geotechnical Investigations	G-10
	d. Environmental Studies	G-11
	e. Summary of Detailed Studies	G-12
3.	Hydropower Formulation and Optimization	G-12
	a. Streamflow Availability and Duration	G-12
	b. Energy Potential	G-13
	c. Hydropower Optimization	G-17
	d. Operation	G-21
4.	Comparison of Alternative Plans	G-21

TABLES

Number		
G-1	Cost Estimate Summary - Underground Hydropower Plus Fish Hatchery - 800 CFS Powerhouse	G-22
G-2	Cost Estimate Summary - Underground Hydropower Only - 800 CFS Powerhouse	G-23
G-3	Cost Estimate Summary - Underground Hydropower Plus Fish Hatchery - 1,000 CFS Powerhouse	G-24
G-4	Cost Estimate Summary - Underground Hydropower Only - 1,000 CFS Powerhouse	G-25
G-5	Cost Estimate Summary - Underground Hydropower Plus Fish Hatchery - 1,200 CFS Powerhouse	G-26
G-6	Cost Estimate Summary - Underground Hydropower Only - 1,200 CFS Powerhouse	G-27
G-7	Cost Estimate Summary - Underground Hydropower Plus Fish Hatchery - 1,400 CFS Powerhouse	G-28
G-8	Cost Estimate Summary - Underground Hydropower Only - 1,400 CFS Powerhouse	G-29
G-9	Detailed Comparison of Alternative Plans	G-30

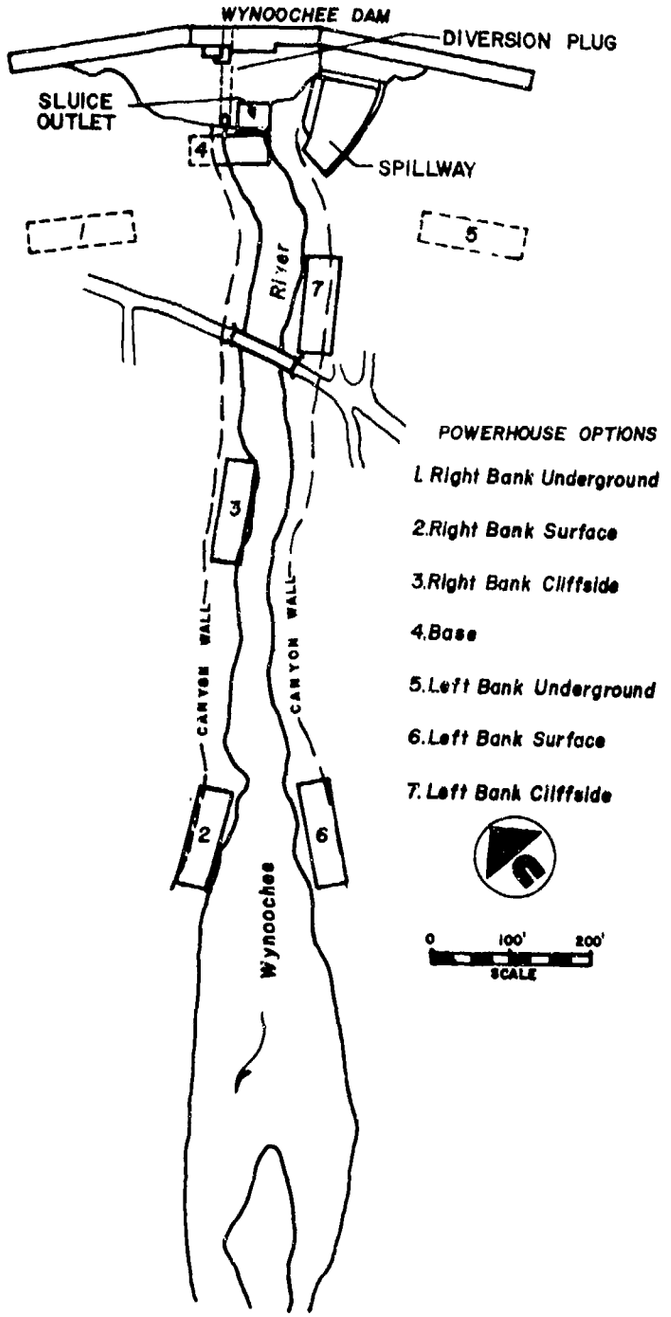
FIGURES

Number		Page
G-1	Wynoochee Powerhouse Location Options	G-2
G-2	Wynoochee Fish Hatchery Location Options	G-6
G-3	Flow Duration Curve for Regulated Average Monthly Discharges, Wynoochee Lake Project - November	G-14
G-4	Flow Duration Curve for Regulated Average Monthly Discharges, Wynoochee Lake Project - December	G-15
G-5	Flow Duration Curve for Regulated Average Monthly Discharges, Wynoochee Lake Project - January	G-16
G-6	Power Benefits Versus Power Costs for Four Powerhouse Sizes	G-19
G-7	Net Power Benefits Versus Powerhouse Hydraulic Capacity	G-20

1. Preliminary Analysis and Screening. Alternatives for meeting the two planning objectives were formulated, evaluated, and screened during preliminary engineering, economic, and environmental studies. The alternatives included hydropower at Wynoochee Dam, various fish enhancement measures in the vicinity of Wynoochee Dam, and no action.

a. Hydropower at Wynoochee Dam. Hydropower formulation studies were conducted to determine the powerhouse configuration most appropriate to produce energy from a reasonably high percentage of expected outflows from Wynoochee Dam without modifying existing project operations. A preliminary hydraulic capacity of the powerhouse was selected to be 1,200 cubic feet per second (c.f.s.), the flow equalled or exceeded 20 percent of the time in December, the month with the highest runoff at Wynoochee Dam. The selection of the 1,200 c.f.s. powerhouse was confirmed by the hydropower optimization studies (see paragraph 3c). A combination of three horizontal shaft Francis turbines was considered to be reasonable and sufficient to produce power under the varying existing project flow conditions up to 1,200 c.f.s. One small turbine would be used during low flow operation as well as other flow periods, and two larger turbines would be used during intermediate and high flow periods. The small turbine was sized for a 190-c.f.s. discharge from the 780-foot pool (133 feet net head). The larger turbines were each sized for a full gate discharge of 500 c.f.s. from the 764-foot pool elevation (117 feet net head). The small generator would have a 1.8-megawatt (MW) nameplate capacity rating (2.1-MW continuous overload rating) which would be matched to the turbine full gate output from the 800-foot pool elevation (153 feet net head). The larger generators would each have a 4.2-MW nameplate capacity rating (4.8-MW continuous overload rating each) which would be matched to the turbine full gate outputs from the 764-foot pool. In total, there would be three commercially available generators, a 1.8-MW (1.7-MW overload) unit, and two 4.2-MW (4.8-MW overload) units, with a total installed generating capacity of 10.2 MW nameplate (11.3-MW continuous overload). The final size of the units will be determined during advanced engineering and design studies. These studies will include the possibility of making full use of the presently unutilized industrial water supply and irrigation storage in the existing project for power production until such time as the storage is requested for its authorized purposes. The powerhouse would be approximately 130 feet long, 40 feet wide, and 60 feet high. The average annual energy of the project based on average monthly pool elevations (net heads) and reservoir releases would be 37,400 megawatthours (MWH) (4.3 MW average energy), approximately 91 percent of the total annual potential energy available at Wynoochee Dam. The average annual capacity factor would be 42 percent and the average winter (November, December, and January) capacity factor would be 60 percent.

Seven powerhouse locations (figure G-1), with various penstock configurations as appropriate, were considered during the preliminary studies. The hydropower design options to the hydropower alternative were as follows:



Wynoochee Powerhouse Location Options

FIGURE G-1

(1) Right bank underground powerhouse (200 feet downstream of the dam).

(a) Tunnel through diversion plug, into right canyon wall, and through right bank.

(b) Tunnel under right abutment and through right bank.

(c) Tunnel through dam at 700-foot level, into right canyon wall, and through right bank.

(2) Right bank surface powerhouse (900 feet downstream of dam).

(a) Tunnel through diversion plug, into right canyon wall, and through right bank.

(b) Tunnel under right abutment and through right bank.

(c) Tunnel through dam at 700-foot level, into right canyon wall, and through right bank.

(d) Tunnel through diversion plug and surface penstock down canyon.

(3) Right bank cliffside powerhouse (500 feet downstream of dam).

(a) Tunnel through diversion plug, into right canyon wall, and through right bank.

(b) Tunnel under right abutment and through right bank.

(c) Tunnel through diversion plug and surface penstock down canyon.

(4) Powerhouse at base of dam.

(a) Tunnel through diversion plug with powerhouse cut into right canyon wall.

(b) Tunnel through diversion plug with powerhouse under sluices.

(c) Manifold existing low flow conduits through dam with powerhouse under sluices (no intake structure).

(5) Left bank underground powerhouse (200 feet downstream of dam).

(a) Tunnel under left abutment and through left bank.

(b) Tunnel through dam at 700-foot level, into canyon wall, and through left bank.

(6) Left bank surface powerhouse (900 feet downstream of dam).

(a) Tunnel under left abutment and through left bank.

(b) Tunnel through dam at 700-foot level, into left canyon wall, and through left bank.

(c) Tunnel through dam at 700-foot level and surface penstock down canyon.

(7) Left bank cliffside powerhouse (300 feet downstream of dam).

(a) Tunnel under left abutment and through left bank.

(b) Tunnel through dam at 700-foot level, into left canyon wall, and through left bank.

(c) Tunnel through dam at 700-foot level and surface penstock down canyon.

All hydropower design options to the hydropower alternative except 1b and 2b were deleted from further consideration during the preliminary studies. Design options 5, 6, and 7 were deleted because of potential hydraulic and operational problems associated with the spillway. Design option 4c was deleted because existing low flow conduits through the dam would create significant head losses if they were used as penstocks, thereby wasting the energy potential (see paragraph 3c for further evaluation). Design options 4a and 4b were deleted because there is insufficient room for the powerhouse at the base of the dam. Design option 3 was deleted because of potential problems with the powerhouse being located in the canyon below a slide in the overburden material at the same location. Design option 2d was deleted because of potential problems associated with the penstock being located along the bottom of the rock canyon. Design options 1c and 2c, the design options originally proposed by R. W. Beck and Associates in their appraisal report for Grays Harbor Public Utility District No. 1 (PUD) (see paragraph 3.04a in feasibility report), were deleted from further consideration by the Corps because their proposed penstock went through the joint between monoliths 6 and 7 in the dam, squeezed in between the elevator and the sluices, possibly endangering the structural integrity of the dam. Design options 1a and 2a were deleted because of potential problems associated with the penstock entering the canyon wall and the need to construct a full height multilevel intake structure underwater.

b. Fish Enhancement at Wynoochee Dam. Three alternatives are possible in the vicinity of Wynoochee Dam to enhance the anadromous fish runs: spawning channels, rearing ponds, and a fish hatchery. All three would take advantage of the gravity water supply from Wynoochee Dam.

Spawning channels would increase spawning capability only and would be dependent upon the river for rearing capacity. The spawning channel alternative would cause adverse impacts on the natural runs of fish spawning and rearing in the Wynoochee River and would create minor enhancement benefits. Rearing ponds would be dependent upon the fish spawned at other locations. The rearing pond alternative would cause fish management problems similar to those of the spawning channel alternative. A fish hatchery would include both spawning and rearing facilities and provide optimum use of the water supply from Wynoochee Dam. A fish hatchery was considered to be the most viable fish enhancement alternative in the vicinity of Wynoochee Dam because it would provide optimum use of the opportunity at Wynoochee Dam in terms of production and efficiency.

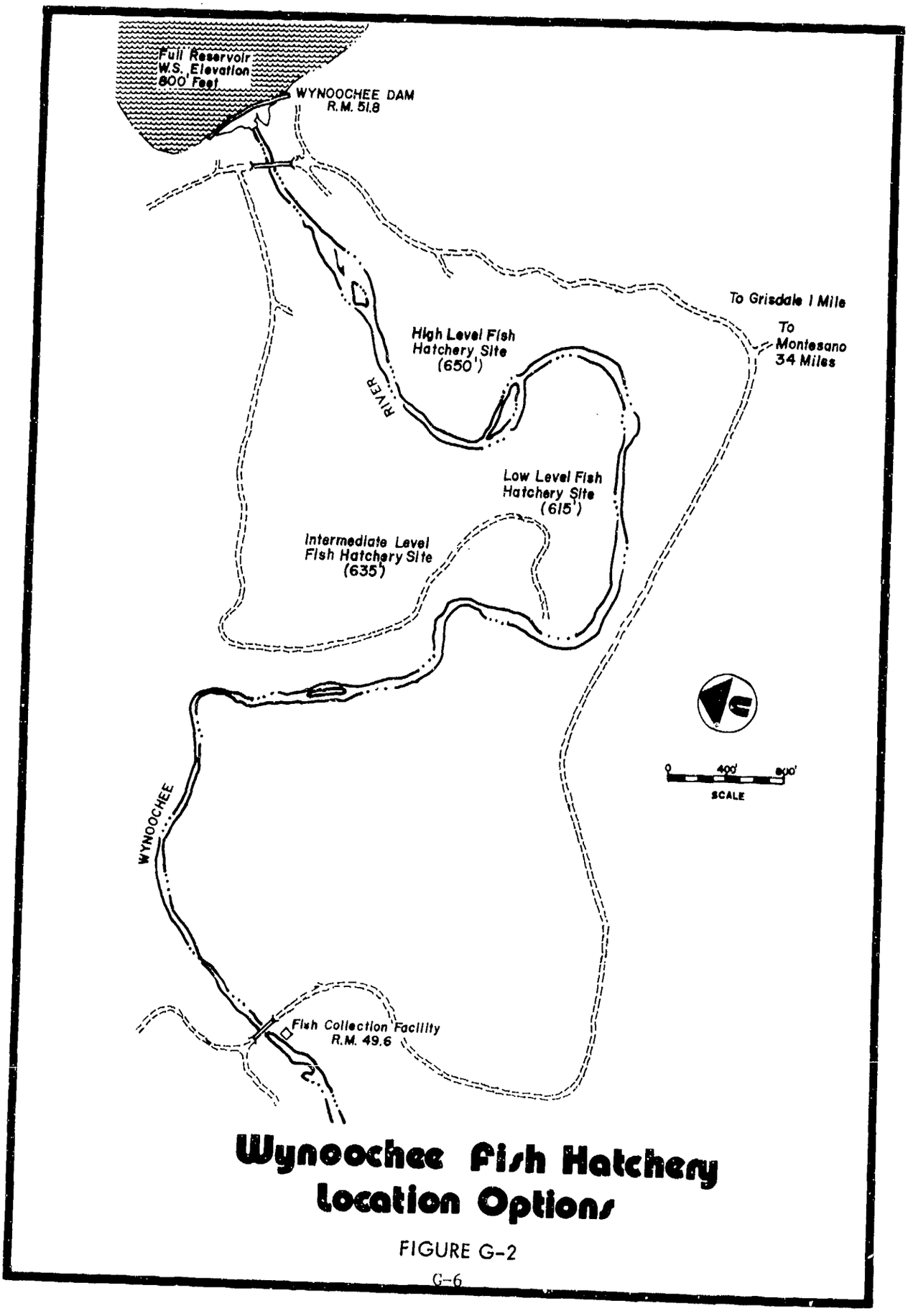
Three location options were available for the location of the fish hatchery alternative in the vicinity of Wynoochee Dam (figure G-2). A small site on a high level bench (elevation 650 feet) on the left bank 2,000 feet downstream of the dam was too small an area for a hatchery which could utilize the available water (190/140-c.f.s. minimum flow release), was not a flat site, and was too high above the river to be connected with a gravity flow pipeline from a hydropower facility. Two large sites approximately 3,000 feet downstream of the dam on the right bank were acceptable. The sites were similar except that one site was located on an intermediate level bench (elevation 635 feet) and the other on a low level bench (elevation 615 feet). Both sites could accommodate a hatchery which could utilize all the available water and could be connected with a gravity flow pipeline from a hydropower facility. A large fish hatchery on the right bank of the Wynoochee River 3,000 feet downstream of Wynoochee Dam offers a unique combination of factors that make development of an enhancement fish hatchery at either site very attractive because:

(1) A generous source of good quality water (190/140-c.f.s. minimum flow release) is available from Wynoochee Dam. This is one of the most important factors in locating a hatchery. In addition, the temperature of water from Wynoochee Dam is partially controllable as a result of the multilevel intake withdrawals.

(2) A fail-safe gravity flow from the dam or hydropower facility to the hatchery site could be developed, eliminating the usual energy requirement and associated costs for pumping water and the need for a standby emergency power source.

(3) A special cold water supply leading from the depths of the Wynoochee Dam Reservoir would make the hatchery especially adaptable to holding adult spring chinook salmon prior to spawning.

(4) A fish hatchery location above the traditional fishing areas near the head of the anadromous fish run would permit a sizable terminal fishing area for sportsmen and Indian fishermen.



Wynoochee Fish Hatchery Location Options

FIGURE G-2

(5) A fish barrier dam and collection facility is part of the existing Wynoochee Dam project and could be used to capture spawning stock for the fish hatchery.

(6) There is a large area above the 100-year flood level suitable for construction of the hatchery.

In addition, the fish hatchery could meet fishery mitigation requirements onsite, would require no change in the operation of the existing project, and has strong public and agency support.

This unique combination of factors, together with the state's concern for the anadromous fish in the Northwest, including the Chehalis River Basin and Grays Harbor area, prompted the letter from the Governor of Washington requesting the study of a fish hatchery in conjunction with hydropower at Wynoochee Dam. Other fish hatchery sites in the Chehalis River Basin and Grays Harbor area could be developed by state and other Federal agencies, but the sites do not offer the unique combination of factors that make the Wynoochee fish hatchery site the most desirable hatchery site in the basin.

The lower level site at elevation 615 feet was selected over the intermediate level site at elevation 635 feet because it would cause less hydropower head loss if the fish hatchery had a direct pipeline connection from a hydropower facility. In addition, the lower fish hatchery site would be a source of suitable aggregate materials for construction of the hydropower facility.

Selection of the intermediate level fish hatchery site was preferred by the Grays Harbor PUD because they are interested in investigating the hydropower potential of the Oxbow site at Wynoochee river mile 42.5. Construction of the fish hatchery on the lower level site would restrict future development of the Oxbow site to a maximum pool elevation of 615 feet instead of 635 feet. Development of the Oxbow site to elevation 635 feet would extend the Oxbow reservoir up to the Wynoochee hydropower outlet and allow full development of the 22-MW Oxbow powerplant. The 20-foot increment of head would produce approximately 2 MW of generation capability of the Oxbow site and more than offset the loss of approximately 0.2 MW of generation capability associated with the 20-foot head loss for the one small unit in the Wynoochee powerhouse connected to the fish hatchery intake structure. Investigation of the intermediate level site during this feasibility study was not practical due to the uncertainty at this time regarding future development of the Oxbow site. However, the Grays Harbor PUD has requested that the intermediate level fish hatchery site be investigated during advanced engineering and design studies based on its interest in the Oxbow site.

Two Wynoochee fish hatchery design options to the selected alternative site were studied, with the water supply for the hatchery either taken

directly from the dam or taken from the tailrace of a powerhouse. The first fish hatchery design option would not be in conjunction with hydropower development at Wynoochee Dam and would have a water supply pipeline from a manifold connecting the outlets of the existing low flow passages through the dam to the fish hatchery. The second fish hatchery design option would be in conjunction with hydropower development at Wynoochee Dam and would have a water supply pipeline leading from an intake structure at the outlet of the powerhouse tailrace tunnel to the fish hatchery. The second fish hatchery design option would require that one small turbine in the powerhouse be sized to operate under the 190/140-c.f.s minimum flow releases required at Wynoochee Dam. This small turbine would have a minor reduction in power production because the tailwater surface in the fish hatchery intake structure must be raised about 4 feet above the existing water surface elevation at 190 c.f.s. to gain sufficient head for gravity flow to the fish hatchery.

c. No Action. Instead of developing the hydropower and/or fish enhancement alternatives at Wynoochee Dam, no Federal action would be taken at Wynoochee Dam at this time. The probability of the region being without sufficient resources to meet electrical demands has caused power planners to focus on smaller renewable resource projects as well as conservation methods. Both structural and conservation methods are considered necessary to relieve the potential energy deficits in the Pacific Northwest. In accordance with the Pacific Northwest Electrical Power Planning and Conservation Act (Public Law 96-501, 5 December 1980), Bonneville Power Administration (BPA) must give highest priority to cost effective conservation programs, treating them as a resource preferrable to all other means of responding to the demand for electrial energy. The energy conservation programs will be undertaken by public and private utilities and state and local governments with BPA's technical assistance and financial backing. Even though all resources, including small renewable resources and conservation methods, are employed to meet the regional loads, loads will probably exceed generating resources by at least 13 million MWH in the next decade and beyond. With the no-action alternative, the opportunity for reducing this regional energy deficit by 37,400 MWH per year through Federal construction of a hydropower facility at Wynoochee Dam would be foregone.

Fish habitat improvements and fishery management are within the jurisdiction of the state and federal fisheries agencies and are now being employed or planned where practicable by the agencies. Nonstructural fish enhancement measures include fish habitat improvement and fishery management. Fish habitat could be improved by changes in streams such as removing silt from gravel, controlling flood runoff, increasing vegetation cover in the watershed, providing vegetation cover over streams, and improving water quality. Some stream areas could be improved to provide ideal spawning grounds by removing undesirable gravels and replacing them with desirable substrate. Rigorous management of the fisheries to sustain maximum yield is another measure implementable by the fisheries agencies. These fish enhancement measures should continue with or without implementation of a structural alternative such as a

fish hatchery. However, the increasing need for anadromous fish cannot be completely met by these methods alone.

2. Detailed Studies.

a. Combinations of Design Options. Detailed design and cost estimate studies, geotechnical investigations, and environmental studies were conducted on the five possible hydropower and fish hatchery design options which remained after the preliminary studies. The remaining design options (see figure 3 in feasibility report) were as follows:

(1) Underground hydropower only.

(2) Surface hydropower only.

(3) Fish hatchery only.

(4) Underground hydropower plus fish hatchery.

(5) Surface hydropower plus fish hatchery.

b. Design and Cost Estimate Studies. Design details were added and detailed cost estimates were prepared for the five design options. The project outputs and construction costs of each option were as follows:

Design Option	Description	Powerhouse Nameplate Capacity (MW)	Average Annual Energy (MWH)	Fish Production (Pounds)	October 1981 Construction Costs (Million Dollars)
(1)	Underground hydropower only	10.2	37,400		25.5
(2)	Surface hydropower only	10.2	37,400		23.5
(3)	Fish hatchery only			396,000	21.0
(4)	Underground hydropower plus fish hatchery	10.2	37,400	396,000	42.4
(5)	Surface hydropower plus fish hatchery	10.2	37,400	396,000	39.3

Summaries of the cost estimates of these design options are presented in appendix E.

There were negligible differences in power production among the design options which produce power due to minor differences in net heads. There was no difference in fish production among the design options which produce fish. The only difference among the options was cost. However, option 4 would have a cost savings of $4.1 million over a combination of option 1 plus option 3; option 5 would have a cost savings of $5.2 million over a combination of option 2 plus option 3. Most of these additional costs would be due to the need for the hydropower only options to include a downstream fish bypass facility to maintain the upstream anadromous fish run, while the hydropower/fish hatchery combinations incorporate mitigation of the loss of the upstream anadromous fish run into the combined project. These cost savings showed an economic advantage to developing a hydropower/fish hatchery option in lieu of the hydropower only options, fish hatchery only option, or combination of hydropower and fish hatchery options built as two independent projects. In addition, the hydropower/fish hatchery options addressed both planning objectives while the hydropower only and fish hatchery only options addressed only one planning objective. Option 4 would be $3.1 million more expensive than option 5 due to the additional costs associated with the underground powerhouse.

c. Geotechnical Investigations. According to the results of the preliminary hydropower studies, consideration was given to two powerhouse locations on the right bank: an underground location and a surface location. A conservative approach was used in siting the underground powerhouse about 200 feet downstream of the dam and 200 feet behind the canyon wall. Considerations included the length of existing rock bolts which stabilize stress relief joints in the canyon wall, possible structural disturbances to the existing visitor center, and a conservative margin of safety for tunnel blasting. The surface powerhouse site would be located about 900 feet downstream of the dam at the lower end of the bedrock canyon and at the toe of a slide in the overburden material. Foundation preparation for the surface powerhouse site would require excavation of both bedrock and overburden, leading to a potentially unstable slide condition and the possibility of requiring potentially expensive remedial measures not included in the cost estimate. Further downstream the bedrock surface drops rapidly and a bedrock foundation is not possible. The Seattle District, Corps of Engineers, determined that the cost of remedying potential geotechnical problems associated with the surface powerhouse offset the additional construction cost of the underground powerhouse, which has no known potential geotechnical problems. The underground powerhouse location was selected as the most favorable powerhouse location. Preliminary investigations of the selected fish hatchery site showed no apparent foundation problems would be expected for the facility. Adequate quantities of materials for the production of concrete aggregate for the hydropower facility appear available from the hatchery site. Additional geotechnical data is presented in section 4 of the feasibility report and appendix F.

d. Environmental Studies. Probable beneficial and adverse impacts of the development of hydropower and fish enhancement facilities at Wynoochee were determined from analyses of data collected from literature search; field inventories of the plan area; and coordination with Federal, state, and local agencies and the public. Specific analyses were performed relative to threatened and endangered species, water-quality, cultural resources, social environment, and fish and wildlife resources. The bald eagle is the only threatened and endangered species known to occur in the plan area. Studies of this species included coordination with appropriate Federal and state agencies, review of available records of bald eagle sightings in the plan area, and field investigations. A biological assessment (BA) of the impacts of the hydropower and hatchery development on the bald eagle was prepared and furnished to the U.S. Fish and Wildlife Service for their concurrence. The BA concluded that the plan would not impact the local, regional, and national bald eagle populations and would not jeopardize its continued existence. Water quality analyses of parameters such as temperature, dissolved oxygen, and heavy metals are ongoing and have shown that the quality of Wynoochee Lake and River is good and is adequate for hatchery water supply. Cultural resource studies included a cultural resource reconnaissance of the plan area and coordination with appropriate Federal and state agencies. No evidence of prehistoric or historic sites was found. Investigations of fish and wildlife and the social environment of the plan area were accomplished by field investigations; literature review; and discussions with Federal, state, and local agencies and interested public. These studies concluded that the various plan options would not have significant impacts on the environment.

Development of the underground hydropower option would not significantly impact the environment and would have fewer potential impacts than the surface hydropower option. If slides would occur at the surface powerhouse area, the slide material could move into the river and result in adverse impacts to the spawning and rearing habitat in the Wynoochee River below the dam. The esthetic impacts and disturbance to terrestrial wildlife habitat would also be less with the underground hydropower option than the surface hydropower option. Hydropower only options would provide no enhancement of the anadromous fisheries and would require a costly fish attraction and bypass facility at Wynoochee Dam to pass downstream migrants. The hatchery only option and the two hydropower plus fish hatchery options would result in termination of the anadromous fish runs above the existing Wynoochee Dam but would enhance the overall fishery resources in the Chehalis River Basin, Grays Harbor area, and northern Pacific Ocean. Further, the fish hatchery would include mitigation for the lost upstream fish runs and would incorporate the mitigation for the previous loss of steelhead spawning habitat associated with the existing Wynoochee Lake project. The hatchery only option would not contribute to meeting the need for energy in the Pacific Northwest as the hydropower/fish hatchery options would. There would be no significant difference in net environmental impacts between the hatchery only option and the underground hydropower plus fish hatchery option. The underground hydropower plus fish hatchery design option

would result in the greatest net beneficial environmental impact and would address both planning objectives while minimizing adverse environmental impacts and eliminating the need for a costly fish attraction and bypass facility.

e. Summary of Detailed Studies. Detailed design and cost studies showed an economic advantage for developing a combined hydropower and fish hatchery project, with the underground powerhouse option $3.1 million more expensive than the surface powerhouse option. However, detailed geotechnical investigations considered that the risk of potential slide problems associated with the surface powerhouse offset the additional construction cost of the underground powerhouse and determined that the underground powerhouse location is geotechnically sound with no known potential problems. Detailed environmental studies showed that an underground hydropower and fish hatchery option had a net beneficial environmental impact. Therefore, based on present information, the combination of the underground hydropower and fish hatchery was the only hydropower and fish hatchery design option which remained for consideration as an alternative plan during this feasibility study. Additional consideration will be given to the alternate project locations during advanced engineering and design studies to verify selection of the most advantageous design option. In response to coordination with fish resource agencies and interested parties, the fish hatchery was expanded into a Washington coastal fish enhancement facility by adding two satellite fish stations. Detailed siting and design studies will be accomplished during advanced engineering and design as the details of the hatchery and its management are formulated.

3. Hydropower Formulation and Optimization.

a. Streamflow Availability and Duration. Wynoochee River streamflow and Wynoochee Lake project operation are discussed in paragraphs 4.03b and 1.05 of the feasibility report, respectively. The mean annual Wynoochee River streamflow at the U.S. Geological Survey streamgage near Grisdale, Washington, located approximately 1/2 mile downstream of Wynoochee Dam, is 534 c.f.s. (period of record 1965-1979).

Mean monthly reservoir discharges used for estimating the hydropower potential were based on the water supply study conducted for the Wynoochee Lake project which generated 214 years of average monthly regulated streamflow using statistic methods and maximum level of water supply demand. The average, maximum, and minimum regulated average monthly discharges from the Wynoochee Lake projected based on the simulated 214-year record are as follows:

Month	Average	Maximum	Minimum
January	918 c.f.s.	2,525 c.f.s.	175 c.f.s.
February	751	1,725	175
March	478	1,175	175

Month	Average	Maximum	Minimum
April	211	837	187
May	255	787	137
June	277	787	137
July	235	405	195
August	266	324	175
September	473	975	125
October	388	1,675	175
November	711	1,625	175
December	885	2,125	225
Average	487		

Flow duration curves for November, December and January are presented in figures G-3, G-4 and G-5.

b. Energy Potential. Potential energy generation was estimated for 4 powerplant sizes - 800 c.f.s., 1,000 c.f.s., 1,200 c.f.s., and 1,400 c.f.s. The nameplate capacities of the 4 powerplants are 6.8 MW, 8.6 MW, 10.2 MW, and 11.8 MW, respectively. Streamflows were based on the 214 year monthly streamflow record with adjustments (1) to substract streamflows that exceed the powerhouse hydraulic capacity and (2) to reduce monthly winter streamflows for losses caused by high daily streamflows. Forebay elevations used for computing hydraulic heads were based on the flood control pool, elevation 764 feet, during the winter (October-March) and conservation pools between elevation 765 feet and normal full pool, elevation 800 feet, during the remaining months. Hydraulic head losses included penstock losses (5 feet) and miscellaneous losses (2 feet). A constant tailwater elevation of 640 feet was used in all cases. Average energy production (MWH) with the four hydraulic capacities and total potential energy (MWH) were as follows:

	Energy Production				Total
	Powerhouse Hydraulic Capacity				Potential
Month	800 c.f.s.	1000 c.f.s.	1200 c.f.s.	1400 c.f.s.	Energy
Jan.	3529	4039	4655	5222	6206
Feb.	3600	3707	4307	4377	4645
Mar.	3280	3322	3329	3329	3329
Apr.	1598	1598	1598	1598	1598
May	2190	2190	2190	2190	2190
Jun.	2365	2365	2365	2365	2365
Jul.	2049	2049	2049	2049	2049
Aug.	2241	2241	2241	2241	2241
Sep.	3265	3265	3265	3265	3265
Oct.	2527	2601	2634	2649	2657
Nov.	3853	4262	4519	4633	4651
Dec.	3116	3745	4238	4142	5983
Annual	33,613 MWH (100%)	35,384 MWH (82%)	37,390 MWH (86%)	38,060 MWH (91%)	41,179 MWH (92%)

FIGURE G-3 FLOW DURATION CURVE FOR REGULATED AVERAGE MONTHLY DISCHARGE, WYNOOCHEE LAKE PROJECT - NOVEMBER

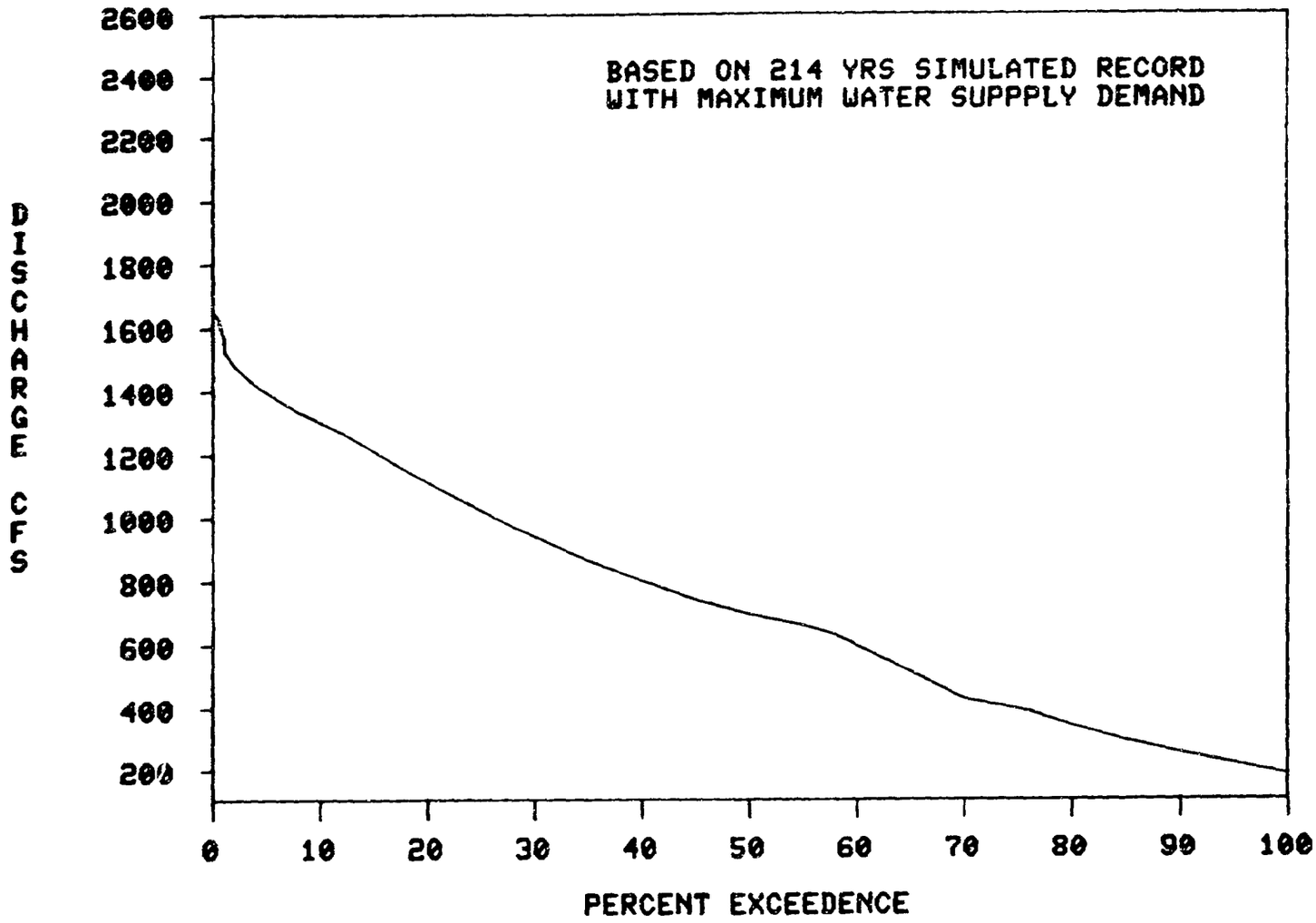


FIGURE G-4 FLOW DURATION CURVE FOR REGULATED AVERAGE MONTHLY DISCHARGE, WYNOOCHEE LAKE PROJECT - DECEMBER

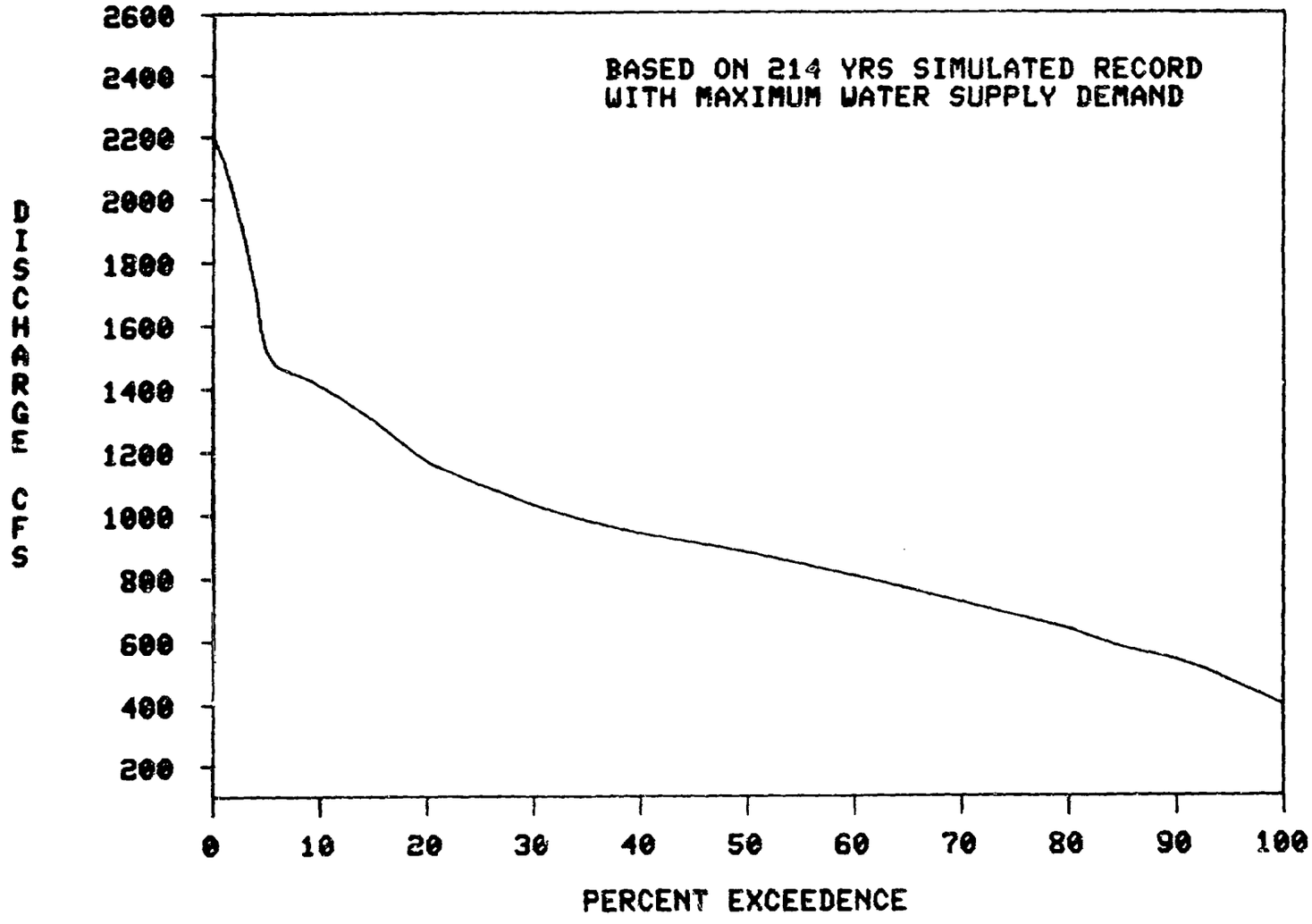
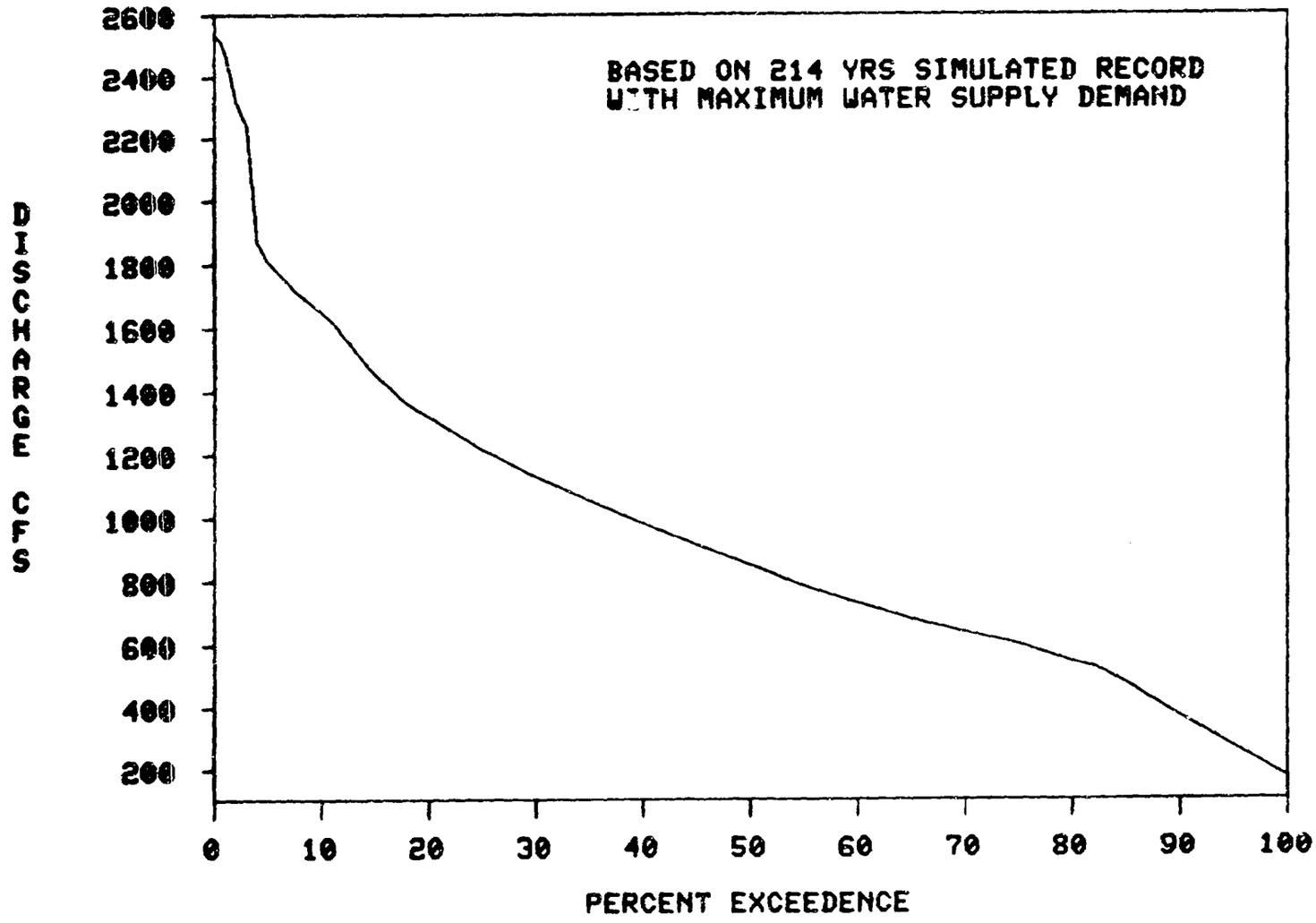


FIGURE G-5 FLOW DURATION CURVE FOR REGULATED AVERAGE MONTHLY DISCHARGE, WYNOOCHEE LAKE PROJECT - JANUARY



c. Hydropower Optimization. The optimum level of hydropower development was determined by evaluating the costs, benefits, and energy production of the hydropower facility with four different hydraulic capacities - 800 c.f.s., 1,000 c.f.s., 1,200 c.f.s., and 1,400 c.f.s. The design of the intake structure, penstock, electrical equipment, draft tubes, and tailrace was changed from the 1,200 c.f.s. powerplant design to reflect the different hydraulic capacities. The cost of the powerhouse was not changed because the powerhouse size would be essentially the same for all levels of development. Cost estimate summaries for the combined underground hydropower plus fish hatchery and underground hydropower only designs for the four different hydraulic capacities are presented in tables G-1 through G-8. Annual operation, maintenance, and replacement costs for each hydropower facility were also determined.

Power data for the four powerplants were as follows:

	Powerhouse Hydraulic Capacity			
	800 cfs	1000 cfs	1200 cfs	1400 cfs
Number of units	3	3	3	3
Hydraulic capacity of units	1-190 cfs 2-305 cfs	1-190 cfs 2-405 cfs	1-190 cfs 2-505 cfs	1-190 cfs 2-605 cfs
Size of Units	1-1.8 MW 2-2.5 MW	1-1.8 MW 2-3.4 MW	1-1.8 MW 2-4.2 MW	1-1.8 MW 2-5.0 MW
Total Installed Capacity	6.8 MW	8.6 MW	10.2 MW	11.8 MW
"Dependable Capacity"	5.3 MW	6.4 MW	7.2 MW	7.6 MW
Average Annual Energy	33.6 GWH	35.4 GWH	37.4 GWH	38.1 GWH
Percent Total Potential Energy	82%	86%	91%	92%
Capacity Factor	56%	47%	42%	36%

Average annual power benefits ($1,000) for the four hydraulic facilities, determined using the procedures described in appendix C, would be as follows:

	Powerhouse Hydraulic Capacity			
	800 cfs	1000 cfs	1200 cfs	1400 cfs
Capacity	$ 677	$ 817	$ 919	$ 970
Energy	1,347	1,420	1,500	1,528
Total	$2,024	$2,237	$2,419	$2,498

Project costs for a combined hydropower/fish hatchery project were allocated between the two project purposes, power and fish, for each different powerhouse size, using the separable costs-remaining benefits cost allocation procedure. The results of the cost allocation were as follows:

	Powerhouse Hydraulic Capacity			
	800 cfs	1000 cfs	1200 cfs	1400 cfs
Allocated average annual Power Costs ($1,000)	$1,667	$1,788	$1,987	$2,212
Average Annual Power Benefits ($1,000)	2,024	2,237	2,419	2,498
Net Power Benefits ($1,000)	357	449	432	286
Power Benefit-to-cost Ratio	1.21	1.25	1.22	1.13
Average Energy Cost (mills/KWH)	49.6	50.5	53.1	58.1
Total Project Net Benefits ($1,000)	5,117	5,229	5,210	5,063
Total Project Benefit-to-cost Ratio	2.23	22.2	2.16	2.07

A plot of power benefits versus costs (figure G-6) showed the maximum net power benefits would be $455,000. A plot of net power benefits versus powerhouse hydraulic capacity (figure G-7) showed the maximum net power benefits would occur with a 1,065 c.f.s. hydraulic capacity. However, the increase in energy production between 1,000 c.f.s. and 1,200 c.f.s. is slightly greater than the increase between 800 c.f.s. and 1,000 c.f.s., and the rate of increase in energy production decreases for powerhouses larger than 1,200 c.f.s. Therefore, the 1,200 c.f.s. powerhouse was selected as the optimum level of hydropower development to capture the extra energy production with only a slight decrease in net power benefits.

The power potential of the six multilevel low-flow outlets in the existing dam in combination with an underground facility was also evaluated. The invert elevations of the six low-flow pipes are 786, 775, 764, 752, 721, and 688 feet, respectively. Since the power generation through the low-flow outlets would be used to supplement power generation in the underground facility, only high flow releases from pipes normally used during the flood season could be used in combination with the underground facility to capture energy from high flows. High project outflows occur in November through February when the reservoir is

FIGURE G-6 POWER BENEFITS VERSUS
POWER COSTS FOR FOUR POWERHOUSE SIZES

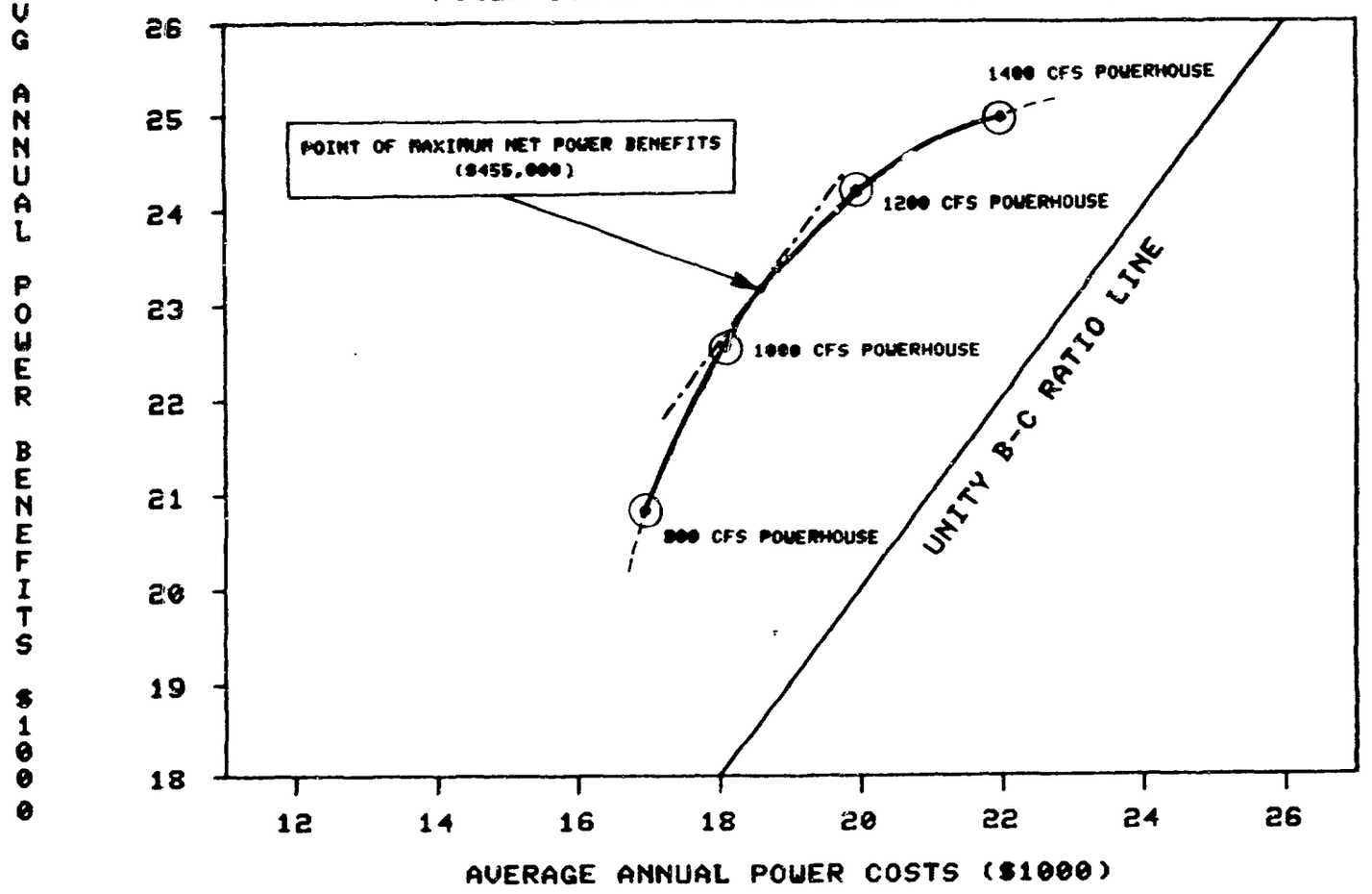
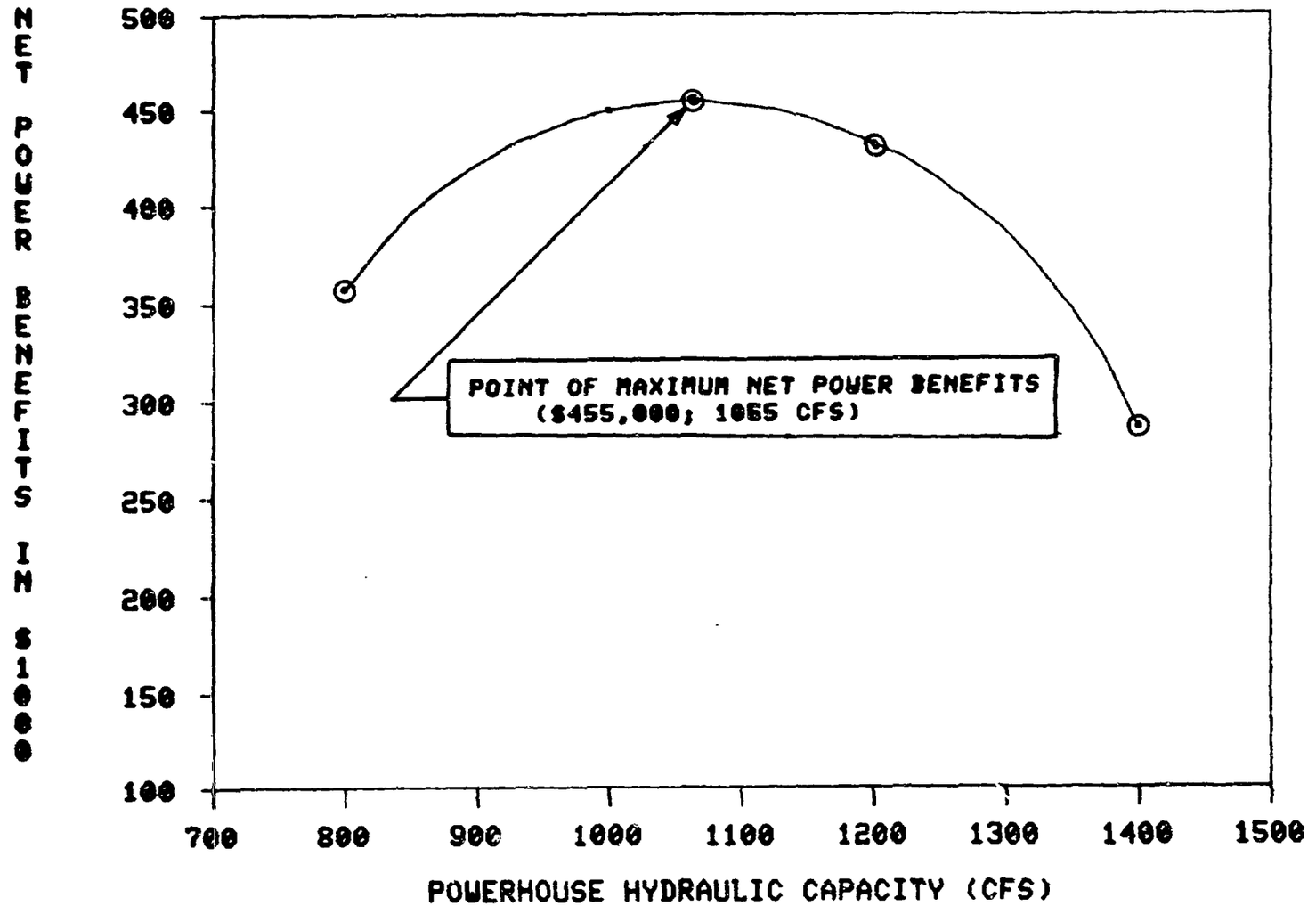


FIGURE G-7 NET POWER BENEFITS
VERSUS POWERHOUSE HYDRAULIC CAPACITY



drawn down to elevation 764 feet, at which elevation only low-flow outlets 5 and 6 are normally used. At this elevation, outlets 5 and 6 have an average hydraulic capacity of 200 c.f.s. Because the low-flow outlets were sized to reduce velocity, head losses in the pipes are large. The average net power head of pipes 5 and 6 is 60 feet at reservoir elevation 764 feet and tailwater elevation 640 feet. The installed capacity of a hydropower unit(s) on outlets 5 and 6 would be approximately 1.7 MW based on 400 c.f.s. flow and 60 feet head. Since an evaluation showed that the cost of a hydropower facility at the end of low-flow outlets 5 and 6 in combination with either a 800- or 1,000-c.f.s. underground hydropower facility would result in less net power benefits than the selected 1,200 c.f.s., underground hydropower facility, the low-flow outlet hydropower facility was dropped from further consideration. In addition, serious potential construction and operational problems associated with a hydropower facility at the base of the dam and under the sluice exits also eliminate such a facility from further consideration.

d. Operation. The proposed Wynoochee hydropower project would be operated in accordance with the approved criteria and procedures for the existing Wynoochee Lake project. The multilevel intake structure, penstock, powerhouse, draft tubes, and tailrace tunnel would be used as an alternate hydraulic outlet for reservoir releases during normal reservoir regulation operation. Reservoir releases would be made by the Corps of Engineers to meet the congressionally authorized purposes of the existing project and the water quality and quantity needs of the proposed fish hatchery. The hydropower operation would be subordinate to all other purposes and the facility would operate as a run-of-river plant producing baseload energy from the reservoir releases.

The powerplant would be operated remotely because of its small size. An interface with the existing project and proposed fish hatchery would be required to automatically or manually adjust water temperature intake and powerplant hydraulic releases in response to adjustments in reservoir releases requirements.

4. Comparison of Alternative Plans. A detailed comparison of the no-action plan and the combined hydropower and enhancement fish hatchery plan is presented in table G-9.

TABLE G-1

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER PLUS FISH HATCHERY
800 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$190
04	DAM		3,810
.4	Power Intake Works	$3,810	
06	FISH AND WILDLIFE FACILITIES		15,120
	Fish Hatchery	15,120	
07	POWERPLANT		10,050
.1	Powerhouse	4,6[illegible]	
.2	Turbines and Generators	2,420	
.3	Accessory Electrical Equipment	760	
.4	Miscellaneous Powerplant Equipment	180	
.5	Tailrace	1,840	
.6	Switchyard	190	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		850
	Subtotal		$30,270
30	ENGINEERING AND DESIGN		2,390
	Engineering and Design (7-1/2 percent)	2,270	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (3-1/2 percent)		1,980
	Subtotal (April 1980 Price Level)		$34,640
	Increase Price Level to October 1981 (+12 percent)		4,160
	TOTAL (October 1981 Price Level)		$38,800

TABLE G-2

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER ONLY
800 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$10
04	DAM		3,810
.4	Power Intake Works	$3,810	
06	FISH AND WILDLIFE FACILITIES		3,880
	Fish Attraction Facility	3,880	
07	POWERPLANT		9,100
.1	Powerhouse	4,660	
.2	Turbines and Generators	2,420	
.3	Accessory Electrical Equipment	760	
.4	Miscellaneous Powerplant Equipment	180	
.5	Tailrace	890	
.6	Switchyard	190	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		170
	Subtotal		$17,220
30	ENGINEERING AND DESIGN		1,410
	Engineering and Design (7-1/2 percent)	1,290	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		1,110
	Subtotal (April 1980 Price Level)		$19,740
	Increase Price Level to October 1981 (+12 percent)		2,360
	TOTAL (October 1981 Price Level)		$22,100

TABLE G-3

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER PLUS FISH HATCHERY
1,000 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$190
04	DAM		4,120
.4	Power Intake Works	$4,120	
06	FISH AND WILDLIFE FACILITIES		15,120
	Fish Hatchery	15,120	
07	POWERPLANT		10,810
.1	Powerhouse	4,690	
.2	Turbines and Generators	2,990	
.3	Accessory Electrical Equipment	780	
.4	Miscellaneous Powerplant Equipment	190	
.5	Tailrace	1,960	
.6	Switchyard	200	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		850
	Subtotal		$31,340
30	ENGINEERING AND DESIGN		2,460
	Engineering and Design (7-1/2 percent)	2,340	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		2,020
	Subtotal (April 1980 Price Level)		$35,820
	Increase Price Level to October 1981 (+12 percent)		4,280
	TOTAL (October 1981 Price Level)		$40,100

TABLE G-4

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER ONLY
1,000 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$10
04	DAM		4,120
.4	Power Intake Works	$4,120	
06	FISH AND WILDLIFE FACILITIES		3,880
	Fish Attraction Facility	3,880	
07	POWERPLANT		9,830
.1	Powerhouse	4,690	
.2	Turbines and Generators	2,990	
.3	Accessory Electrical Equipment	780	
.4	Miscellaneous Powerplant Equipment	190	
.5	Tailrace	980	
.6	Switchyard	200	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		170
	Subtotal		$18,260
30	ENGINEERING AND DESIGN		1,470
	Engineering and Design (7-1/2 percent)	1,350	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		1,170
	Subtotal (April 1980 Price Level)		$20,900
	Increase Price Level to October 1981 (+12 percent)		2,500
	TOTAL (October 1981 Price Level)		$23,400

TABLE G-5

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER PLUS FISH HATCHERY
1,200 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$190
04	DAM		4,700
.4	Power Intake Works	$4,700	
06	FISH AND WILDLIFE FACILITIES		15,120
	Fish Hatchery	15,120	
07	POWERPLANT		11,990
.1	Powerhouse	4,750	
.2	Turbines and Generators	3,880	
.3	Accessory Electrical Equipment	860	
.4	Miscellaneous Powerplant Equipment	200	
.5	Tailrace	2,090	
.6	Switchyard	210	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		850
	Subtotal		$33,100
30	ENGINEERING AND DESIGN		2,600
	Engineering and Design (7-1/2 percent)	2,480	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		2,200
	Subtotal (April 1980 Price Level)		$37,900
	Increase Price Level to October 1981 (+12 percent)		4,500
	TOTAL (October 1981 Price Level)		$42,400

TABLE G-6

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER ONLY
1,200 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$10
04	DAM		4,620
.4	Power Intake Works	$4,620	
06	FISH AND WILDLIFE FACILITIES		3,880
	Fish Attraction Facility	3,880	
07	POWERPLANT		10,970
.1	Powerhouse	4,750	
.2	Turbines and Generators	3,880	
.3	Accessory Electrical Equipment	860	
.4	Miscellaneous Powerplant Equipment	200	
.5	Tailrace	1,070	
.6	Switchyard	210	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		170
	Subtotal		$19,900
30	ENGINEERING AND DESIGN		1,600
	Engineering and Design (7-1/2 percent)	1,480	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		1,300
	Subtotal (April 1980 Price Level)		$22,800
	Increase Price Level to October 1981 (+12 percent)		2,700
	TOTAL (October 1981 Price Level)		$25,500

TABLE G-7

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER PLUS FISH HATCHERY
1,400 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$190
04	DAM		5,170
.4	Power Intake Works	$5,170	
06	FISH AND WILDLIFE FACILITIES		15,120
	Fish Hatchery	15,120	
07	POWERPLANT		13,580
.1	Powerhouse	4,840	
.2	Turbines and Generators	5,100	
.3	Accessory Electrical Equipment	970	
.4	Miscellaneous Powerplant Equipment	210	
.5	Tailrace	2,230	
.6	Switchyard	230	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		850
	Subtotal		$35,160
30	ENGINEERING AND DESIGN		2,750
	Engineering and Design (7-1/2 percent)	2,630	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		2,290
	Subtotal (April 1980 Price Level)		$40,200
	Increase Price Level to October 1981 (+12 percent)		4,800
	TOTAL (October 1981 Price Level)		$45,000

TABLE C-8

COST ESTIMATE SUMMARY

UNDERGROUND HYDROPOWER ONLY
1,400 C.F.S. POWERHOUSE

Account No.	Feature or Item	Item Cost ($1,000)	Feature Cost ($1,000)
01	LANDS AND DAMAGES		$10
04	DAM		5,170
.4	Power Intake Works	$5,170	
06	FISH AND WILDLIFE FACILITIES		3,880
	Fish Attraction Facility	3,880	
07	POWERPLANT		12,520
.1	Powerhouse	4,840	
.2	Turbines and Generators	5,100	
.3	Accessory Electrical Equipment	970	
.4	Miscellaneous Powerplant Equipment	210	
.5	Tailrace	1,170	
.6	Switchyard	230	
19	BUILDINGS, GROUNDS, AND UTILITIES		250
20	PERMANENT OPERATING EQUIPMENT		170
	Subtotal		$22,000
30	ENGINEERING AND DESIGN		1,760
	Engineering and Design (7-1/2 percent)	1,640	
	Model Studies	120	
31	SUPERVISION AND ADMINISTRATION (6-1/2 percent)		1,420
	Subtotal (April 1980 Price Level)		$25,180
	Increase Price Level to October 1981 (+12 percent)		3,020
	TOTAL (October 1981 Price Level)		$28,200

TABLE G-9

DETAILED COMPARISON OF ALTERNATIVE PLANS

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
PLAN DESCRIPTION		
Major Features	Non-Federal hydropower development possible but not certain. Fish habitat improvement measures and fishery management by state fisheries agencies.	Intake structure; penstock; 10.2-megawatt (MW) nameplate underground powerhouse; switchyard; 22-mile PUD transmission line; draft tubes and tailrace tunnel; hydropower outlet/fish hatchery intake structure; fish hatchery water supply pipeline; 396,000-pound fish hatchery, including residences and upgraded access road; 2 satellite stations.
Land Requirements	Not available.	Powerhouse 5 acres Fish hatchery and pipeline 60 acres
Plan Outputs	Continue regional energy deficit of over 10.2-MW nameplate capacity which may produce approximately 37,400 MWH of energy per year. Some improvement of anadromous fish runs but fish runs expected to continue to decline.	Continue regional energy nameplate of over 22 million MWH. 10.2-MW nameplate capacity which produces 37,400 MWH of energy per year. Major enhancement of anadromous fishery; 129,000 adult spring chinook salmon and steelhead annual contribution to anadromous fish harvest. Final species selection and numbers would be determined in AE&D.
Construction Costs	Not available.	
Federal		$18,780,000
Non-Federal		23,620,000
Total		$42,400,000

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
Annual Operation, Maintenance and Replacement Costs	Not available.	
Federal		$679,000
Non-Federal		646,000
Total		$1,325,000
Average Cost of Energy Produced	Not available.	53 mills/KWH
Benefit-to-Cost Ratio	Not determined.	Hydropower 1.2 Fish Hatchery 2.9 Combined Plan 2.2
CONTRIBUTION TO PLANNING OBJECTIVES		
Meets a portion of the increasing energy needs in the Pacific Northwest by development of the potential of Wynoochee Dam, Washington	Yes.	Yes.
Meets a portion of the increasing demand for anadromous fish in the Pacific Northwest by development of fish enhancement facilities at Wynoochee Dam, Washington	No.	Yes.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
ENVIRONMENTAL QUALITY IMPACTS		
1. Impacts on Wetlands (Executive Order (E.O.) 11990)	Minor impact depending upon fish habitat measure utilized.	Loss of 2 acres of sedge marsh. Potential of additional loss with construction of satellite stations.
2. Impacts on Water Quality* and Supply	With hydropower development utilizing surface powerhouse, potential reduction in quality of 1,000-foot reach of Wynoochee River between dam and hydropower outlet. Water would be ponded in this reach when reservoir releases are no greater than that quantity of water diverted to the powerhouse.	Potential water quality impact in 6,800-foot reach of the Wynoochee River between the weir and the hatchery outlet if extreme low flows occur (April-June). Impacts would primarily be reduced visual esthetics and reduced aquatic habitat. Potential water quality reduction in 250-foot reach between dam and the existing overflow weir. Water would be ponded in this reach when reservoir releases are no greater than the quantity of water diverted to the powerhouse. Impacts to water quality would not be significant.
	Short-term water quality impacts associated with potential construction of non-Federal hydropower and habitat improvement measures.	Hatchery discharge may result in increased aquatic productivity and an alteration in the aquatic benthic community in the area near the effluent outlet; a possible beneficial impact because aquatic productivity in the river is rather low naturally.

*Effect assessment item specifically listed under Section 122 of Public Law 91-611.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
		Water supply downstream of the hatchery would not be affected. Short-term impacts to water quality would be associated with project construction. A multilevel intake structure would maintain preproject water quality from reservoir releases.
3. Construction Related Noise*	Short-term localized impact during construction of non-Federal hydropower facility. Long-term impact should be minimal.	Increased noise associated with project construction. Long-term permanent increase in noise levels and traffic due to project operation, residences, and increased recreational fishery.
4. Impacts on Air Quality*	Short-term associated with potential construction of non-Federal hydropower.	Short-term associated with construction. Long-term associated with increased traffic.
5. Impact on Floodplain (E.O. 11988)	Minor potential impact from implementation of fish habitat improvements.	Minor potential impact from construction of satellite fish stations.
6. Impacts on Threatened and Endangered species	Continued existence of bald eagle would not be expected to be jeopardized; although, use in the area could decrease with decreasing available food supply (anadromous fish).	Continued existence of bald eagle would not be jeopardized. Threatened and endangered species analysis for the satellite fish stations would be accomplished in AE&D when the stations are sited.

*Effect assessment item specifically listed under Section 122 of Public Law 91-611.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
7. Impacts on Wildlife	Temporary disruption during potential construction of non-Federal hydropower and habitat improvement measures.	Temporary disruption during construction. Long-term permanent changes in habitat due to hatchery construction. Permanent losses would total approximately 50 acres of rain forest vegetation, of which 25 acres are considered old growth and constitute critical elk winter range. Big game use of the hatchery site would be lost and use would be reduced in the area around the hatchery due to increased human disturbance. Construction of the satellite fish stations would impact wildlife due to loss of approximately 10 acres of habitat and increased human disturbance. Loss of habitat associated with buried transmission line and powerhouse would be minor. Hatchery water supply pipeline would be buried and the corridor reseeded. Reduced habitat in the 6,800-foot reach between the existing overflow weir and the hatchery outlet during critical low flow periods would have minimal impact on wildlife. Impacts to wildlife during ponding in the reach from the Wynoochee Dam to the existing weir would be negligible.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
8. Impacts on Fish	Minor fish improvement; however, overall declining trend expected to continue. Mitigation facilities for impacts on fish runs could be needed with possible non-Federal hydropower development.	Enhancement of anadromous fish runs in the Grays Harbor area, in the Chehalis River Basin and other Washington coastal streams, and in the northern Pacific Ocean. Provides opportunity for improvement of anadromous fish runs in river systems in vicinity of the Wynoochee River through development of satellite fish stations and implementation of an outplanting program. Anadromous fish runs above Wynoochee Dam would be terminated; the resident fishery in Wynoochee Lake should improve. Potential adverse impacts on resident fishery in the 6,800-foot reach of the Wynoochee River between the existing overflow weir and the hatchery outlet from reduced aquatic habitat during critical low flow periods (Apr-Jun). Impacts to fish as a result of ponding in the reach from the dam to the existing overflow weir would be negligible.
9. Impacts on Cultural Resources*	None expected.	No impact - no known cultural resources in the plan area.
10. Prime and Unique Farmlands	None.	None.
11. Mineral Resources Resources	No significant impact on any known mineral resource deposits.	No significant impact on any known mineral resource deposits. Local borrow sources would not be significantly depleted by project construction.

*Effect assessment item specifically listed under Section 122 of Public Law 91-611.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
REGIONAL ECONOMIC DEVELOPMENT IMPACTS		
1. Impacts on Employment*	Minor beneficial.	Minor beneficial.
2. Contribution to Community Development and Growth*	Minor beneficial.	Minor beneficial.
3. Increased Net Income to Region During Plan Implementation	Minor beneficial.	Positive contribution to regional economy as a result of enhancement of available anadromous fish for harvest.
4. Impact on Public Services*	None.	Increased pressures on public services provided to study area due to project residences and increased recreation fishery.
5. Impacts on Community Cohesion*	None.	Minor beneficial.
6. Displacement of People, Businesses, and Farms*	None.	None.
7. Safety and Well-Being	Moderate contribution from provision of energy; minor contribution from fish habitat improvement measures.	Moderate contribution from provision of energy; major contribution to fishing livelihood in Chehalis River Basin and Grays Harbor area. Potential for contribution to fishing livelihood in other northern Washington coastal rivers.

*Effect assessment item specifically listed under Section 122 of Public Law 91-611.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
8. Long-Term Productivity	Makes use of a renewable resource for energy production; provides minor fish habitat improvements.	Makes use of a renewable resource for energy production with minimal environmental impacts; provides for major fish enhancement in the Chehalis River Basin and Grays Harbor area. Also provides an opportunity to improve anadromous fish runs in river systems near the Wynoochee River through development of satellite fish stations.
9. Recreation	Minor, due to some potential increase in recreational fishery. Potential short-term disruption to area recreational activities if non-Federal hydropower is developed.	Major increase in area recreational fishery. Loss of hunting use of hatchery site. Change in dispersed recreation character of the hatchery site from overnight camping and water-related activities to hatchery visitation and limited picnicking and hiking. Short-term disruption to area recreational activities during project construction.
10. Impact on Property Values and Tax Revenues*	An aerial transmission line would result in adverse impacts due to some removal of private lands for use as the transmission corridor if non-Federal hydropower is developed. No impact is expected if the transmission line is buried.	No impact expected.

*Effect assessment item specifically listed under Section 122 of Public Law 91-611.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
11. Impact on Energy	May contribute approximately 37,400 MW hours of energy to the Grays Harbor area.	Contributes 37,400 MW hours of energy to the Pacific Northwest.
OTHER SOCIAL EFFECTS		
1. Impacts on Esthetics	Short-term effects during potential construction of non-Federal hydropower. Long-term effects due to powerhouse, switchyard, and transmission line.	Short-term effects during construction. Long-term effects due to hatchery, satellite fish stations, switchyard, and by hatchery operation resulting in low flows in the reach of Wynoochee River between existing overflow weir and hatchery outlet in certain times of the year and ponding in reach between dam and existing weir. Instream flows will be determined during AE&D. Terrestrial esthetic impacts would be reduced by native grass seeding and landscape plantings. A buried transmission line would have minimal esthetic impact.
2. Energy Requirements and Energy Conservation	Would contribute energy to Grays Harbor area and provide station power to existing dam if non-Federal hydropower is developed.	Would contribute energy to the Grays Harbor area and provide station power to the existing dam. The energy requirement of this alternative is minimized by use of a gravity feed water supply pipeline to the hatchery.

TABLE G-9 (con.)

	Alternative Plan 1 - No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 - Combined Underground Hydropower and Enhancement Fish Hatchery
3. Land Use	Extent of impact would depend upon transmission line alternative.	Construction of fish hatchery would result in a change in land use classification of the hatchery site from its current designation under the U.S. Forest Service timber management plan of "visual variety A." Powerhouse, switchyard, and a buried transmission line would have minimal impacts on land use.

TABLE G-9 (con.)

	Alternative Plan 1 — No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 — Combined Underground Hydropower and Enhancement Fish Hatchery
RESPONSE TO PLANNING CRITERIA		
National Economic Development Criteria		
1. Reduce Energy Deficits in the Pacific Northwest	Yes.	Yes.
2. Enhance the Commercial, Indian, and Sport Fisheries Harvest in the Pacific Northwest	Yes (minor).	Yes (major).
Environmental Quality Criteria.		
1. Enhance Runs of Salmon and Steelhead in the Chehalis River Basin, Grays Harbor Area, and other Washington Coastal Rivers	No.	Yes (major).
2. Minimize Adverse Impacts on Resident Fish and Wildlife in Plan Area	Yes.	Yes.
3. Minimize Energy Use	Not known.	Yes.
4. Maintain Water Quality of Wynoochee River Within Existing State Classification	Not known.	Yes.

TABLE G-9 (con.)

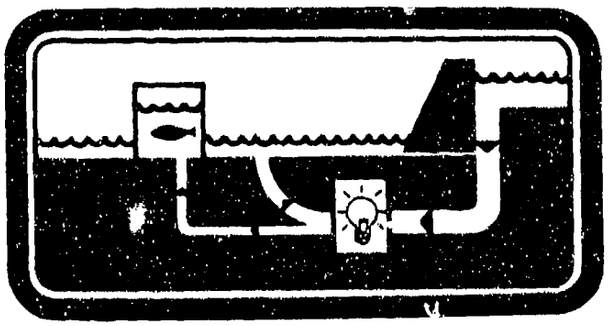
	Alternative Plan 1 No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 Combined Underground Hydropower and Enhancement Fish Hatchery
5. Preserve or Salvage Significant Historic and Prehistoric Cultural Resources Sites Affected by Potential Project Construction or Effects in Accordance with Authorities Contained in the National Historic Preservation Act of 1966, the Reservoir Salvage Act of 1960 as Amended by Public Law 93-291, and E.O. 11593	Yes.	Yes.
6. Preserve Wetlands in Conformance with E.O. 11990	Yes.	Yes.
7. Preserve Flood Plain in Conformance with E.O. 11988	Yes.	Yes.
8. Protect Habitat of Any Threatened and Endangered Species	Yes.	Yes.
9. Allow for Appropriate Instream Flows in the Wynoochee River	Yes.	Yes.
10. Be Compatible with Existing Wynoochee Project Mitigation Facilities	Yes.	Yes.
11. Provide State of Washington Opportunity to Develop Mitigation Facilities for Previous Steelhead Losses Associated with Existing Wynoochee Project Under 28 July 1977 Memorandum of Agreement	No.	Yes.
12. Minimize Adverse Impacts on Existing Wild Stocks of Anadromous Fish in the Chehalis River Basin, Grays Harbor Area, and Other Washington Coastal Rivers	Yes.	Yes.
13. Assure That Wynoochee River Fluctuations Continue to be Compatible With the Fish Resource	Yes.	Yes.

TABLE G-9 (con.)

	Alternative Plan 1 No Action (Most Probable Future Without Federal Action)	Alternative Plan 2 Combined Underground Hydropower and Enhancement Fish Hatchery
Regional Economic Development Criteria.		
1. Reduce Energy Deficits in the Pacific Northwest	Yes.	Yes.
2. Enhance the Commercial, Indian, and Sport Fisheries Production in the Pacific Northwest	Yes (minor).	Yes (major).
3. Increase Employment of Unemployed or Underemployed Resources in the Chehalis River Basin and Grays Harbor Area	Yes.	Yes.
4. Increase Recreational Opportunities in Chehalis River Basin and Grays Harbor Area	Yes (minor).	Yes (major).
Other Social Effects Criteria.		
1. Maintain Structural Soundness of Wynoochee Dam	Yes.	Yes.
2. Maintain Operation of Wynoochee Project for Its Authorized Project Purposes	Yes.	Yes.
3. Minimize Adverse Social Impacts in Study Area	Yes.	Yes.
4. Provide Improved Indian Fisheries	Yes (minor).	Yes (major).
5. Assure That River Fluctuations Continue at Existing Safe Levels	Yes.	Yes.
6. Provide Water Quality Consistent With Existing State Classification for Wynoochee River	Yes.	Yes.

FEASIBILITY REPORT & DRAFT
ENVIRONMENTAL IMPACT STATEMENT

WYNOOCHEE
Hydropower/Fish Hatchery



APPENDIX H

APPENDIX H

ENVIRONMENTAL ANALYSIS

Paragraph		Page
	PREFACE	H-iv
	SECTION 1. Wynoochee Hatchery, Water Quality Evaluation of Supply Water	
1.01	Introduction	H-1
1.02	Methodology	H-1
	a. Wynoochee Lake	H-1
	b. Wynoochee River	H-1
1.03	Results	H-2
	a. Water Chemistry	H-2
	b. Temperature	H-2
	c. Dissolved Oxygen	H-3
	d. Total Dissolved Gases	H-3
	e. Turbidity	H-3
	SECTION 2. WYNOOCHEE HYDROPOWER/FISH HATCHERY STUDY, INSTREAM FLOW ANALYSIS	
2.01	General	H-16
2.03	"With Project" Instream Flow Conditions	
	a. Reach of Wynoochee River Between Dam and Existing Overflow Weir	H-16
	b. Reach of Wynoochee River Between Existing Overflow Weir and the Proposed Hatchery Outlet	H-16
2.04	Wildlife Impacts	H-19
2.05	Fish Impacts	H-19
2.08	Water Quality Impacts	H-20
2.09	Esthetic Impacts	H-21
2.12	Coordination	H-22
	SECTION 3. WYNOOCHEE HATCHERY MANAGEMENT CONCEPT	
3.01		H-23

TABLE OF CONTENTS (con.)

Paragraph		Page
	SECTION 4. WYNOOCHEE HYDROPOWER/FISH HATCHERY STUDY, ELK IMPACT ASSESSMENT	
4.01	"Without Project" Condition	H-25
	a. Fish Hatchery Site	H-27
	b. Hydropower Facility	H-29
	c. Transmission Lines	H-29
4.05	"With Project" Condition	H-29
	a. Fish Hatchery	H-29
	b. Hydropower Facility	H-31
	c. Transmission Lines	H-31
	References	H-32
	SECTION 5. WYNOOCHEE HYDROPOWER/FISH HATCHERY STUDY, RECREATION IMPACT ASSESSMENT	
5.01	Existing Facilities	H-33
5.04	"Future Without" Conditions	H-33
5.05	"With Project" Conditions	H-34
	a. Fish Hatchery	H-34
	(1) Probable Impacts	H-34
	(2) Replacement Facilities	H-35
	(3) Development Analysis	H-35
	b. Hydropower	H-38
	c. Transmission Lines	H-38
	d. Construction	H-38
	References	H-39

TABLES

Number		Page
H-1	Chemical Analysis of Water from Lake Wynoochee Reservoir during 1980 and 1981	H-9
H-2	Temperature of Inflow and Outflow to Lake Wynoochee	H-13
H-3	Total Dissolved Gas Analysis Completed in Lake Wynoochee	H-14
H-4	Total Suspended Sediments Measured in Wynoochee Dam Forebay and Tailwater	H-15
H-5	Elk Winter Range Habitat Losses Associated with the Wynoochee Fish Hatchery Plan	H-30
H-6	Resource Base Classification	H-37

TABLE OF CONTENTS (con.)

Number		Page
	FIGURES	
H-1	Temperature Profile of Wynochee Dam Forebay, 1973 through 1980	H-4
H-2	Inflow and Outflow Temperature at Lake Wynoochee, 1973 through 1980	H-5
H-3	Dissolved Oxygen Profile of Wynoochee Dam Forebay, 1973 through 1980	H-6
H-4	Dissolved Oxygen Profile of Wynoochee Reservoir Forebay, December 1980 to April 1981	H-7
H-5	Turbidity Measured in Wynoochee Forebay and Tailwater, June 1980 to June 1981	H-8
H-6	Wynoochee Hydropower/Fish Hatchery Plan Area (Showing Referenced River Reaches)	H-17
H-7	Location of Wynoochee Dam	H-26
H-8	Wynoochee Hydropower/Fish Hatchery Plan Area	H-28
H-9	Location of Alternate Dispersed Recreation Sites	H-36

PREFACE

Appendix H contains the water quality evaluation performed to assess the suitability of Wynoochee Lake and River as a water supply source for a salmonid fish hatchery and the results of select environmental analyses performed as part of the Wynoochee Hydropower/Fish Hatchery Feasibility Study. The analyses are presented as back-up information to the Wynoochee draft feasibility report/EIS in order to fully respond to the major environmental concerns raised during the study of hydropower and fish enhancement opportunities at Wynoochee Dam. These concerns relate to instream flow determinations for the Wynoochee River from the Wynoochee Dam to the hatchery outlet, fish hatchery management, and elk habitat and dispersed recreation losses due to construction of the fish hatchery.

SECTION 1. WYNOOCHEE HATCHERY, WATER QUALITY EVALUATION OF SUPPLY WATER

1.01 Introduction. Seattle District is conducting a feasibility study of the development of a 10.2-MW nameplate hydropower addition to Wynoochee Dam and a salmonid fish enhancement hatchery downstream of the dam. Wynoochee Lake and River water quality data was evaluated to assess its suitability as a supply source for a salmonid fish hatchery and to obtain background information.

1.02 Methodology. Wynoochee Lake is routinely monitored for pH, temperature, dissolved oxygen, total dissolved gases, and conductivity at strategic lake stations during summer conservation periods. Concurrent with lake sampling, the river sampling was conducted for similar water quality parameters. The routine sampling was augmented by an intensive sampling in 1980 and 1981. This intensive study principally involved the collection and analysis of samples for those parameters necessary to characterize the water and evaluate use as a salmonid hatchery water supply. The methodology used in the monitoring program is presented below.

a. Wynoochee Lake. Monthly water column profiles (taken at 6-foot intervals from the surface to 39 feet; 16-foot intervals from 39 feet to the bottom) were conducted for pH, conductivity, dissolved oxygen, and temperature. Discrete water samples were collected from the surface and bottom of the water column for laboratory analyses of other parameters. Environmental Protection Agency (EPA) approved procedures were used for all laboratory analyses. Daily turbidity readings were taken in the surface forebay with a Hach Nephlometric turbidity meter. Total suspended solids (TSS) measurements were made on water samples whenever turbidity exceeded 10 Nephelometric Turbidity Units (NTU)

b. Wynoochee River. Daily field analyses for turbidity were begun in June 1980. TSS measurements were made when turbidity exceeded 10 NTU. Samples were collected bimonthly for heavy metals, major anions and cations, and monthly for ammonia, alkalinity, total organic carbon, chlorophyll a, 5-day biochemical oxygen demand, nitrogen, and phosphorus during the period December 1980 through May 1981. Inflow temperatures were measured with a mercury thermometer just above the reservoir in the main stem Wynoochee River monthly from June to October during 1974 to 1981. Outflow temperatures were measured in the tailwater below the dam during the same period. Additional outflow temperatures were occasionally recorded from November to April during periods of high reservoir releases.

Total dissolved gas measurements were made with a Weiss saturometer monthly during June to October from 1974 to 1981. Winter/spring measurements were made only during periods of high releases from the dam.

1.03 Results.

a. Water Chemistry. Analytical results (presented in table H-1) indicate that waters of Wynoochee Lake are of good chemical quality and suitable for salmonid hatchery supply. The water is soft, has a low dissolved mineral content, is slightly acidic, and is only mildly buffered. Concentrations of dissolved solids, nutrients, and chlorophyll were all indicative of a low productivity or oligotrophic lake system.

Metal analyses in the forebay and tailwater indicated that heavy metal concentrations were generally low (table 1). However, there were a few instances when mercury and silver exceeded EPA criteria for aquatic life. Discussions with the chemical analytical laboratory revealed that the accuracy of measurements at the lower limit of detection is greatly affected by interference from other elements and insensitivity of the background noise inherent in the instrumental technique. Potential contamination during sampling and in laboratory sample preparation could also have affected the accuracy of the measurement. The concentrations of metals measured in the discrete samples collected from the reservoir were generally higher than the concentrations of metals from composite samples taken below the dam. Since there are no known point sources of heavy metals, it is assumed that the metals detected in the lake water samples, if truly representative, were associated with natural runoff in the watershed. While the higher levels detected exceed criteria, they do not necessarily present a cause for alarm. The instances of exceedence were infrequent and slight enough to be considered only as a potential low-level contaminant if not analytical error. An examination of the tissue of fish reared in Wynoochee River water is recommended in postauthorization study to determine the degree, if any, of accumulation of heavy metals in the fish.

b. Temperature. Wynoochee Reservoir is stratified during the summer low flow conservation period from June to October (figure H-1). The average surface temperature during this time ranges from 60° F (August) to 56.3° F (October), while the bottom waters remain at about 45° F.

During November, thermal stratification begins to break down due to the decrease in air temperature and the reservoir fall drawdown. The water becomes mixed and isothermal, remaining at 39° F to 45° F from some time in November-December through April (figure H-2 and table H-2).

The existing selective withdrawal system in Wynoochee Dam provides the means for controlling outflow temperature to approximate preproject conditions to the extent possible. Reservoir outflow temperatures exceed inflow temperatures by about 2.5° F to 8° F during June to October due to warming of the lake surface water (figure H-2 and table H-2).

The plan for the hydropower/hatchery project under study includes a selective withdrawal system for the powerhouse intake and a cold water supply pipeline from the base of the dam. The ideal temperature for raising salmonids is in the range of 45° to 55° F. Water within this range can be provided the hatchery by utilizing the selective withdrawal structure.

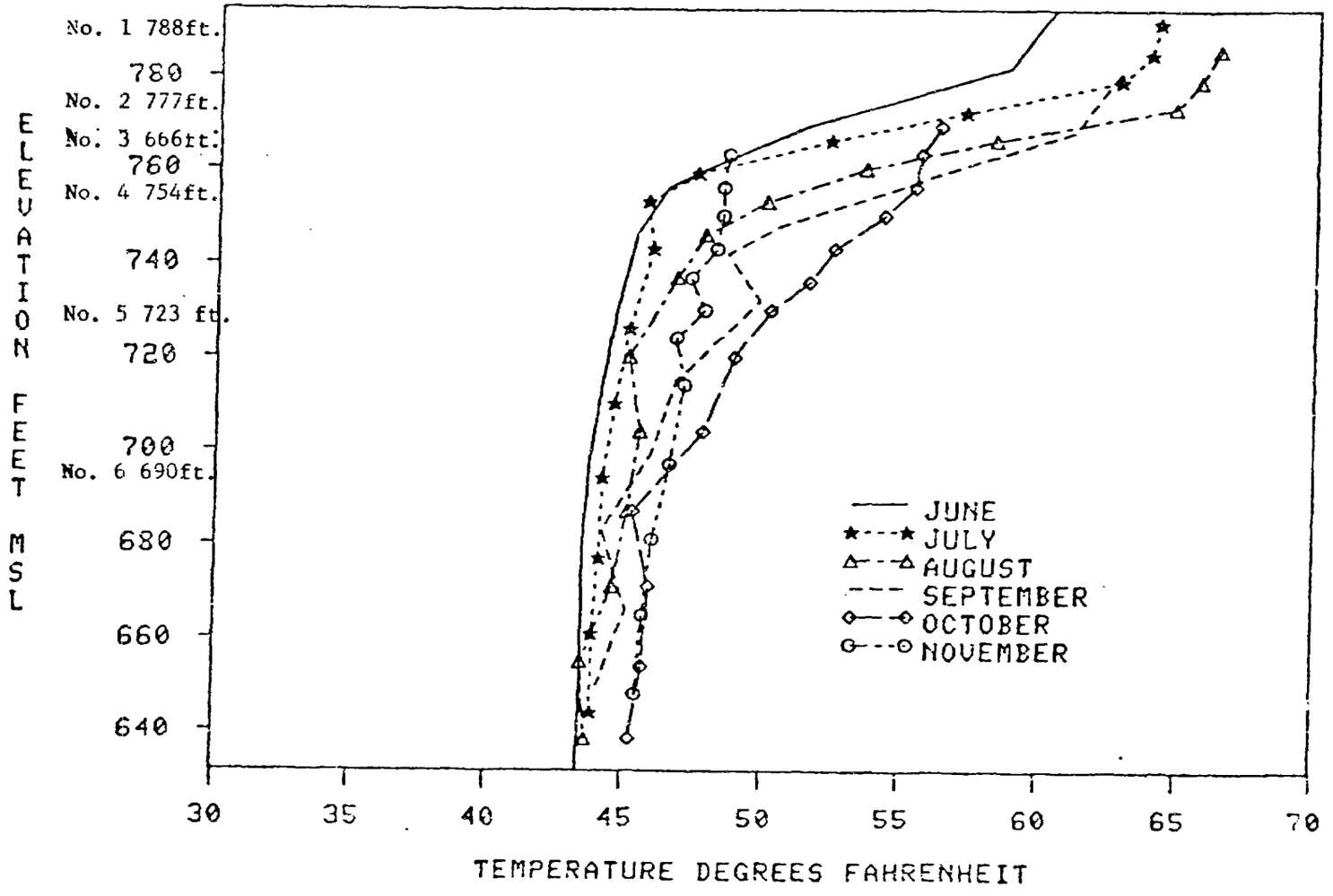
Springs located at the hatchery site have been identified as a potential additional water source. The springs may provide a constant source of 47° to 51° F water in small quantities. Investigations to determine the quantity and quality of water available from the springs would be conducted in postauthorization study.

c. Dissolved Oxygen. During summer thermal stratification, the lake waters are essentially divided into two volumes horizontally. Oxygen levels in the upper layer are at or near saturation. Thermal stratification prevents dissolved gases at the lower level from equilibrating with the atmosphere. Oxygen consuming processes in these bottom levels may reduce dissolved oxygen concentrates below 5 mg/l in the lower levels of the lake (figures H-3 and H-4). The selective withdrawal structure would be operated to assure hatchery supply waters have adequate oxygen levels for salmonid production.

d. Total Dissolved Gases. Unlike dissolved oxygen, dissolved nitrogen gas has little biological or chemical consumption; consequently, levels of this gas entering the reservoir at saturated conditions may become supersaturated when occluded from the atmosphere and subjected to temperature increases. Table H-3 shows influent and effluent dissolved nitrogen and total gases in Wynoochee Reservoir waters. Reservoir total dissolved gas levels are typically at saturation. Gas levels below the dam are increased due to entrainment during spilling or sluicing. Nitrogen gas will not be entrained from powerhouse operation. Additionally, water to the hatchery will pass over a weir where deficiencies or excesses of nitrogen and oxygen will become equilibrated.

e. Turbidity. Turbidity and/or TSS are parameters which affect fish feeding behavior and egg incubation. Turbidity and suspended solids at Wynoochee Reservoir are very low from June through November (figure H-5, table H-4). During winter and spring, turbidity and suspended solids increase due to storm events and snowmelt with associated turbulence and runoff (figure H-5, table H-4). Even the higher turbidity and TSS values are relatively low and should not affect hatchery operation.

Figure H-1 TEMPERATURE PROFILE OF WYNOOCHEE DAM; FOREBAY
1973 THROUGH 1980



No. 1 - 6 - Invert elevations of selective withdrawal system at Wynoochee Dam.

Figure H-2 INFLOW AND OUTFLOW TEMPERATURE AT LAKE WYNOOCHEE
1973 THROUGH 1980

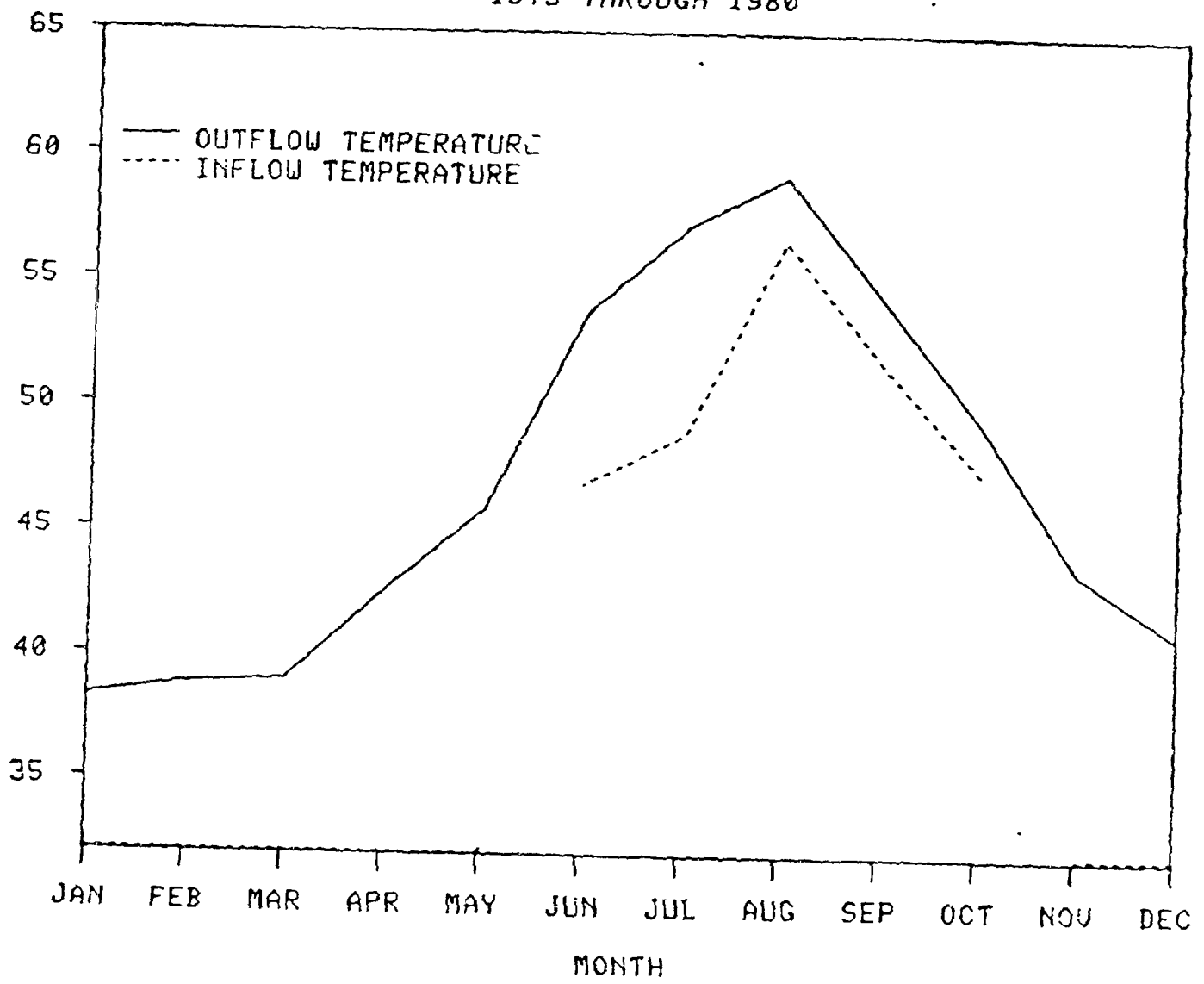


Figure H-3 DISSOLVED OXYGEN PROFILE OF WYNOOCHEE DAM, FOREBAY
1973 THROUGH 1980

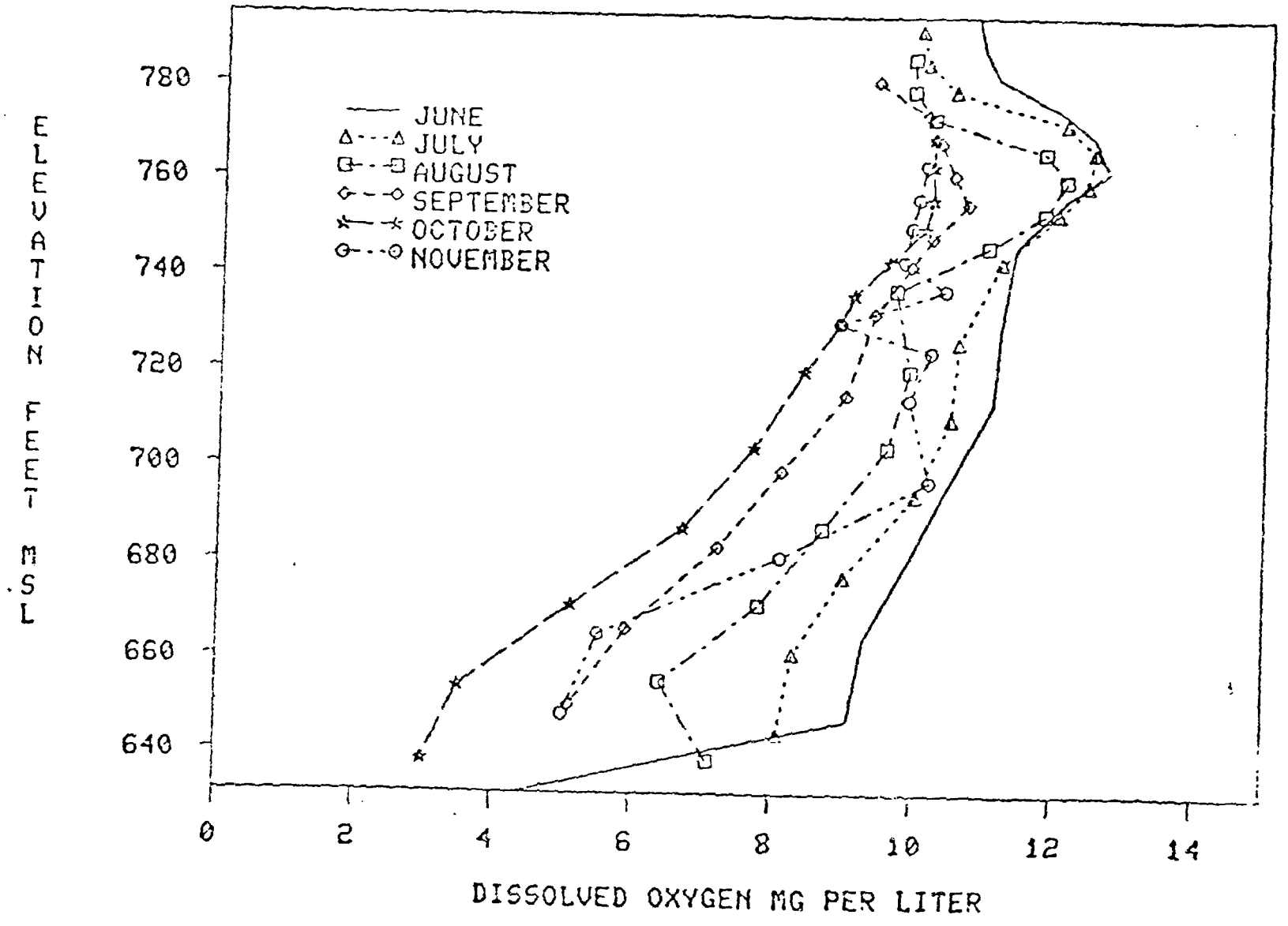


Figure H-4 DISSOLVED OXYGEN PROFILE OF WYNOOCHEE RESERVOIR, FOREBAY
DECEMBER 1980 TO APRIL 1981

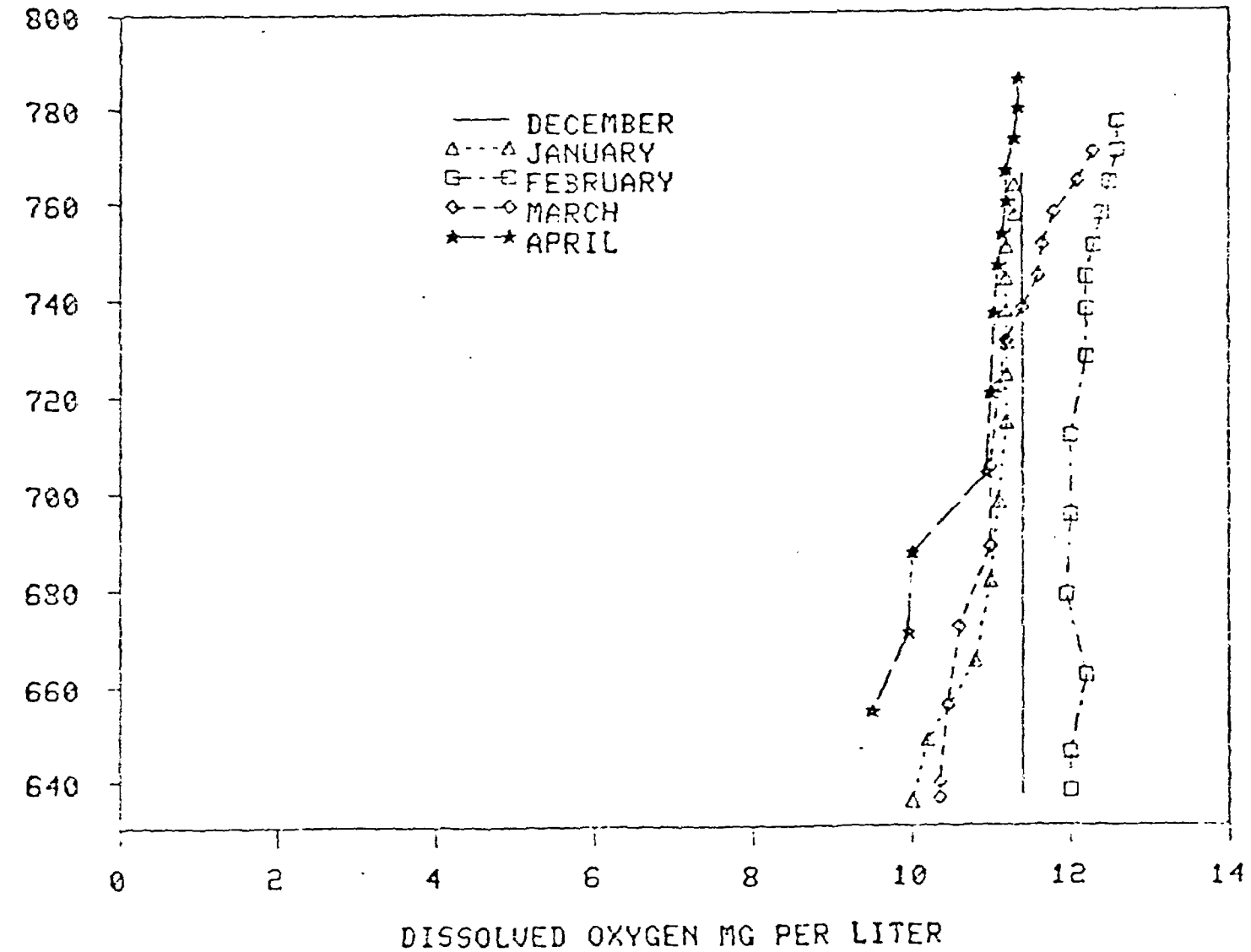


Figure H-5 TURBIDITY MEASURED IN WYNOOCHEE FOREBAY AND TAILWATER
JUNE 1980 TO JUNE 1981

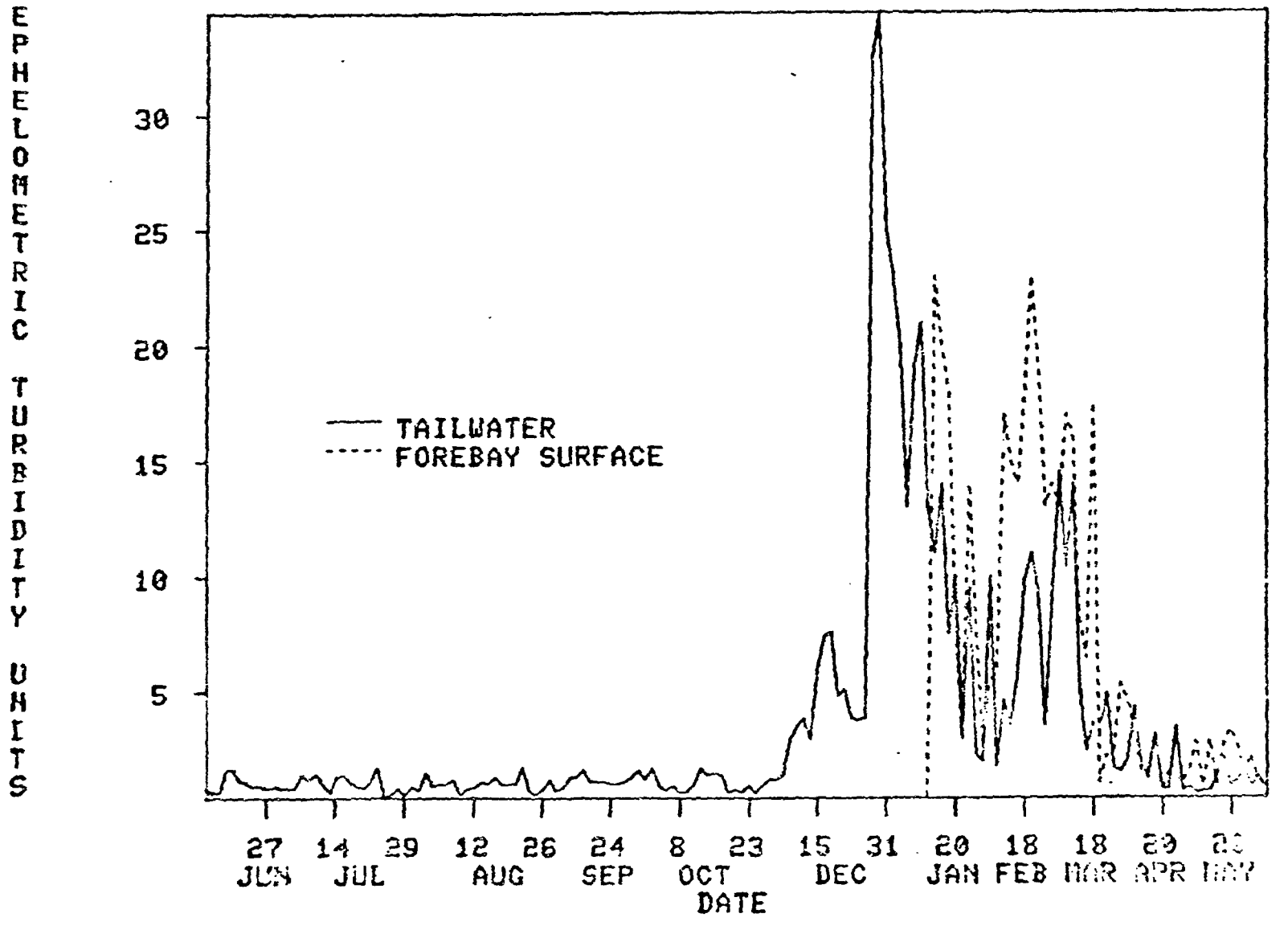


TABLE H-1. Chemical analysis of water from Lake Wynoochee reservoir during 1980 and 1981. From June to October water samples were collected at the surface and bottom of the forebay water column. During November through May, surface water samples were collected in the tailwaters below Wynoochee Dam.

a. Forebay

	June 80		July 80	August 80		June 81	
	1/S	B	Composite	S	B	S	B
Arsenic ug/l	1	1	1	1	1	1	1
Barium ug/l	15	15	6	--	--	--	--
Beryllium ug/l	2	2	--	3	5--	--	
Cadmium ug/l	1	1	1	0.3	0.3	L0.1	L0.1
Copper ug/l	1	8	2	3	4	2	1
Iron ug/l	17	111	153	33	85	24	150
Lead ug/l	L10	L10	40	42	47	1	2
Mercury ug/l	0.7	2.2	0.4	1.4	0.4	L0.2	0.9
Nickel ug/l	18	13	7	6	6	1	2
Selenium ug/l	7	5	7	1	5	L2	L2
Silver ug/l	L0.5	L0.5	1	0.4	0.6	L0.3	L0.3
Zinc ug/l	4	13	8	8	11	11	15
Calcium mg/l	7.8	7.8	8.0	9.4	7.7	6.6	6.8
Chloride mg/l	1.5	1.95	1.00	1.4	1.5	L1.0	L1.0
Fluoride mg/l	0.31	0.25	0.3	0.3	0.3	L0.1	L0.1
Magnesium mg/l	1.34	0.90	1.41	1.00	1.12	1.00	1.00
Potassium mg/l	0.17	0.17	0.1	0.43	0.52	0.10	0.10
Silica mg/l SiO_2	4.2	4.4	12.3	6.0	6.0	5.6	5.6
Sodium mg/l	1.18	0.88	1.2	1.0	1.0	1.07	1.00
Sulfate mg/l	L1.0	L1.0	1.0	1.5	1.5	3.0	2.0
Dissolved Solids mg/l	32.4	32.8	36.0	34.0	33.0	--	--
Ammonia mg/l	0.01	0.006	--	L0.005	L0.005	--	--
Cyanide mg/l	L0.002	L0.002	--	L0.002	L0.002	--	--
Sulfide	2.9	L0.05		L0.1	L0.1	--	--
Color	0.5	0.5	1	1	10	--	--

L = Less than

1/S indicates surface; B indicates bottom.

2/As of July 1980, all chlorophyll values are phaeophytin corrected.

TABLE H-1 (con)

a. Forebay (con.)

	June 80 S	June 80 B 1/	July 80 Composite	August 80 S	August 80 B	June 81 S	June 81 B
Suspended Solids mg/l	2	8	2	0.5	31	--	--
Total Organic Carbon mg/l	L2	L2	L2	L2	L2	--	--
pH	6.13	6.1	6.4	6.72	6.11		
Alkalinity mg/l $CaCO_3$	25	21	26	30	25	23	23
Chlorophyll a ug/l	1.04	1.82	1.76 2/	LO.5	LO.5	0.73	--
Specific Conductance	56	52	47	62	47	54	56

L = Less than

1/S indicates surface; B indicates bottom.

2/As of July 1980, all chlorophyll values are phaeophytin corrected.

TABLE H-1 (con.)

b. Below Wynoochee Dam

	January 1978[1/]	October 1978[1/]	December 1980[2/]	January 1981	February 1981	March 1981	April 1981	May 1981	June 1981
Arsenic ug/l	--	--	8	--	2		1	1	--
Cadmium ug/l	L10	10	0.1	--	0.1	--	L0.1	L0.1	--
Chromium ug/l	L10	20	--	--	--	--	--	--	--
Copper ug/l	2	L2	4	--	3	--	2	1	--
Iron ug/l	50	2,000	220	--	430	--	50	39	--
Lead ug/l	L20	L50	L1	--	1	--	L1	L1	--
Mercury ug/l	0	0	L0.2	--	L0.2	--	L0.2	L0.2	--
Nickel mg/l	--	--	1	--	1	--	1	1	--
Selenium mg/l	--	--	L2	--	L2	--	L2	L2	--
Silver ug/l	--	--	L0.3	--	L0.3	--	L0.3	0.3	--
Zinc ug/l	L10	L10	5	--	5	--	7	5	--
Calcium mg/l	4.8	4.8	5.5	--	5.4	--	5.9	6.5	--
Chloride mg/l	2	2	3.1	--	L1	--	L1	1.7	--
Magnesium mg/l	0.82	0.8	1.3	--	0.8	--	0.9	0.8	--
Potassium mg/l	0.1	0.2	0.19	--	0.2	--	0.07	L0.01	--
Silicate mg/l SiO_2	--	--	6.4	--	6.0	--	7.3	5.8	--
Sodium mg/l	1.2	2.0	0.69	--	1.0	--	1.3	1.4	--
Sulfate mg/l	--	--	2.8	--	5.9	--	4.7	2.4	--
Orthophosphate mg/l-P	L0.02	0.01	0.007	L0.005	0.012	0.018	L0.005	L0.005	L0.005
Total Phosphorus mg/l-P	--	--	0.02	0.03	0.03	0.02	0.01	L0.005	0.27

L = Less than

1/Chemical analysis by Washington Department of Fisheries

2/Data collected by Corps of Engineers.
December 1980, January through June 1981 analyses by Corps of Engineers.

TABLE H-1 (con.)

b. Below Wynoochee Dam

	January 1978[1/]	October 1978[1/]	December 1980[2/]	January 1981	February 1981	March 1981	April 1981	May 1981	June 1981
Nitrite mg/l & Nitrate mg/l-N	0.02	0.7	0.13	0.10	0.10	0.05	0.08	0.06	0.21
Total Kjeldahl Nitrogen mg/l-N	--	--	L0.50	L0.5	L0.5	L0.5	L0.5	L0.5	L0.5
Ammonia mg/l-N	--	--	0.064	0.04	0.019	0.008	L0.005	0.012	L0.005
Suspended Solids mg/l	--	--	2.0	--	--		--	--	--
Total Organic Carbon mg/l	--	--	L2	L2	L2	L2	--	--	3
Alkalinity mg/l $CaCO_3$	--	--	23	15	19	--	22	23	--
Chlorophyll a ug/l	--	--	L0.5	L0.5	L.05	L0.5	L0.5	L0.5	0.73
BOD_5 (mg/l)	--	--	1.0	2	1	2	1	1	2
Specific Cond	--	--	51.0	42	39	46	46	48	--

L = Less than

1/Chemical analysis by Washington Department of Fisheries

2/December 1980, January through June 1981 analysis by Corps of Engineers

TABLE H-2

Temperature of inflow and outflow to Lake Wynoochee. Mean of samples collected from 1973 through 1980.

	Temperature Degrees Fahrenheit			
	Inflow	N	Outflow	N
January			38.3	2
February			38.8	3
March			39.0	3
April			42.6	2
May			45.9	2
June	45.9	3	52.1	8
July	48.9	5	57.2	13
August	56.7	8	59.2	17
September	51.8	9	54.3	15
October	47.5	7	49.5	13
November			43.5	2
December			41.5	2

N = No. of observations

TABLE H-3. Total dissolved gas analysis completed in Lake Wynoochee. 1973 through 1980 mean of samples collected from June through October, single samples collected on November 1980 and January through May 1981.

	Total % Saturation				Nitrogen (N2) % Saturation			
	Inflow	N	Outflow	N	Inflow	N	Outflow	N
January			105.7	1			106	1
February			114.8	1			114.5	1
March			105.9				104.4	1
April			104.2	1			104.5	1
May								
June	101.3	5	107.3	6	100.2	5	105.4	6
July	102.1	6	106.0	7	100.8	6	104.8	7
August	102.5	8	106.7	9	101.5	8	106.2	9
September	101.2	11	106.1	11	100.2	11	105.8	11
October	100.4	6	105.8	8	97.3	6	104.2	8
November	101.0	2	107.0	1	101.7	2	105.7	1
December	101.0	2	112.9	7	86.2	2	111.3	7

N = No. of observations

Washington State Department of Ecology Criterion for total dissolved gas is 110 percent saturation

Note: Routine sampling is performed during June through October. Samples taken during winter and spring months are only collected during high periods of spills when gas saturated levels are expected to be elevated. Therefore, December through May data do not represent average conditions.

TABLE H-4

Total suspended sediments (milligrams per liter) measured in Wynoochee Dam forebay and tailwater.

Date	Tailwater	Forebay
29 Dec 80	20	
30 Dec 80	18	
05 Jan 81	7	
06 Jan 81	7	
08 Jan 81	15	
09 Jan 81	4	
12 Jan 81		19
16 Jan 81		7
04 Feb 81	4	
09 Feb 81		7
20 Feb 81	14	
24 Feb 81		10
06 Mar 81		

SECTION 2. WYNOOCHEE HYDROPOWER/FISH HATCHERY (HP/FH) STUDY, INSTREAM FLOW ANALYSIS

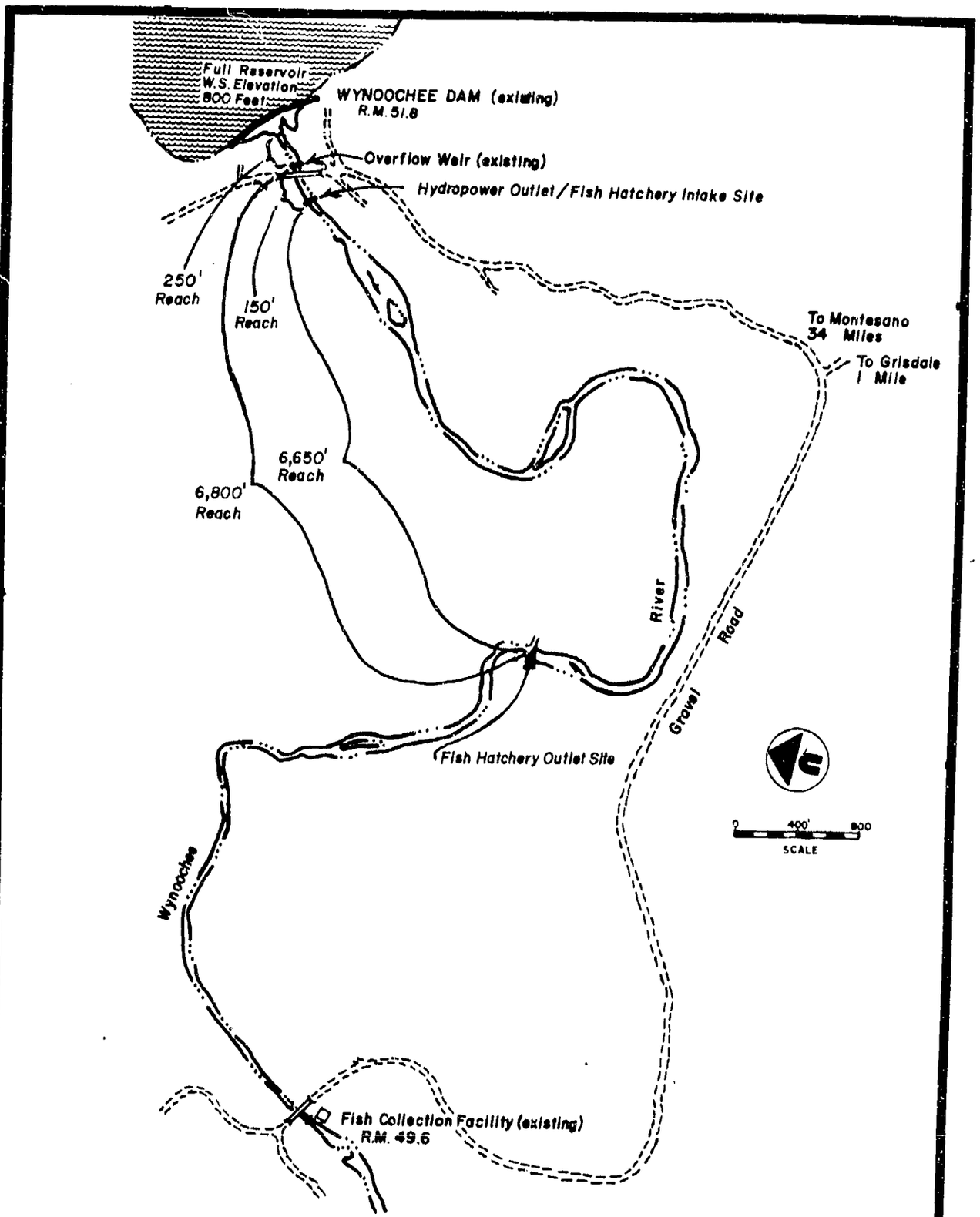
2.01. General. The Wynoochee hatchery is being planned for a water supply of 190 c.f.s. Except for the months of May and June, 190 c.f.s. is the operational minimum flow from the existing Wynoochee Dam. In May and June, the operational minimum flow may drop to 140 c.f.s. The proposed powerhouse is designed to utilize the 190/140 c.f.s. minimum flow from the existing project up to a hydraulic capacity of 1,200 c.f.s. With the HP/FH plan, water from the reservoir that is not passed through the powerhouse would be discharged from the existing dam's spillways, and/or multilevel outlets. Flows from the powerhouse that are not passed to the hatchery would be discharged to the Wynoochee River via a tailrace tunnel structure located about 400 feet downstream of Wynoochee Dam (refer to plate 2 of the draft feasibility report/EIS). An existing concrete overflow weir in the river just upstream from the powerhouse tailrace would assure water in the river between the main dam and powerhouse tailrace. The water supply system to the hatchery is designed with an intake structure at the hydropower outlet, which can be alternatively supplied with water from the powerhouse or dam discharges. Accordingly, should the powerhouse be shut down for any reason, water supply to the hatchery would not be interrupted.

2.02 Water supply to the hatchery and the operation of the powerhouse would not result in a change to the existing operational mode of Wynoochee Dam. River discharge frequency in the Wynoochee River below the hatchery outlet would not change from existing conditions. The hydropower operation would be subordinate to all other purposes, and the facility would operate as a run-of-river plant producing baseload energy from the reservoir releases.

2.03 "With Project" Instream Flow Conditions.

a. Reach of Wynoochee River between Dam and Existing Overflow Weir (refer to figure H-6). Due to the diversion of up to 1,200 c.f.s. of reservoir releases to the proposed hydropower facility, the water in the 250-foot reach of the Wynoochee River from the dam to the existing overflow weir would be ponded rather than flowing when releases from the reservoir are 1,200 c.f.s. or less and that quantity is discharged through the powerhouse. This condition could occur in the late spring through summer months and its duration would depend to a large degree on the meteorologic conditions of any particular year. The principal impacts associated with this condition would potentially be reduced water quality and esthetics in the 250-foot reach between the Wynoochee Dam and the existing overflow weir.

b. Reach of Wynoochee River between the existing overflow weir and the proposed hatchery outlet (includes 150 feet from weir to the hydropower outlet/fish hatchery intake structure and approximately 6,650 feet from that structure to the hatchery outlet (refer to figure H-6).



Wynoochee Hydropower/Fish Hatchery Plan Area

(Showing Referenced River Reaches)

Figure H-6

Flow in the Wynoochee River in the 6,800-foot reach between the existing overflow weir (located approximately 150 feet upstream of the hydropower outlet/fish hatchery intake structure shown on plate 2 of the draft feasibilty report/EIS) and the hatchery outlet could become extremely low should the full complement of water (190/140 c.f.s.) be supplied to the hatchery during a time of minimum discharge (190/140 c.f.s.) from the reservoir. The reservoir is generally filled from elevation 764 feet to elevation 800 feet between 15 March and 1 June to provide up to 59,500 acre-feet of conservation water supply. The critical period when discharge from the reservoir may potentially be 190 c.f.s. is April-May; the critical period when discharge could drop to 140 c.f.s. is May-June. During the spring refill period (April-May) for the reservoir, the Grisdale streamgage located 2,000 feet downstream of Wynoochee Dam records approximately 20 c.f.s. more streamflow than the Wynoochee Lake project releases according to operational controls. This flow is due to groundwater inflow from seeps and springs. Accordingly, it is not anticipated that the reach of the river between the existing overflow weir and the hatchery outlet would be dry when the supply to the hatchery equals the total discharge of the powerhouse.

In addition to low flows when the full 190/140 c.f.s. minimum discharge from the reservoir is supplied to the hatchery, the 150-foot reach between the existing overflow weir and the hydropower outlet/fish hatchery intake structure (refer to figure H-6) would be receiving no discharge from the Wynoochee Dam when releases from the reservoir are 1,200 c.f.s. or less and that quantity is diverted to the powerhouse. This condition would occur in the late spring through early fall and potentially could occur throughout most of the year (e.g. during 1973-1978, 97% of the flows from Wynoochee Dam were less than 1,200 c.f.s.). When the minimum discharge from the reservoir would be 190/140 c.f.s. (April-June), it is expected that the 150-foot reach would receive some inflow from groundwater springs and seepage. During times when minimum reservoir discharge exceeds 190 c.f.s. and all reservoir releases (up to 1,200 c.f.s.) are diverted to the powerhouse, any flow above 190 c.f.s. would be released to the river at the hydropower outlet/fish hatchery intake structure and would create a backwater effect in the 150-foot reach. It is therefore expected that impacts associated with low flows in the 150-foot reach would essentially be the same as those associated with low flows in the 6,650-foot reach of the Wynoochee River from the hydropower outlet/fish hatchery intake structure to the hatchery outlet. Depending upon the quantity of discharge from the hydropower outlet/hatchery intake structure, the 150-foot reach may experience low flow conditions for a longer period of time (1-2 months) than the remainder of the reach, but the impacts between the two segments of the 6,800-foot reach would not be significantly different. For purposes of impact discussion, the 150-foot reach plus the 6,650-foot reach are treated as one 6,800-foot reach from the existing overflow weir to the hatchery outlet.

The impacts of a potential low flow in the 6,800-foot reach would primarily be reduced visual esthetic value and reduced aquatic habitat with resulting effects to fish and wildlife which utilize the area. Downstream of the hatchery outlet, the flow of the Wynoochee River would be the same as that without a hatchery and powerhouse project.

The impacts of a potential low flow between the dam and the hatchery outlet are described in the following paragraphs for the "worst case" situation in which no instream flow exists in the reach during critical periods other than the 20 c.f.s. from groundwater springs and seepage. If higher instream flows are determined to be appropriate during advanced engineering and design (AE&D) studies, then the impacts to instream resources would be less than those discussed for the "worst case" situation.

2.04 Wildlife Impacts. The reach of the Wynoochee River from Wynoochee Dam to the proposed hatchery outlet is characterized by steep rock canyon walls in the first several hundred feet followed by steep earthen river banks down to the hatchery site where the slope of the right bank flattens to form a bench. The vegetation along the river banks is that typical of the Olympic rain forest, the canopy being dominated by mixed stands of western hemlock and Douglas fir, interspersed with large stands of bigleaf maple. Wildlife usage in the 250-foot reach of the Wynoochee River from the dam to the existing overflow weir is negligible, thus direct impacts to wildlife as a result of the potential ponding of this reach due to implementation of the HP/FH project would not be significant. Wildlife usage typical of other riparian areas of the Wynoochee River Basin can also be expected in the 6,800-foot reach of the Wynoochee River from the existing overflow weir to the hatchery outlet. Such usage would include small mammals, such as beavers, minks, muskrats, and some river otters, some big game use by Roosevelt elk and Columbian black-tailed deer, and small numbers of game bird and waterfowl populations. With the project, potential low flows could occur in this reach during the period April through June adversely impacting small mammal and waterfowl populations directly through a reduction in available aquatic habitat and indirectly through a reduction in the food supply of those wildlife species that rely on aquatic organisms for their sustenance. Big game mammals would not be impacted by the potential low flow condition. Fur harvest, upland-game hunting, and waterfowl hunting in the plan area are minor and would not be significantly impacted by any impacts to wildlife populations as a result of potential low flow conditions in this reach.

2.05 Fish Impacts. Under existing conditions, adult anadromous fish are collected at the barrier dam/fish collection facility 2.2 miles below Wynoochee Dam (see figure H-6), trucked to a fish release site above Wynoochee Dam, and released to spawn in the upstream reaches of the Wynoochee River below Wynoochee Falls. The barrier dam thus forms the upstream limit of adult anadromous fish migration. Fish use of the reach of the Wynoochee River from the Wynoochee Dam to the hatchery outlet

site consists of use by resident fish species and use as a transportation corridor by juvenile anadromous outmigrants which have passed through the sluiceway or through the existing multilevel outlets in the Wynoochee Dam. Resident game fish in the reach are rainbow and cutthroat trout, most of which are thought to have passed through Wynoochee Dam from the reservoir. Non-game species, such as suckers and squawfish, which are typical of those found in other Pacific Northwest streams, can be expected to occupy this reach of the Wynoochee River.

2.06 If the HP/FH plan is constructed, the anadromous fish runs above Wynoochee Dam would be terminated, thus the reach between the dam and the hatchery outlet would no longer be utilized as a transportation corridor for juvenile anadromous outmigrants from above Wynoochee Dam. Other than use by juvenile outmigrants, fish use of the 250-foot reach of the Wynoochee River from the dam to the existing overflow weir is negligible. Thus impacts to fish as a result of ponding in this reach under low flow conditions associated with the HP/FH project would be minor.

2.07 Reduced streamflow in the reach between the existing overflow weir and the hatchery outlet as a result of construction of the HP/FH plan would limit resident fish populations through a reduction in available aquatic habitat. Existing resident populations are small, and although they would be locally impacted by reduced flows, in terms of the resident fish populations of the Wynoochee River as a whole, impacts would not be significant. Fishing in this reach of the Wynoochee River is currently closed to the public and would remain closed with implementation of the HP/FH plan. Through provision of sufficient instream flows, the potential exists for use of the area between the hatchery intake/hydropower outlet structure and the hatchery outlet for anadromous fish that are in excess of the hatchery needs. This potential would be explored in AE&D as the details of hatchery management and operation are developed.

2.08 Water Quality Impacts. If the reservoir releases are less than 1,200 c.f.s. and the 1,200 c.f.s. are routed through the powerhouse rather than the existing dam, approximately 9 acre-feet of reservoir water would be ponded in the area between the existing overflow weir and the Wynoochee Dam. If the water is trapped during April and allowed to remain throughout the summer without any mixing, it would begin to resemble a shallow, stable pond, although some seepage into this area from the reservoir would be expected. Water temperatures in the ponded area would reach equilibrium with air temperatures. Theoretically, the average daily water temperature during mid to late summer may reach 76 degrees F during a warm year. As a result of ponded conditions, chemical elements and biological organisms would increase in the area between Wynoochee Dam and the existing overflow weir. Primary productivity which is dependent upon solar radiation would be limited by shading as a result of the topographical location of the pond within a steep sided gorge. When the reservoir releases exceeded 1,200 c.f.s., the water would be

forced to pass out of the ponded areas and into the mainstream of the Wynoochee River. During the initial release, there may be a small quantity (less than 9 acre-feet) of warm (76 degrees F), high nutrient water flowing through the Wynoochee River downstream of the existing overflow weir; however, the temperature and dissolved elements would be rapidly diluted by groundwater seepage as well as seepage from the reservoir and would have no significant impact on the overall water quality of the reach of the Wynoochee River between the dam and the hatchery outlet. When the water finally would mix with the 190 c.f.s. hatchery outflow, there would be no measurable change from ambient hatchery outflow conditions.

2.09 During extremely low flow periods (April-June) when the reservoir releases may be reduced to 190 c.f.s./140 c.f.s., the only water in the 6,800-foot reach from the exiting overflow weir to the hatchery outlet would be groundwater seepage (approximately 20 c.f.s.). The river in this reach would probably flow in a small primary channel with a wide gravel and rock streambed and pools possibly formed in shallow holes. If the flows remain low for an extended period of time (15 to 30 days), the pools may increase in temperature and provide habitat for a small aquatic community of algae and invertebrates. However, as soon as the reservoir releases are increased, any shallow water communities would be scoured by the increased discharge. The low flow condition would be temporary and of short duration and would not be expected to result in significant impacts from nuisance algal growth, odor problems, or low dissolved oxygen levels. Some stranding and subsequent mortality of resident fish could occur from a rapid reduction in stream discharge. Decomposition of fish carcasses would cause some minor organic nutrient loading to the river. Any contribution would be diluted in the Wynoochee River below the hatchery outlet.

2.10 Esthetic Impacts. During low flow periods (potentially April-June) associated with operation of the HP/FH plan, visual esthetics in the reach of the Wynoochee River from the dam to the hatchery outlet would be altered from the existing condition of a flowing river. Water would be ponded in the 250-foot reach from the Wynoochee Dam to the existing overflow weir and a small stream with a wide gravel and rock streambed and possibly some pools formed in shallow holes would exist in the 6,800-foot reach from the existing overflow weir to the hatchery outlet. Access to river views are limited in this reach of the Wynoochee River and consist of views primarily from the hatchery site, the road on the left bank across from the hatchery site, the Wynoochee Dam, the Wynoochee Lake project visitor's center, and the Forest Service road bridge south of Wynoochee Dam. Views of the river from the hatchery site on the right bank, from the road above on the left bank, and from the Forest Service bridge would be that of an exposed rock and gravel streambed with a small stream resulting from approximately 20 c.f.s. due to groundwater springs and seepage. Adverse esthetics from nuisance algae and odors in pools that may form along the streambed are not expected to occur. The possibility of such impacts occurring is dependent in part on the amount of

solar radiation and the duration of the low flow period. Although the low flow period has the potential of extending into the beginning of the summer tourist season (June), it would not exist for the majority of the season of peak visitor use for the Wynoochee Lake project. The Wynoochee plan area is in a remote location and is not expected to become a major visitor attraction center with or without the HP/FH project. No impact to recreation would result from the potential low flow conditions. Lack of access to most of the reach due to steep banks preclude recreational use, and public fishing in all of the reach is prohibited.

2.11 The 250-foot reach of the Wynoochee River between the dam and the existing overflow weir would only be visible from the dam itself and from the existing visitor's center. Views would be from approximately 100 feet above looking down on a ponded area below the dam in a steep canyon gorge. As discussed in paragraph 2.09. above, nuisance algae and odor problems are not expected to occur in the ponded area. Therefore, the esthetic impact would primarily result from a change from a flowing to a ponded condition for a maximum period of April-September. This impact would not be significant.

2.12 Coordination. Coordination has been ongoing with the State of Washington including the Washington Departments of Ecology (WDE), Fisheries (WDF), and Game (WDG) regarding the instream flow issues related to the Wynoochee HP/FH plan. The WDE has used as a general guideline the 7-day, 10-year, historical low flow as a lower limit of permitted flow in a river reach. The 7-day, 10-year, unregulated flow in the Wynoochee River is 55 c.f.s. The minimum flow that could be expected in the reach of the Wynoochee River between the existing overflow weir and the hatchery outlet during a critical low flow period with the HP/FH project is 20 c.f.s. from groundwater springs and seepage. The determination of an instream flow requirement is based primarily on fish, wildlife, water quality, recreation, navigation and esthetic considerations none of which are now or are expected to be significant in the reach of the river from the Wynoochee Dam to the hatchery outlet. In this case, another consideration in determining an instream flow would be the impacts of any flow requirement on the hatchery operation and production capability. Until the hatchery details, including the specific species, numbers of fish, specific water requirements, and management flexibility, are determined in AE&D, establishment of an instream flow would be premature and could jeopardize making full use of the available water supply in design of the project at the planning stage. This approach to the instream flow issue has been coordinated with WDG, WDF, and WDE, and all parties have agreed that instream flows for the reach of the Wynoochee River between the Wynoochee Dam and the hatchery outlet would be determined during AE&D studies, rather than at the feasibility stage of planning (refer to letter, dated 28 October 1981, from WDE in appendix B).

SECTION 3. WYNOOCHEE HATCHERY MANAGEMENT CONCEPT 1/

3.01 The site beneath the Wynoochee reservoir offers an excellent opportunity to build a large, gravity-fed hatchery, of approximately six times the rearing capacity of an average sized salmon or steelhead hatchery. Water quality and quantity appear very good, and temperatures could be held within a near optimal annual range by drawing water at various depths from the reservoir.

3.02 Salmon and steelhead runs in Grays Harbor and adjacent streams are among the most depressed in the State. Catches from this region are tending to decline relative to catches elsewhere in the State. Enhancement efforts in this region have not generally been in proportion to the relative importance of the fisheries there. Thus, about 15% of the State's chinook and coho and about 10% of the State's steelhead are caught in the Grays Harbor region, yet only about 7% and 5% of the State's salmon and steelhead hatchery plants, respectively, are made in this region.

3.03 Not only are many of the runs depressed, but the Boldt decision has caused a severe reapportionment of the dwindling resources from one class of fishermen to another. Grays Harbor is in the Boldt case area and has in effect been promised a substantial Federal salmon enhancement effort by passage of a $37.5 million enhancement act in 1980. However, no funds for such enhancement projects have yet been authorized.

3.04 The Wynoochee hatchery project offers an opportunity to subtantially enhance the depressed salmon and steelhead runs over much of coastal Washington, from the Hoh River to the upper Chehalis watershed. The potential to rebuild commercial Indian and non-Indian fisheries, revitalize a sagging ocean recreational fishing industry, and create a steelhead sport fishery equivalent to the high-success lower Columbia area steelhead fishery with this facility should be utilized.

3.05 The Wynoochee site is potentially very cost-effective when compared with other hatchery sites and other recently completed hatcheries. The amount of fish that could be reared per dollar of capital cost, as a measure of cost-effectiveness, is as high as several of the most recent, efficient hatcheries built by the Washington Department of Fisheries. Water could be provided entirely by gravity, thus obviating the need to pump by electric power. As energy costs rise in the future the relative efficiency of gravity-fed hatcheries over pumped-water hatcheries will substantially increase.

3.06 Specific recommendations are as follows:

1/Executive Summary from: Mathews, S. B., 1981. Biological Report for Wynoochee Hatchery Management Planning. University of Washington, Seattle, Washington. Prepared under contract with the U.S. Army Corps of Engineers, Seattle District.

a. This should be a regional hatchery designed to enhance runs throughout Grays Harbor as well as depressed north coastal Washington runs such as the Queets and the Hoh, two large rivers which have no hatcheries on them.

b. The hatchery should be utilized to improve all non-Indian commercial and sport fisheries negatively impacted by the Boldt decision and related Federal court actions, as well as coastal Indian fisheries negatively impacted by depressed salmon runs to their rivers.

c. Priority species should be steelhead, spring chinook, and coho. Because of the large volume of high quality water available, yearling releases of these three species should be emphasized. Local steelhead and spring chinook stocks should be utilized if possible. Coho production should emphasize both the local stocks as well as the early running outside Soleduc stock. However, use of Soleduc stock should be phased in with the rebuilding of depressed native Grays Harbor fall chinook stocks with which Soleduc coho would overlap in terminal timing.

d. Any fall chinook rearing should utilize local stocks from various streams and emphasize outplantings for the purpose of rebuilding potential spawning populations of those runs particularly depressed.

e. Rearing of other species such as chum should be experimental initially.

f. Hatchery production and harvest of these fish should be coordinated with an overall fishery management policy for Grays Harbor and north coastal Washington that emphasize natural production. The latter policy implies common harvest rates on any mixtures of natural and hatchery runs hold be no greater than is optimal for the natural runs.

g. A percentage of the annual operating funds should be earmarked for research and evaluation. The use of a dam to improve salmonid production by providing both hatchery water and improved natural rearing environment in the river below represents a turnaround over the past history of negative impacts of dams on salmonid runs. Wynoochee Dam represents a prototype multiple-use facility wherein salmonid production is of high and equal priority to hydropower and other uses. Experience and knowledge gained at Wynoochee would be invaluable for application at other salmonid rivers on which dams are planned.

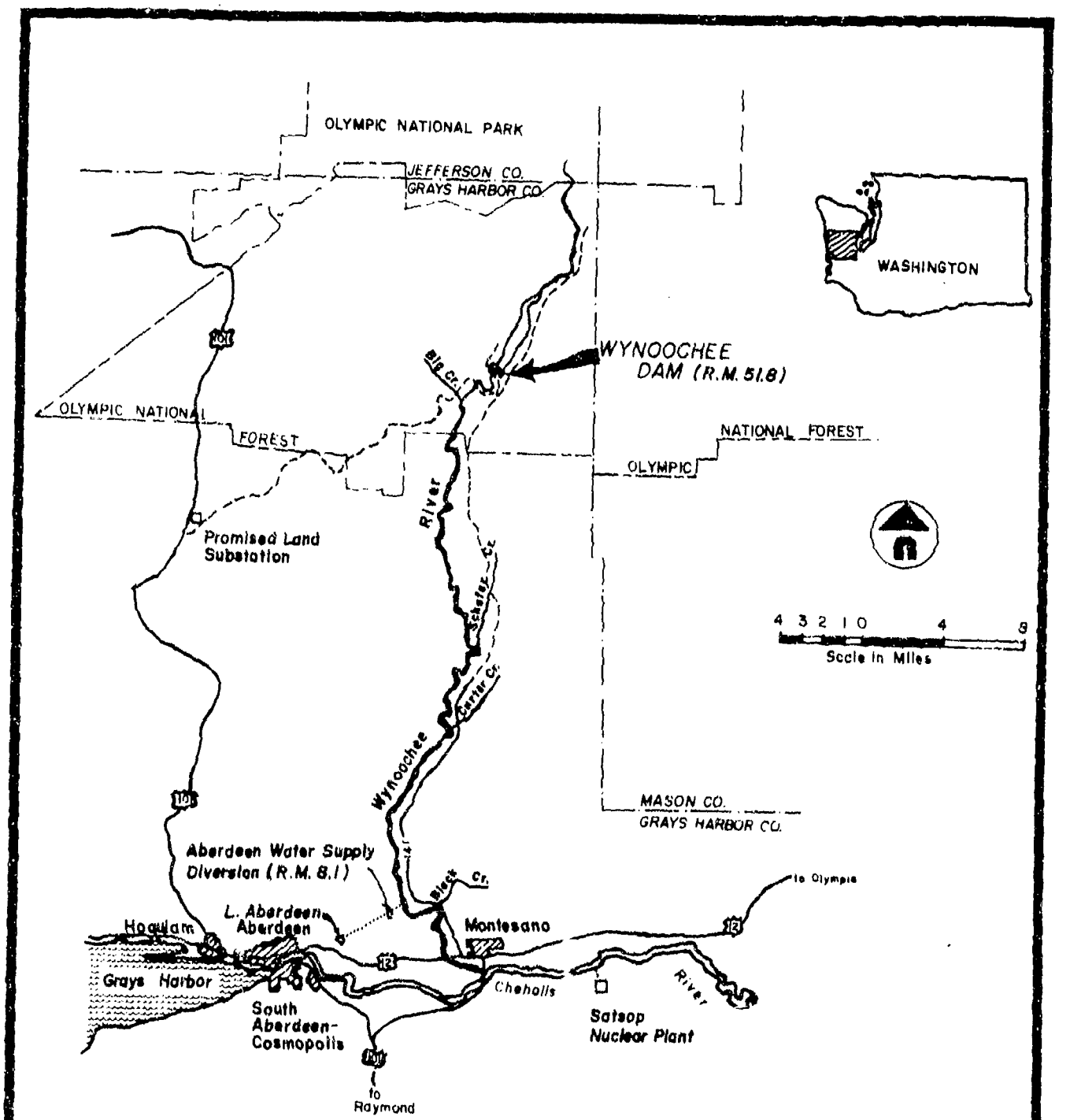
h. To avoid the possibility of overextending the carrying capacity of any segment of the nearshore or marine environment from large outplants from the hatchery, release strategy should be broad in terms of time, space, and species.

SECTION 4. WYNOOCHEE HYDROPOWER/FISH HATCHERY (HP/FH) STUDY, ELK IMPACT ASSESSMENT

4.01 "Without Project" Condition. The plan area for the Wynoochee hydropower/fish hatchery study is located in the vicinity of the Corps of Engineers' Wynoochee Lake project in the 37,649-acre Wynoochee River basin which lies within the Shelton Ranger District of the Olympic National Forest (figure H-7). The Wynoochee Lake project consists of a 177-foot-high dam which provides 70,000 acre-feet of total storage and is presently operated for city of Aberdeen industrial water supply, winter flood control, and fisheries. The existing project includes mitigation lands for elk habitat inundated by the reservoir and a fish collection facility and trucking program for anadromous fish. A visitors' center and day-use facilities for swimming, boating, and picnicking at the project are managed by the Corps of Engineers. Overnight camping facilities in the area around the Wynoochee reservoir are owned and managed by the U.S. Forest Service (USFS).

4.02 The Shelton Ranger District consists of the Wynoochee and Skokomish River basins and includes 112,874 acres of national forest under administration by the USFS. Of the 112,874 acres, approximately 104,900 acres are commercial forest. Approximately 74,500 acres of the commercial forest are classified as being standard commercial forest available for harvesting under a cooperative sustained yield agreement with Simpson Timber Company. Of that acreage, about 59,000 acres of old growth timber had been harvested through 1979, and the remainder is expected to be logged in the next 10-year harvest cycle. Commercial forest that is not classified under the cooperative agreement is categorized as either marginal timber or for special use.

4.03 Both migratory and resident Roosevelt elk (Cervus canadensis roosevelti) are present in the Shelton Ranger District (Taber and Raedke, 1980). Migratory elk move into the high country to spend the summer, while resident elk remain in the valley bottoms the year round. Both types of elk use the forested areas below 1,500-foot elevation as winter range; snow accumulation precludes the use of the higher areas during the winter. Since the mid-1960's, the elk population in the Shelton Ranger District has shown a constant and dramatic decline in numbers. The elk population size estimate for 1968 was approximately 1,200 elk and for 1978 had declined to approximately 500 elk (Taber and Raedke, 1980). In addition to harvest mortality, winter mortality and illegal kill appear to be important mortality factors in this area of the Olympic National Forest (Taber and Raedke, 1980). Current winter carrying capacity of the elevations below 1,500 feet ranges from approximately 10-35 elk per square mile, which is perhaps four times greater than the number of elk that summer in the lowland areas (Smith, 1981).



Location of Wynoochee Dam

Figure H-7

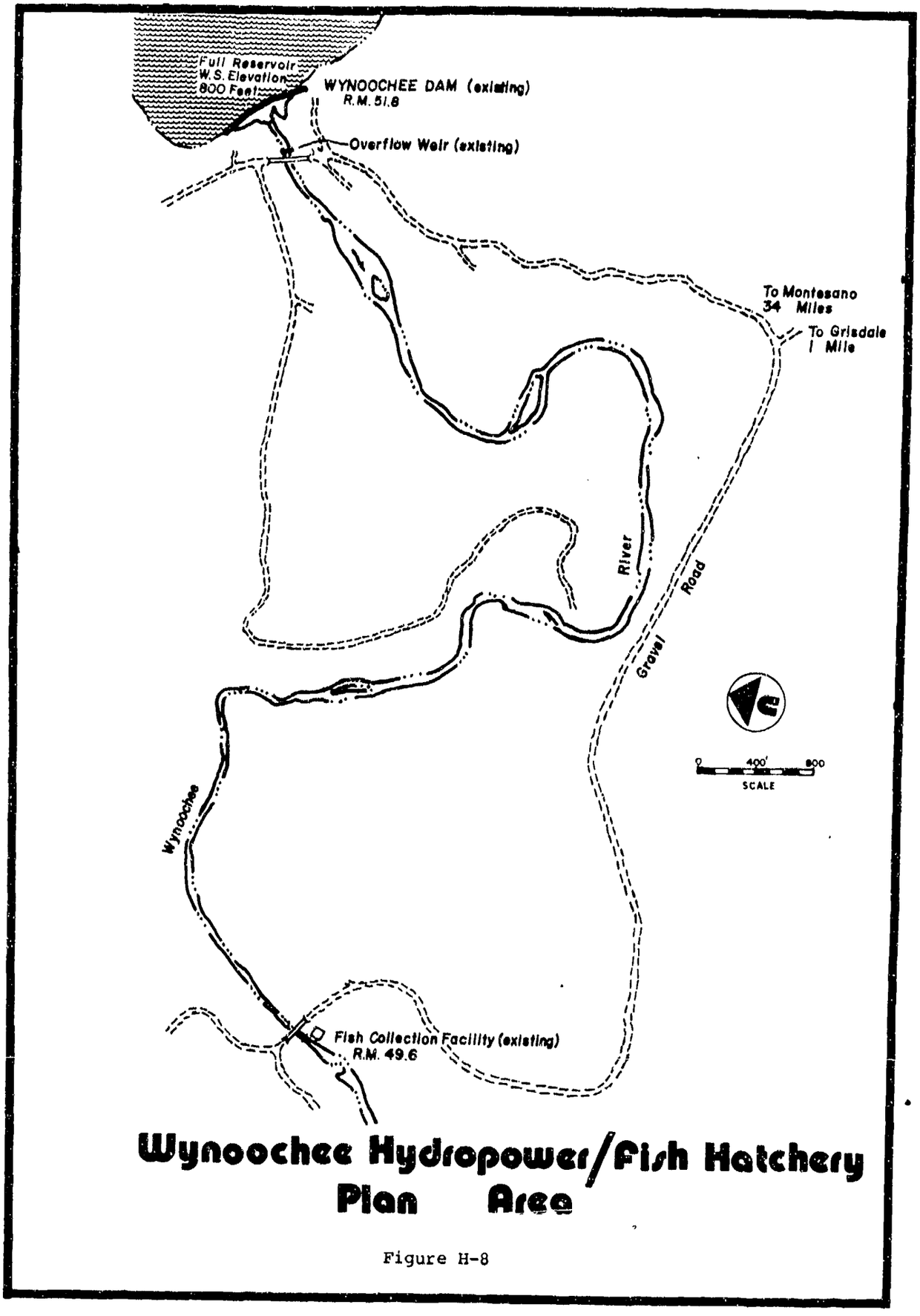
4.04 Old growth[1/] vegetation is critical to elk in times of severe winters since the old growth canopy intercepts much of the snowfall and the windfall, and forest floor vegetation still provides adequate forage. The elk population in the Shelton Ranger District is currently thought to be limited by the carrying capacity of the winter range below 1,500-foot elevation, which is further limited by the amount of old growth, the preferred winter habitat (Taber and Raedeke, 1980). The amount of old growth is declining as logging proceeds. Summer range has not been a limiting factor in the past in the Shelton Ranger District but may become so in the future as the young regenerating forest shades out the forage.

a. Fish Hatchery Site. Under the USFS timber management plan, the 50-acre Wynoochee fish hatchery site is classified special use as "visual variety A" and is on a 200-year harvesting rotation. The objective of this special use category is to maintain or enhance a visually pleasing landscape. To obtain this objective, management of timber on the site is modified to yield less than full biological timber production. Because this site is on a longer harvesting rotation and is managed for a less than optimum timber production, its importance to elk as critical winter range may increase as harvesting of old growth on other winter range continues over the next 10-year period.

The fish hatchery would be constructed adjacent to the Wynoochee River on a low elevation bench forested predominantly by deciduous bottomland species interspersed by mature coniferous trees. Away from the river, at the higher elevations next to the proposed hatchery location, vegetation is principally mature coniferous forest. The USFS has classified this area as old growth forest (Shelton Ranger District, 1981). For the purposes of this analysis, a conservative estimate of 50 percent of the hatchery site or 25 acres has been considered "old growth." Two to three small bands of elk (approximately 10 elk total) are estimated to utilize the area of the proposed hatchery as part of their winter range, although no specific population studies have been performed (Beckstead, 1981). The site is also a popular dispersed recreation area which limits it use by resident elk as summer range. A dirt road provides access to the site. The Wynoochee Lake project is approximately 5,000 feet upstream from the site, and a fish collection facility is located approximately 7,000 feet downstream of the site (figure H-8).

The fish hatchery water supply pipeline leading from the proposed hydropower facility to the hatchery intake would be a buried pipeline 2,400 feet long. It would cross the Wynoochee River in two places and would transverse approximately 5 acres of forest classified by the USFS as winter range. None of this acreage is considered old growth forest.

1/Old growth is defined by U.S. Forest Service (Shelton Ranger District) as a stand of trees dominated by coniferous trees which are an average age of 334 years old. Stands will usually contain a multi-layered canopy and trees of several age classes.



Wynoochee Hydropower/Fish Hatchery Plan Area

Figure H-8

b. Hydropower Facility. The site of the hydropower facility is the existing visitor's parking lot for the Wynoochee Lake project. The site of the switchyard is shrub/grass vegetation approximately 100 feet set back from the road adjacent to the existing visitor's parking lot.

c. Transmission Lines. The route of the proposed transmission line extends from Wynoochee Dam along Donkey Creek Road to the Promised Land Substation at the junction of Donkey Creek Road with U.S. Highway 101. The total length of the route is 22 miles, approximately 14 of which are gravel road and 8 of which are paved. The road travels through national forest land and is utilized as an access road by the U.S.F.S. and by Simpson Timber Company. The USFS classifies this road as a scenic corridor and has a combination of easements and public use agreements with Simpson Timber Company along the gravel segment of the road. Along the 8 miles of paved road, the USFS owns a 100-foot wide corridor on both sides of the roadway and has classified that partial retention for scenic purposes.

4.05 "With Project" Condition. Because winter range is considered limiting to elk production in the Shelton Ranger District, an analysis was performed to determine how much winter range would be impacted by construction of the Wynoochee hydropower/fish hatchery plan. The results of the analysis are described in the following paragraphs.

a. Fish Hatchery. The construction of the hatchery and associated facilities would result in the permanent loss of 50 acres of elk winter range, 25 acres of which are being considered old growth and constitute critical winter range. The water supply pipeline would have temporary impacts on approximately 5 acres of winter range; however, the pipeline would be buried and the corridor reseeded, and habitat would reestablish in time. Table H-5 summarizes the evaluation of permanent losses of elk winter range associated with implementation of the Wynoochee fish hatchery.

The loss of 50 acres of elk winter range represents 0.3 percent and 0.1 percent of the winter range in the Wynoochee drainage basin and Shelton Ranger District, respectively. Twenty-five acres of that loss are old growth, considered critical elk winter habitat. Its loss represents 0.4 percent and 0.2 percent of the critical winter range in the Wynoochee drainage basin and Shelton Ranger District, respectively. The loss of winter range would eliminate elk use of the hatchery site. In the future, as logging of winter range continues over the next 10 years in the Shelton Ranger District and the availability of critical winter range becomes greatly reduced, the impact to elk of losing the hatchery site may increase. However, in view of the small acreage involved at the site relative to the magnitude of planned logging, the large range

TABLE H-5

ELK WINTER RANGE HABITAT LOSSES ASSOCIATED WITH THE WYNOOCHEE FISH HATCHERY PLAN

Winter Range	Existing Acres	With HP/FH Acres	With HP/FH Percent Loss
I. Local (Wynoochee Drainage)1/			
a. Old Growth	5,018	4,993	0.4
b. Other Seral Stages	9,532	9,507	0.3
c. Total	14,550	14,500	0.3
II. District-Wide (Shelton Ranger District)2/			
a. Old Growth	11,872	11,847	0.2
b. Other Seral Stages	28,947	28,922	0.1
c. Total	40,819	40,769	0.1

1/ Total Wynoochee drainage includes 37,649 acres.
2/ Shelton Ranger District includes 112,874 acres administered by the USFS and consists of the Wynoochee and Skokomish River Basins.

requirements of elk, and the predicted future condition of limited summer range, the future of the elk population in the Shelton Range District is not expected to be significantly different with or without construction of the hatchery.

According to the USFS, an additional 100 acres of winter range would be secondarily impacted by the increased human and vehicular disturbance associated with the hatchery complex. The impact would be an expected reduction in use of the area by elk similar to that reported to occur within 1/4 to 1/2 mile from roadways (Lyon, 1980). Under the existing condition, the hatchery site lies within areas of secondary impact as a result of the Wynoochee Lake project, the existing hatchery site access road, and the recreational use of the site. The construction of the hatchery would contribute to the reduced availability of the habitat surrounding the hatchery site to some unknown extent. Secondary impacts could be minimized by a vegetative buffer zone around the hatchery complex and by leaving stands of trees in wind-firm areas.

Considering both primary and secondary impacts, the total elk impact area associated with hatchery construction would be 150 acres or 0.1 percent and 0.3 percent of the total winter range in the Wynoochee drainage basin and Shelton Ranger District, respectively. In the context of the overall carrying capacity of the Shelton Ranger District and

the Wynoochee drainage basin as well as in view of the changing nature of the managed national forest and the projected future conditions of limited summer range, the unavoidable impacts to elk winter range from implementation of the Wynoochee fish hatchery plan are not considered to be significant.

b. Hydropower Facility. The powerhouse and switchyard would have no impact on elk populations or existing elk habitat in the Shelton Ranger District.

c. Transmission Lines. Construction of a buried transmission line along Donkey Creek Road from the Wynoochee Dam to the Promised Land Substation would have no impact on elk populations. Construction of an aerial transmission line could adversely impact elk populations by attraction of elk to the transmission line corridor with a resulting increase in road kill along Donkey Creek Road. An estimated 25 percent of the 22 mile route from Wynoochee Dam to the Promised Land Substation would be away from the road and would traverse both summer and winter elk range. The cleared corridor would provide some benefits to elk through provision of increased forage. Some critical old growth habitat would be lost; however, this habitat would be lost as a result of logging with or without the HP/FH plan. Impacts to elk and other wildlife from loss of habitat could be reduced through planting in the transmission line corridor.

REFERENCES

Beckstead, M., 1981. Personal communication, U.S. Forest Service, Olympia, Washington.

Lyon, L. J., 1979. Habitat Effectiveness for Elk as Influenced by Roads and Cover. Journal of Forestry (October).

Shelton Ranger District, 1981. Information provided from data files. U.S. Forest Service, Shelton, Washington.

Smith, J., 1980. Washington Department of Game. Cited in: Wynoochee Hydropower and Hatchery Projects, Fish and Wildlife Coordination Act Report, July 1981. U.S. Fish and Wildlife Service, Olympia, Washington.

Taber, R. D. and K. J. Raedeke, 1980. Status Report, Roosevelt Elk of the Olympic National Forest. Prepared for Olympic National Forest, U.S. Forest Service, Olympia, Washington, Contract No. R6-79-237.

SECTION 5. WYNOOCHEE HYDROPOWER/FISH HATCHERY STUDY, RECREATION IMPACT ASSESSMENT

5.02 Existing Facilities. Within the Olympic National Forest, the Shelton Ranger District of the U.S. Forest Service (USFS) provides five developed recreation areas and estimates that another 140 areas are customarily used by the public for dispersed recreation activities. Developed recreation areas include Coho, Tenas, Wynoochee Falls, Chetwoot, and Brown Creek campgrounds. In addition, the Corps of Engineers operates and maintains a visitor's center and facilities for swimming and picnicking within the Shelton Ranger District at the existing Wynoochee Lake project.

5.02 Dispersed recreation is defined as outdoor recreation in which visitors are diffused over relatively large areas and, where facilities or developments are provided, they are more for access and protection of the environment than for the comfort or convenience of people (U.S. Department of Agriculture (USDA), 1981). Dispersed recreation activities occur primarily during the summer and fall and include driving for pleasure, hiking, fishing, hunting, photography, rock collecting, and berry picking (USDA, 1978). As described by the USFS (Eldredge, 1981), dispersed recreation in the Shelton Ranger District also includes overnight camping outside of the developed campgrounds, picnicking, woodcutting, and various water-related activities such as wading, tubing, and swimming where access to a stream is available.

5.03 Visitation estimates for the period 1976-1980 show that the developed recreation areas in the Shelton District averaged about 38,000 visitor days annually, while dispersed recreation activities averaged about 85,000 visitor days use. Activities which account for the greatest use on national forest lands include camping (30 percent), driving for pleasure (27 percent), hiking (7 percent), fishing (10 percent), and hunting (15 percent). The remaining 11 percent includes winter sports, water sports, picnicking, and gathering of forest products.

5.04 "Future Without" Conditions. In their long-range development plans, the USFS proposes three additional campgrounds in the Wynoochee Basin to be developed as demand warrants. It is anticipated that the Wynoochee Lake area will never be a significant recreation attraction due to its distance from major roadways and the competition from major recreational attractions in the area, such as Lake Quinault, Olympic National Park, and Pacific Ocean beaches. Currently, the existing campgrounds are not being utilized to their capacity, and all of the future demand should be satisfied by the existing and proposed facilities. Dispersed recreation use is expected to increase in the future in the Shelton Ranger District based on the current trend of visitors preferring the undeveloped camping experience while still maintaining the ability to bring their vehicles to the campsite. This poses potential future management problems for the USFS as increasing human use in undeveloped areas impacts wildlife and increases the need for sanitation facilities and water.

5.05 "With Project" Conditions.

a. Fish Hatchery.

(1) Probable Impacts. The principal beneficial recreation impact of the hatchery would be the enhancement of the recreational anadromous fishery in the Chehalis River Basin, Grays Harbor area, and northern Pacific Ocean. The increased fishery would also result in an increased utilization of fishery support businesses and facilities in the area and an increased use pressure on existing day-use and overnight camping facilities in the Shelton Ranger District. One or more fisherman access sites could be provided below the hatchery. The plans and locations of these sites would be investigated in advanced engineering and design (AE&D) studies in coordination with Federal and state resource agencies.

The 50-acre hatchery site is owned and managed by the USFS and under their timber management plan is classified as "visual variety A" with the objective of maintaining a visually pleasing landscape. According to USFS estimates, the Wynoochee hatchery site is customarily used for dispersed recreation activities at an average rate of 300 visitor days per year (Davis, 1980).[1/] Peak use of the site is estimated by the USFS at about 20 people per day. Although no figures are available on the origin and length of stay of the typical dispersed recreation user, USFS personnel of the Shelton Ranger District estimate that the majority of users reside within a 100-mile radius, with many families and individuals customarily using a particular, or "favorite," site each visit. Implementation of the tentatively selected plan would permanently impact recreation use of the hatchery site. The nature of the impact would be a change in the recreational character of the site from that of an undeveloped camping and day-use site to an area dominated by the hatchery and its associated visitor facilities. Hunting, overnight camping, and water-related activities would be precluded by hatchery construction. Fishing in the area of Wynoochee River from the existing fish collection facility to Wynoochee Dam is currently not permitted and would continue to be prohibited with the hatchery. The hatchery complex would provide some day-use recreation opportunities such as sightseeing and would provide limited vistors' facilities. The area around the hatchery grounds would still be available for hiking and picnicking, and fishing opportunities in the Shelton Ranger District would be greatly enhanced by the hatchery.

Visitors who currently utilize the hatchery site as a camping area may seek out new dispersed recreation areas in the vicinity or may be displaced to other customarily used dispersed recreation areas with resulting increased use pressure and secondary impacts to wildlife resources.

1/U.S. Forest Service treats a visitor day as a 12-hour period in which a visitor is engaged in a recreation pursuit. Twenty-four hours equal 2 visitor days.

Estimates of total dispersed recreation use within the Shelton District for the period 1976-1980 range from a low of 65,000 visitor days in 1980 to a high of 92,700 visitor days in 1979. The average annual use during the period 1976-1980 was about 85,000 visitor days. This use may increase with the increased recreational fishing opportunities provided by the fish hatchery. The 300 visitor days use of the proposed hatchery site represents 1/3 of 1 percent (0.353 percent) of the total dispersed recreation use in the Shelton District. The reduction in recreation use of the hatchery site as a result of hatchery construction and the loss and possible displacement of some of the existing dispersed recreation activities are not considered significant adverse impacts.

(2) Replacement Facilities. At the request of the Shelton Ranger District, analysis was undertaken of replacing dispersed recreation use of the hatchery site at two alternate sites located about 1 mile downstream as shown on figure H-9. These two sites were selected by the Shelton Ranger District as the only sites along the Wynoochee River that were similar to the hatchery site. The analysis was conducted using the planning criteria and objectives of the USFS as presented in their recently published, Viewshed Plan, Skokomish Corridor and Wynoochee Corridor, Olympic National Forest. The Viewshed Plan categorizes national forest acreage according to its value for scenery, recreation, wildlife, or streamside protection. If found valuable for any of these purposes, land is given a "special category" designation whereby future timber management activities are conducted according to their effect on the values. Each parcel of land with a "special category" designation is given a "cell" number and rated on a scale of 1 to 3, with 1 generally the highest, for each category of Visual, Recreation, Wildlife, and Timber. Based upon overall values, each cell is then designated as a "key" area for either visual resources, wildlife resources, visual and wildlife, or recreation. The two alternative dispersed recreation sites have been classified as key wildlife sites by the USFS and both have been found to have no specific recreational opportunities now or for the future. The overall designations for the two sites are shown in table H-6.

(3) Development Analysis. Replacement of dispersed recreation at either of the two alternate sites would require provision of road access. Existing wildlife usage of the alternate sites includes elk calving and use in the vicinity by at least one pair of osprey (Beckstead, 1981). Although USFS management guidelines do not preclude recreation use of key wildlife areas, in the case of the two alternate sites with their low ratings for recreational development, the probable impacts to wildlife values as a result of development may outweigh any benefit gained by replacement of dispersed recreation lost as a result of the fish hatchery. The USFS has indicated that provision of road access to the river's edge would not be desirable on these two sites due to probable adverse impacts to wildlife as a result of increased human disturbance. The existing hatchery site has access to the Wynoochee River which is thought to be one of the key attractions contributing to

Figure H-9

LOCATION OF ALTERNATE DISPERSED RECREATION SITES

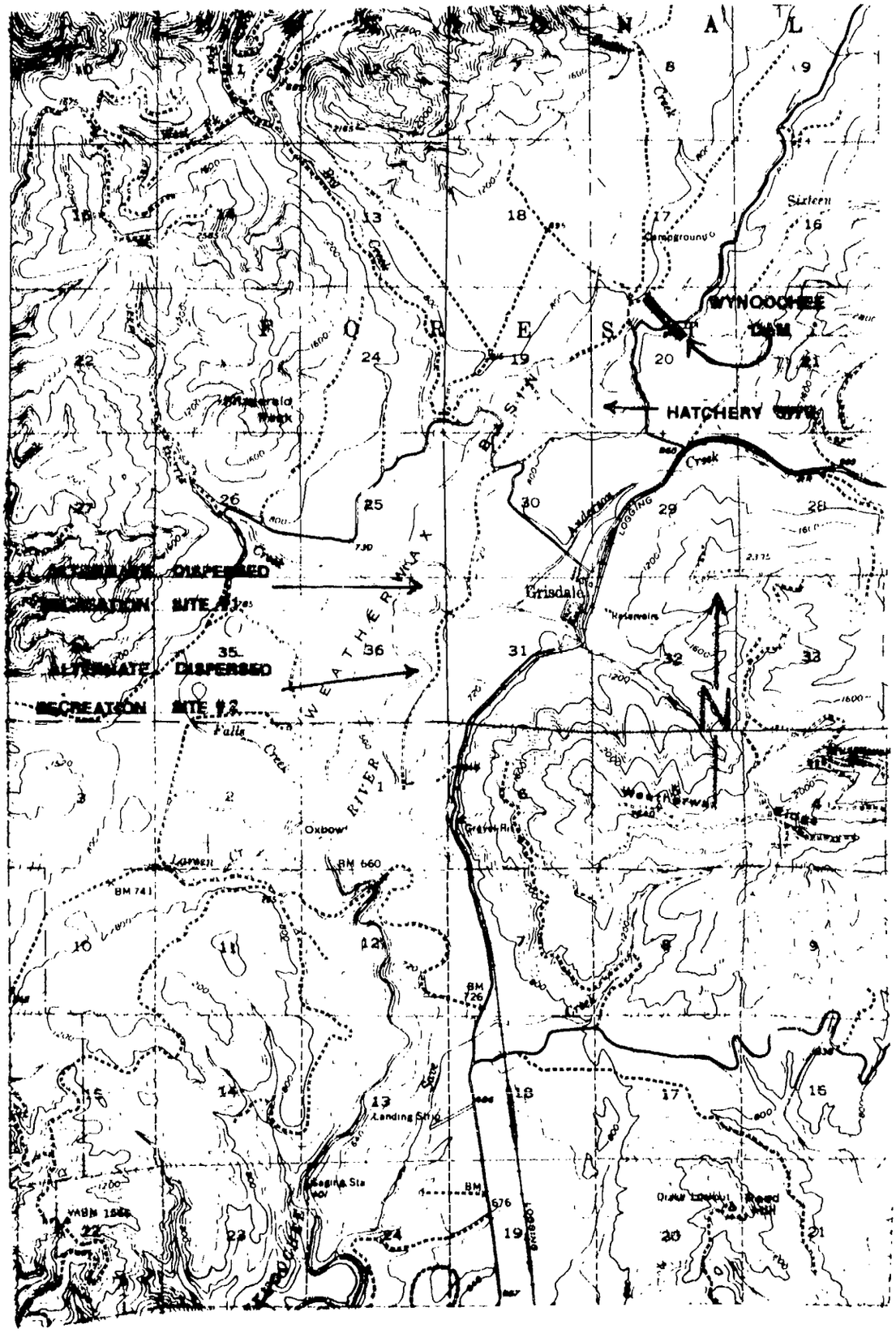


TABLE H-6[1/]

RESOURCE BASE CLASSIFICATION

	SITES			
	Alternate Site #1		Alternate Site #2	
	Cell 98	Cell 34	Cell 66	Cell 16
VISUAL				
V-1 Visible from primary roads, trails, use sites, and water bodies.		X		
V-2 Not seen unless vegetation is removed, modified, or added.				
V-3 Not seen due to observer position, landforms, and/or viewing distance.	X		X	X
RECREATION				
R-1 High potential for developed recreation.				
R-2 High potential and ideally suited for dispersed recreation.				
R-3 No specific recreation opportunity exists now or is planned for the future.	X	X	X	X
WILDLIFE				
W-1 Vital areas for providing basic habitat requirements for fish and wildlife.	X	X	X	X
W-2 Area adjacent to W-1. Important for terrestrial wildlife.				
W-3 Limited plant and animal diversity.				

1/Compiled from U.S. Forest Service Document, "Viewshed Plan, Skokomish Corridor and Wynoochee Corridor, Olympic National Forest."

TABLE H-6[1/] (con.)

	SITES			
	Alternate Site #1		Alternate Site #2	
	Cell 98	Cell 34	Cell 66	Cell 16
TIMBER				
T-1 Commercial forest with marketable timber.				X
T-2 Precommercial forest with immature marketable timber.				
T-3 No recognized commercial value.	X	X	X	

1/Compiled from U.S. Forest Service Document, "Viewshed Plan, Skokomish Corridor and Wynoochee Corridor, Olympic National Forest."

its popularity to dispersed recreationalists. Without access to the river, use of either alternate site could be expected to be limited. For these reasons, development of the two alternate dispersed recreation sites has not been recommended as part of the tentatively selected plan. Further, because dispersed recreation use at the hatchery site represents 1/3 of 1 percent of the total dispersed recreation use in the Shelton Ranger District, additional analysis of alternate sites to replace that portion of the use that is lost due to construction of the fish hatchery was not considered justified.

b. Hydropower. Other than minor short-term impacts associated with the powerhouse and switchyard construction, the hydropower facility would have no impacts on recreation.

c. Transmission Lines. A buried transmission line along Donkey Creek Road from Wynoochee Dam to the Promised Land Substation would have no impact on recreation. An aerial line would result in both esthetic impacts and timber resource losses. Extensive coordination with the USFS would be necessary to avoid significant conflicts in current land use along the transmission corridor.

d. Construction. Depending on the season, construction activities could inconvenience visitors to the Wynoochee Dam area due to curtailment of some activities (such as boating and swimming) during construction of the hydropower/fish hatchery intake system and from traffic congestion. These impacts would be minor and short term. During construction of the hydropower facility under the existing parking lot at the visitors' center for the Wynoochee Lake project, alternative visitors' parking would be provided.

REFERENCES

Beckstead, M., 1981. Personal Communication. U.S. Forest Service, Olympic National Forest, Olympia, Washington.

Davis, J., 1980. Letter to U.S. Army Corps of Engineers, dated 24 July 1980. Shelton Ranger District, U.S. Forest Service, Shelton, Washington.

Eldredge, K., 1981. Personal Communication. U.S. Forest Service, Olympic National Forest, Olympia, Washington.

U.S. Department of Agriculture, 1978. Final Environmental Statement, Timber Resource Management Plan, Shelton Cooperative Sustained Yield Unit. U.S. Forest Service, Olympic National Forest, Olympia, Washington.

U.S. Department of Agriculture, 1981. Draft Environmental Impact Statement for Standards and Guidelines, Pacific Northwest Region Plan. U.S. Forest Service, Portland, Oregon.