Cowlitz Falls Final Environmental Impact Statement

DOE/EIS-0156

Bonneville
POWER ADMINISTRATION

December 1990

COWLITZ FALLS

FINAL ENVIRONMENTAL IMPACT STATEMENT

Bonneville Power Administration

December 1990

Additional copies of this document and the Cowlitz Falls Environmental Impact Statement Attachment are available from:

Bonneville Power Administration
Public Involvement Office
P.O. Box 12999
Portland, OR 97212

PREFACE

Bonneville Power Administration (BPA) is adopting this Federal Energy Regulatory Commission (FERC) Final Environmental Impact Statement (FEIS) (No. 2833-0032), April 1983, as a final EIS for its proposed action to acquire the power output from the Cowlitz Falls Hydroelectric Project in accordance with the Council on Environmental Quality (CEQ) procedures set forth in 40 CFR 1506.3(b).

For additional background information, please refer to our Cowlitz Falls Final Environmental Impact Statement Attachment (DOE/BP-1524).

December 1990

FERC/EIS-0032

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ELECTRIC POWER REGULATION

FINAL ENVIRONMENTAL IMPACT STATEMENT

COWLITZ FALLS PROJECT
FERC NO. 2833-WASHINGTON

APPLICANT: Public Utility District No. 1
of Lewis County
321 N. W. Pacific Avenue
Chehalis, Washington 98532

April 1983

COVER SHEET

a. Title: Cowlitz Falls Project, FERC No. 2833, Lewis County, Washington

Application for FERC License to construct, operate, and maintain the proposed Cowlitz Falls Project.

b. Final Environmental Impact Statement

c. Lead Agency: Federal Energy Regulatory Commission

d. Abstract: The Public Utility District No. 1 of Lewis County (Applicant), with headquarters in Chehalis, Washington, proposes to construct a hydroelectric project with an installed capacity of 70 MW on the Cowlitz River in the vicinity of Morton and Randle, Washington. The project would inundate 12.3 miles of the Cowlitz River and 1.7 miles of the Cispus River, and would consist of: (1) a concrete-gravity dam at River Mile (RM) 88.6, extending 140 feet above the streambed, with a 15-foot-wide, 800-foot-long crest, and containing an ogee spillway overflow section with four radial gates; (2) a power intake structure integral with a nonoverflow section of the dam; (3) a reservoir covering 870 acres, with a total volume of 13,150 acre-feet; (4) an indoor powerhouse integrated with the dam and intake; (5) a switchyard located about 500 feet downstream from the powerhouse; (6) a tailrace and modified channel, extending approximately 1 mile downstream from the powerhouse; (7) a 115-kV transmission line, extending approximately 5.2 miles to a new substation at Glenoma; and (8) appurtenant facilities.

e. Contact: Mr. James P. Feeney
Federal Energy Regulatory Commission
Office of Electric Power Regulation
825 North Capitol Street, NE
Washington, D.C. 20426
Telephone (202) 376-1758

f. Transmittal: This final environmental impact statement prepared by the Commission's staff in connection with an application filed by the Public Utility District No. 1 of Lewis County for proposed Project No. 2833, is being transmitted on or about April 29, 1983, pursuant to the requirements of the National Environmental Policy Act of 1969 and Commission Order No. 415-C,

FOREWORD

The Federal Energy Regulatory Commission (FERC), pursuant to the Federal Power Act (FP Act)* and the Department of Energy (DOE) Organization Act**, is authorized to issue licenses for terms up to 50 years for the construction and operation of non-Federal hydroelectric developments subject to its jurisdiction, on the necessary condition:

> (T)hat the project adopted . . . shall be such as in the judgement of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilitzation of waterpower development, and for other beneficial public uses, including recreational purposes . . . ***

The Commission may require such other conditions not inconsistent with the provisions of the FP Act as may be found necessary to provide for the various public interests to be served by the Project.† Compliance with such conditions during the license period is required. Section 1.6 of the Commission's Rules of Practice and Procedure allows any person objecting to a licensee's compliance with such conditions to file a complaint noting the basis for such objection for the Commission's consideration.††

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* 16 U.S.C. § 791(a) - 825 (r)
** Public Law 95-91, 91 Stat. 556
*** 16 U.S.C. Sec. 803(a)
† 16 U.S.C. Sec. 803(g)
†† 18 C.F.R. Sec. 1.6

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SUMMARY

The Public Utility District No. 1 of Lewis County (the Applicant or the District) proposes to construct and operate a hydroelectric project with an installed capacity of 70 MW at Cowlitz Falls, on the Cowlitz River near the towns of Morton and Randle, Washington. The proposed project would inundate 12.3 miles of the Cowlitz River and 1.7 miles of the Cispus River, and would consist of: (1) a concrete-gravity dam at River Mile (RM) 88.6, extending 140 feet above the streambed, with a 15-foot-wide, 800-foot-long crest, and containing an ogee spillway overflow section with four radial gates; (2) a power intake structure integral with a non-overflow section of the dam; (3) a reservoir at elevation 866 feet mean sea level (EL 866), covering 870 acres, with a total volume of 13,150 acre-feet; (4) an indoor powerhouse integrated with the dam and intake; (5) a switchyard located about 500 feet downstream from the powerhouse; (6) a tailrace and modified channel, extending approximately 1 mile downstream from the powerhouse; (7) a 115-kV transmission line, extending approximately 5.2 miles to a new substation at Glenoma; and (8) appurtenant facilities.

This Final Environmental Impact Statement analyzes several alternatives to the proposed project, including alternative project designs, a woodwaste facility, a coal-fired plant, and no-action. An analysis of possible hydroelectric alternatives in Lewis County and within the State of Washington found there were no viable hydroelectric alternatives to the proposed project. A wind-powered alternative is examined as part of the economic evaluation of project alternatives, but large wind turbines are not considered to be commercially available at the present time.

The analysis of alternative designs of the proposed project includes reservoirs with operating levels at elevation 862 feet mean sea level (EL 862) and elevation 872 feet mean sea level (EL 872), and two alternative transmission line rights-of-way.

The woodwaste generation alternative would probably be located at one of two sites in eastern Lewis County near existing sources of woodwaste supply. This alternative would require: (1) a 30-acre plant site; (2) a landfill site for the disposal of ash; (3) a supply of coolant water; (4) a dependable supply of woodwaste products; and, (5) a transmission line connected to the existing power grid.

It is assumed that the Applicant could purchase a 45-MW share of a large (800 MW) coal-fired powerplant, when available, as an alternative to the proposed project. No specific location for the plant has been identified, but it is assumed that such a facility would require approximately 2,500 acres for the powerplant and solid-waste disposal sites. The plant would also require a source of coal, a supply of cooling water, and transmission facilities.

The no-action alternative would increase the possibility of energy shortages above those forecast for the Pacific Northwest. If no action is taken on the pending application for license, the Applicant would still need to develop additional generating capacity to meet its projected energy needs in the years ahead.

Construction and operation of the proposed project at EL 862 is the preferred hydroelectric alternative. A reservoir with an operating level of EL 862 would have significantly fewer adverse impacts than a reservoir at EL 866 or 872. Based on the available information, the Applicant's proposed transmission line route appears to be the preferred alternative.

Development of the proposed Cowlitz Falls Project would result in the following unmitigated environmental impacts:

- aggravation of flooding in the Randle area.
- the loss of approximately 870 acres of existing riverbed, agricultural land, and timberland.
- the loss of recreational opportunities for stream bank fishing, rafting, and kayaking in existing reaches of the Cowlitz and Cispus Rivers.
- the possible disqualification of sections of the Cowlitz and Cispus Rivers as potential candidates for inclusion in the National Wild and Scenic Rivers System.
- the loss of 15.5 miles of free-flowing rivers and streams, and the associated loss of habitat for fish and benthic organisms.
- the permanent transformation of a diverse reach of the Cowlitz River into a straight, uniform-depth tailrace channel.
- the blockage of upstream fish migrations from Riffe Lake.
- the loss of wildlife through habitat clearing or alteration, and as a result of displacement.

Comparison of a woodwaste facility with a hydroelectric project requires a consideration of some impacts that are dissimilar. Woodwaste generation, however, with only a 30-acre site requirement, could represent an environmentally preferable alternative. A wood-

waste plant would affect only a limited amount of land and few important resources. The woodwaste plant would probably affect the area's air quality, but this impact could be mitigated. From an economic standpoint, a woodwaste plant would have a shorter operating life than a hydroelectric facility, and it would cost more money both initially and over a 50-year operating period.

A coal-fired alternative could potentially affect a wide variety of environmental resources and values. No specific location for the coal-fired plant has been identified, and the Applicant would be purchasing only a small share of the powerplant's output. For these reasons, the relative impacts of a coal-fired project and the proposed action are difficult to compare.

The no-action alternative would leave the existing environmental relationships in the project area unchanged, but it also would not provide for projected energy needs. The Applicant either would need to obtain power from other sources or to accelerate the development of other generation facilities.

1. PURPOSE OF AND NEED FOR ACTION

1.1 PURPOSE OF ACTION

The Cowlitz Falls Project would meet a portion of the Applicant's and the region's projected electrical power needs by supplying 267,200 megawatthours (MWh) average annual energy. The output of the project would be used to serve the Applicant's loads; the balance of the Applicant's load requirements would be served by the Bonneville Power Administration (BPA). Alternatively, the power could, in the future, be sold to BPA to help meet regional power needs.

1.2 NEED FOR POWER

PUD No. 1 of Lewis County (the Applicant or the District) serves the electric power needs of Lewis County, except for the customers served by the city of Centralia. In 1979, the Applicant's service area was approximately 2,450 square miles, and contained approximately 19,000 customers [Public Utility District No. 1 of Lewis County, Washington, 1981 (hereafter Application), Exhibit W]

The Applicant currently purchases or obtains through exchange substantially all of its power requirements from BPA. As a statutory preference customer of BPA, the Applicant has priority over nonpreference customers for power sold by BPA from the BPA system. The Applicant has a power sales contract with BPA under which BPA agrees to supply the Applicant's power requirements, in excess of its own resources, to the extent that power is available from the BPA system.

Until recently, electric power needs in the Pacific Northwest have been met primarily from the large Federal hydroelectric system operated by BPA. The availability of new hydro sites having substantial hydroelectric potential is now limited. For this reason, practically all new large generating facilities must be thermal plants, such as coal and nuclear steam-electric facilities. These thermal facilities have been subject to cost uncertainties, environmental challenges, changing safety requirements, and litigation, resulting in delays in projected commercial operation dates.

These delays led BPA in 1976 to notify all of its statutory preference customers, in accordance with the provisions of the power sales contracts, that BPA would not have sufficient generating resources to supply all of the preference customers' firm energy needs beyond June 30, 1983.

These and other developments ultimately led the United States Congress, on December 2, 1980, to enact a regional power bill, the Pacific Northwest Electric Power Planning and Conservation Act. The Act requires BPA to provide for the power needs of its customers by encouraging conservation, developing renewable resources, and purchasing additional power, as needed. The Act contains provisions intended to enhance BPA's ability to acquire and market new generating resources in the future, as well as to implement "cost-effective" conservation measures through its power marketing area.

The Pacific Northwest Power Planning and Conservation Council (Northwest Planning Council) has been established in compliance with the regional power act to prepare and adopt a plan to supply regional power needs. This plan must give power conservation and renewable resources first and second priority, respectively, for alleviating regional power shortages; other power resources are relegated to lower priorities. The Cowlitz Falls Project would be a renewable resource project that conforms with the objectives of the regional power act.

The Northwest Power Planning Council issued for review and comment a draft Regional Conservation and Electric Power Plan dated January 26, 1983. Based on the comments received, the Council will revise the draft and adopt the final plan by April 28, 1983. The draft specifies a twenty-year approach for power planning and a two-year action plan. Issues discussed in the draft include: treatment of growth forecast uncertainties, current surplus of firm energy, quantity and cost of conservation, fish and wildlife program revisions, and resource strategy. The Council's draft stresses flexibility and provides for a biennial review of the plan.

While the Act provides the legal framework for resolving the Pacific Northwest's projected energy deficits, the Act alone cannot guarantee that these deficits would not occur. For this reason, Staff believes the need for power in the Pacific Northwest still exists despite passage of the Act. Conservation must be implemented, renewable resources must be developed, and conventional hydro and thermal facilities must be constructed to the extent that they are financially feasible and environmentally sound, if regional electric power deficits are actually to be avoided in the future.

1.2.1 Load Growth Projections

Table 1-1 shows the historical and projected energy and peak demand requirements as forecast by the Applicant. Energy load growth from 1969 to 1981 averaged 6.5 percent annually, while peak demand and energy are both projected to grow at 2.6

Table 1-1. The Applicant's historical and projected system requirements and peak demand.

Calendar year	Energy (MWh)	Peak (kW)
Historical 1/		
1969	309,578	71,720
1970	327,249	69,440
1971	360,638	78,054
1972	402,595	101,569
1973	420,757	95,984
1974	474,664	110,351
1975	525,193	110,543
1976	568,479	123,956
1977	592,576	135,168
1978	635,640	146,529
1979	664,743	161,860
1980	664,233	171,644
1981	660,124	152,284
Projected 2/		
1982	705,271	161,021
1983	723,467	165,176
1984	742,108	169,431
1985	761,173	173,784
1986	780,643	178,229
1987	800,586	182,782
1988	820,989	187,440

1/ R.W. Beck and Associates, 1980A.
2/ Smith Barney et al., 1981.

percent from 1983 to 1988. The Applicant's 1983 requirements are projected to be 723,467 MWh, with a winter peak demand of 165,176 kilowatts (kW). By 1988, these requirements are projected to increase to 820,989 MWh and 187,440 kW, which are five-year increases of 13.5 percent each, or about 2.6 percent annually.

The projected loads in Table 1-1 are lower than those shown in the application for license, which were based on an earlier forecast. For example, the 1988 energy load of 820,989 MWh is approximately 17 percent lower than the previous forecast made by R.W. Beck and Associates in August 1980.

Table 1-2 shows the latest forecast of loads and resources by the Pacific Northwest Utilities Conference Committee (PNUCC), and includes projections of loads and resources for the entire area defined by the act rather than for the traditional West Group Area, which is approximately 10 percent smaller in terms of peak load. The energy load for the Northwest Regional Area is projected to grow at an annual rate of 2.8 percent from 1982 to 1992. This compares to 2.6 percent for the Applicant from 1983 to 1988. Similarly, the regional peak demand is projected to grow at a 2.9 percent annual rate from 1982 to 1992, as compared to 2.6 percent for the Applicant from 1983 to 1988.

These energy loads are a summation of forecasts made by individual utilities and BPA, which forecasts loads for its direct service industry (DSI) and Federal agency customers. It should be noted that loads represent mid-point forecasts by the submitting utilities, and they could vary substantially above or below the median estimate.

Compared to the previous 1981 forecast, projected regional firm energy loads are 730 average MW lower in 1982-83 and 1,444 average MW lower in 1991-92. Regional firm peak loads are also lower in this year's forecast; 2,973 MW lower in January 1983, and 5,149 MW lower in January 1992. A key reason for the lower forecast has been the revised projections of population and employment, which are lower than last year's projections, and electricity price, which is higher than was projected last year. In addition, depending upon the year, from 25 to 35 percent of the reduction from last year's estimate in projected peak loads is a result of an adjustment for regional diversity among utility systems, which was done by PNUCC for the first time this year (see notes, Table 1-2).

Table 1-2. Estimated power loads and resources for the Northwest Regional Area, 1982-1993 (Source: Pacific Northwest Utilities Conference Committee, May 1982.

	Loads and resources Northwest Regional Area										
	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93
Load and resource comparison											
January peak load forecast - MW											
Load Forecast											
1. Total	28,671	29,641	30,616	31,530	32,711	33,727	34,673	35,584	36,473	37,253	38,076
2. Firm	27,748	28,707	29,673	30,576	31,684	32,637	33,575	34,481	35,365	36,144	36,967
3. Exports	2,050	1,857	1,868	1,882	1,294	541	411	426	435	445	456
4. Reserves	3,560	3,987	4,435	4,894	5,416	5,933	6,458	6,996	7,548	7,710	7,880
5. Adjustment	997	1,031	1,064	1,096	1,137	1,173	1,206	1,237	1,268	1,295	1,324
January peak load requirements - MW											
Load Requirements											
6. Total	35,278	36,516	37,963	39,402	40,558	41,374	42,748	44,243	45,724	46,703	47,736
7. Firm	34,355	35,582	37,040	38,448	39,531	40,284	41,650	43,140	44,616	45,594	46,627
8. Net Resources	36,158	36,445	38,249	40,284	41,725	41,771	42,475	44,154	45,330	42,203	46,815
Surplus (Deficit)											
9. Total	880	(71)	266	882	1,167	397	(273)	(89)	(394)	(1,500)	(921)
10. Firm	1,803	863	1,209	1,836	2,194	1,487	825	1,014	714	(391)	188
Interruptible Load											
11. January Peak - MW	923	934	943	954	1,027	1,090	1,098	1,103	1,108	1,109	1,109
Energy Forecast - Average MW											
12. Total	18,916	19,522	20,129	20,707	21,501	22,198	22,759	23,280	23,797	24,283	24,762
13. Firm	17,873	18,463	19,057	19,622	20,344	20,974	21,519	22,035	22,545	23,030	23,509
14. Exports	424	314	320	325	332	337	272	272	275	280	285
15. Reserves	275	269	258	246	216	242	247	242	237	238	244
Energy Requirements - Average MW											
16. Total	19,615	20,105	20,707	21,278	22,049	22,777	23,278	23,794	24,309	24,801	25,291
17. Firm	18,572	19,046	19,635	20,193	20,892	21,553	22,038	22,549	23,057	23,548	24,038
18. Net Resources	18,592	18,782	19,517	19,800	20,237	20,325	20,292	21,351	21,878	22,334	22,971
Surplus (Deficit)											
19. Total	(1,023)	(1,323)	(1,190)	(1,478)	(1,812)	(2,452)	(2,986)	(2,443)	(2,431)	(2,467)	(2,320)
20. Firm	20	(264)	(118)	(393)	(655)	(1,228)	(1,746)	(1,198)	(1,179)	(1,214)	(1,067)
Interruptible Load											
21. Energy - Average MW	1,043	1,059	1,072	1,085	1,157	1,224	1,240	1,245	1,252	1,253	1,253

Notes: The Northwest Regional Planning Area includes the states of Washington, Idaho; Montana west of the continental divide; portions of Nevada, Utah, and Wyoming that lie within the Columbia River drainage basin; and any rural electric cooperative customer not in these areas but served by BPA. The loads used for planning are the sum of system peak loads and system energy loads estimated for the utilities operating in the region.

The total regional peak load is adjusted to reflect system diversity and a constant expected occurrence level. Peak load diversity is the difference between the sum of the individual utility noncoincidental peak loads and the sum of the individual utility peak loads coincident with the northwest regional peak. This diversity exists because individual utility monthly peak loads tend to occur at different hours of the month. The adjustment of peak loads to a common occurrence level is made to arrive at the level of peak demand consistent with normal weather. While most utilities submit peak forecasts that assume normal weather, others submit peak forecasts based on extreme weather. The peak loads in this table represent coincidental regional system peak loads that are consistent with normal weather.

Northwest regional firm load equals the sum of the individual utility firm loads plus the firm load for other public utilities, the industrial customers of BPA, BPA transmission losses, BPA diversity adjustment, and the regional system diversity adjustment. Northwest regional total load equals the sum of northwest region firm load, BPA top quartile load, and Utah Power and Light Company interruptible load.

Resource capabilities are based on the assumptions of critical year water, average thermal performance, and all plants being on line on their probable energy dates.

Several load forecasts are, or will be, available for the Pacific Northwest in addition to those of the PNUCC. These include the Washington State Legislative Study, the BPA study, and the final study by the Northwest Planning Council.

A July 1982 BPA forecast of Pacific Northwest regional electricity consumption projects rates of growth that are lower than the PNUCC forecast by approximately 31 percent for energy consumption and 27 percent for peak demand. This forecast focuses on concerns of BPA management, particularly regarding future electricity use as influenced by conservation. It is designed as an interim forecast to provide assistance for making decisions until the final 20-year electrical energy forecast, required by the regional power act, is available. This is the first time that BPA produced an independent regional forecast.

The BPA forecast methodology examined the value of power under three demand scenarios with resources available as identified in the PNUCC forecast. A fourth scenario was analyzed in which the Washington Public Power Supply System's (WPPSS's) nuclear projects nos. 1 and 3 are not completed. Under all the BPA scenarios, surpluses of energy are expected at least through 1986-87.

The degree of uncertainty depicted by the PNUCC econometric model in 1990 is equivalent to plus or minus three years of load growth. Whether the region will experience the projected 1990 load level in 1987, 1990, or 1993 depends upon many factors, such as the timing of the economic recovery from the current recession, and the result of new cost effective conservation programs.

Five nuclear and six coal-fueled generating units account for almost 80 percent of the planned additions to regional generating capacity. These units should supply about 99 percent of the planned increase in energy capability. The nuclear units each have capacities greater than 1,000 MW, and five of the coal-fueled units have capacities in the range of 500 MW. With the delay or cancellation of any of these units, the regional capability to supply forecasted loads would be seriously affected. Though the output from the Cowlitz Falls Project would be relatively small (11 MW dependable capacity and 30.5 average MW of annual energy), the need for this power would greatly increase in the interim while the larger units are delayed.

Regional generating capability totals about 37,700 NW during the period of annual peak. Over 85 percent of this capacity is hydroelectric, with coal, nuclear, and combustion

turbine constituting most of the remainder. It should be noted that BPA resources constitute more than 50 percent of the regional generating capability and generate over 45 percent of the energy. Less than 30 percent of the regional power supply is controlled by private utilities. In addition, the region interchanges power under fixed contracts with other utilities, including Canadian utilities. Currently it is a net importer of power and is forecasted to remain a net importer at least through the 1992-93 period.

The Energy Information Administration (EIA), in its 1981 annual report to Congress, forecasts a midterm, U.S.-wide, average annual electricity production growth rate of 3.0 percent from 1985 to 1995. Thus, the Applicant's 1983 to 1988 energy growth rate of 2.6 percent appears reasonable when compared to 2.7 percent for the entire Northwest Regional Area over approximately the same time frame, and to the EIA forecast of 3.0 percent energy growth for the U.S.

1.2.2 Applicant's Resources

Current Resources

A major portion of the Applicant's resources comes from power purchases from BPA. The District has a 14.25 percent share of the Packwood Lake Hydroelectric Project, owned and operated by WPPSS. The District also obtains some power from the Cowlitz PUD and from its 0.847 percent share of the Hanford Nuclear Plant, which is scheduled to be removed from service in two stages--the first stage in 1983-84 and the remainder in 1988-89.

Future Resources

The Applicant has purchased shares in three nuclear plants being built by WPPSS. Construction of two additional nuclear plants (WNP #4 and #5) was terminated on January 22, 1982, because of a failure to obtain continued financing. The projected in-service dates for the three nuclear plants still under construction, as shown in the 1982 construction budget, as well as the Applicant's share of each project, follow:

		Applicant's share	
Unit	In-Service	Percent	Peak kW
WNP#1	June 1991 (1)	1.449	13,585
WNP#2	February 1984	2.274	18,761
WNP#3	December 1986	1.253	8,157

(1) BPA has recommended that WNP#1 be placed in an extended construction delay status for five years (beyond the original June 1986 in-service date).

In addition to the resources shown above, the District proposes to build the Cowlitz Falls Project, which was projected to be in commercial operation by 1986. More recent information suggests that the project could not be completed until 1987, with the first full year of operation occurring in 1988 (Smith Barney et al., 1981).

Table 1-3 compares the Applicant's existing and planned resources with its projected energy loads through the year 1988. Column 9 shows the Applicant's load that cannot be met by its own resources. Less than 2 percent of the District's 1982 energy load could be met by its own resources. By 1988, it is projected that approximately 52 percent of the District's energy load could be met by its resources if Cowlitz Falls is constructed and operated assuming critical water conditions. If the Cowlitz Falls Project is not constructed, then only approximately 30 percent of the District's 1988 energy load could be met by its resources.

Since a large portion of the Applicant's projected loads will likely be supplied by BPA in the foreseeable future, the power supply situation for the Applicant depends to a great extent on the power supply situation for the BPA system. Table 1-2 shows the consolidated peak demand and energy loads for the Northwest Regional Area (including the Applicant) as projected by the PNUCC. Line 1 shows the total regional peak load forecast. Line 2 excludes the interruptible load component of the peak. Lines 3,4, and 5 show area exports, reserves, and adjustment, respectively, as explained in the footnotes of the table. Lines 6 and 7 show the sum of lines 1,3,4,5 and 2,3,4,5, respectively. Line 8 reflects all firm existing and planned resources in the area as well as firm arrangements for imports from systems outside the region. Lines 9 and 10 reflect total and firm surplus (or deficit), respectively, and are computed as the difference between net resources (Line 8) and either total load requirements (Line 6) or firm load requirements (Line 7). Interruptible load (Line 11) is the difference between total and firm peak load (Line 1 minus Line 2). Lines 12 through 21 show the corresponding information based on energy loads. Peak reserve requirements are defined by PNUCC to be 12 percent of the firm peak load for the first year (1981 forecast), increasing 1 percent per year to 20 percent, and remaining at 20 percent thereafter.

BPA has indicated that it may be to the agency's advantage to enter into an option agreement with the Applicant for future acquisition of the power from the Cowlitz Falls Project. BPA has described the project as a potentially cost-effective regional power resource, and indicates that the region will need such resources to meet forecasted loads by the late 1980's or early 1990's. However, BPA reports that the policy guiding

Table 1-3. The Applicant's estimated energy loads and resources, 1982-88 (Source: Staff).

		(kWh x 1000) Energy for PUD No. 1 of Lewis County supplied by:						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Calendar year	Energy load	Packwood	Cowlitz PUD 1/	Hanford 2/	Cowlitz Falls 1/	WNP 3/ #1, #2, #3	Total of District's own resources	Net load on BPA system
1982	705,271	1,614	1,659	8,700	0	0	11,973	693,298
1983	723,469	1,614	1,659	3,600	0	0	6,873	716,596
1984	742,108	8,392	1,659	0	0	120,517	130,568	611,540
1985	761,173	11,781	1,659	0	0	161,603	175,043	586,130
1986	780,643	11,781	1,659	0	0	169,106	182,546	598,097
1987	800,586	11,781	1,659	0	0	222,697	236,137	564,449
1988	820,989	11,781	1,659	0	173,900	235,797	423,137	397,852

1/ Energy based on critical water conditions, assuming 1988 first full year of project operation.

2/ Projected shutdown on June 1, 1983. (This table does not reflect recent information indicating that the Hanford shutdown will occur in two stages, with the first stage in 1983-84 and the remainder in 1988-89. This rescheduling, however, will not affect the basic conclusions to be drawn from this table.)

3/ BPA has recommended that WNP #1 be placed in an extended construction delay status for five years (until June 1991).

the acquisition of projects such as Cowlitz Falls is still under agency review, and that BPA does not wish to enter into an agreement for the acquisition of power from the Cowlitz Falls Project at this time. Thus, Applicant will be required to use the project power in its own system instead of purchasing less expensive BPA power.

BPA's resource acquisition policy is specified for resources which come on-line prior to 1985. (The Cowlitz Falls Project is expected on-line in 1987-88.) The BPA resource acquisition policy and its forecasts are interim tools for planning until April 1983 when the Regional Planning Council will, by law, have formulated the official forecast and guidelines for new resources.

BPA announced its near-term resource acquisition policy in July 1982. The policy is specifically addressed to resources that begin to produce power or savings before 1985. A policy for those resources that begin commercial operation after that time, such as the Cowlitz Falls Project, has not been outlined.

BPA's near-term resource acquisition policy focuses on the lowest cost resource so that rates would not be adversely affected. To be considered for acquisition, projects which begin producing power or energy savings in the near future must: (1) have an average project-life cost of not more than approximately 35 mills per kilowatthour in 1982 dollars, (2) require early and gradual development to realize the potential in stages as needed, and (3) produce the bulk of their output in the forecasted deficit period. In addition, the policy states that a resource will be considered if delaying or losing it would ultimately increase the cost of meeting future loads. BPA plans to limit expenditures in surplus years to levels that can be recovered through surplus power sales, and to maintain all existing conservation programs at their present levels since these programs already meet the test of the near-term policy.

Examination of Table 1-2 reveals projected deficits in supplying total peak loads in 1983-84, and in every year from 1988-89 to 1992-93. Firm peak deficits are projected only in year 1991-92 during the next decade. Energy deficits are projected for all years for total energy loads and for all years except 1982-83 for firm energy loads. Although firm energy deficiencies are shown in all but one year, the deficiencies are slightly less than projected in last year's forecast despite the termination of WNP 4 and 5, the slipping of Creston #1, #2, and #3, and the extension of construction on WNP 1.

In addition, the regional power act requires the implementation of measures to protect, mitigate, and enhance fish and wildlife resources affected by the development, operation, and management of hydroelectric facilities. The Northwest Planning Council developed and adopted a Fish and Wildlife Program dated November 15, 1982, pursuant to this part of the

act. This will place new restrictions on the regulation of stream flows. With these restrictions, the projected loss of firm energy load carrying capability of the region's power system, based on computer simulation studies conducted by the Council, is approximately 550 megawatts. Some variance from this projection may result when the actual regulation of stream flows is executed.

1.2.3 Overall Need and Use of Project Power

As discussed in Section 1.2.2, the Applicant is expected to be highly dependent on power purchases from BPA, which in turn is projecting regional energy deficits.

The proposed Cowlitz Falls Project would have a rated capacity of 70 MW. The dependable capacity, based on critical streamflows, is estimated at 11 MW, with a critical-period energy generation of 174 gigawatthours (GWh). The average energy generation, based on 40 years of data, would be 267 GWh, for an average plant factor of 44 percent, based on rated capacity (Application, Exhibit I). The Applicant proposed to use the project in a run-of-river mode for maximum energy production. As shown in Table 1-3, the energy generated by Cowlitz Falls would reduce but not eliminate the Applicant's need to purchase power from BPA.

1.2.4 Effects of Conservation on Demand

In 1981, BPA released a conservation study, which began before the 1980 regional power bill was enacted, and therefore considers only the West Group Area rather than the Northwest Regional Area defined by the Act. The West Group Area, however, comprises nearly 90 percent of the newer region.

BPA made varying assumptions concerning price and the role played by BPA, Federal, state, and local governments on the resulting projections of conservation potential in the West Group Area. BPA found the ultimate conservation potential with marginal cost pricing of electricity [48.4 mills per kilowatthours (kWh) in 1978 dollars] in 1990 to be 29 percent of the total area load, or almost a 7,000 MW reduction (Bonneville Power Administration, 1981). Without marginal cost pricing, but assuming regional regulations on appliance efficiency and building codes in the residential and commercial sectors, BPA estimates a potential reduction of 3,170 average MW by 1990. BPA considers this to be the upper limit of what is realistically achievable. State governments could independently implement similar appliance efficiency standards, as California currently does. In the absence of these standards, BPA states that they do have the authority to implement programs that could save 1,535 average MW by 1990 and 2,600 average MW by the year 2000. These potential savings are of sufficient magnitude to significantly reduce the regional energy deficits shown in Table 1-2 for the Northwest Regional Area.

The regional power act requires that the plan developed by the regional council to achieve an adequate power supply for the Northwest Region must include model conservation standards. These standards are expected to have a major long-term influence on energy usage in the region. The council is now making a survey to determine what is being done in the region to conserve electric energy and the potential for conserving it.

The single most important obstacle to achieving these impressive levels of conservation is the low price of electricity in the Pacific Northwest. The average price of electricity in this region is substantially less than the average U.S. price of electricity. By contrast, the cost of new incremental capacity is much higher than the average price of electricity in the Pacific Northwest. For example, based on the costs and schedules in the 1982 project construction budget, WPPSS estimates the annual power cost of WNP #3 in 1987 at 68.9 mills per kWh (Washington Public Power Supply System, 1981). Since the difference between the average and marginal electricity price is so great in the Pacific Northwest, and since consumers pay rates below the marginal cost, there is a potentially high level of cost-effective conservation available when evaluated at the marginal price of electricity.

1.2.5 Effects of Rate Revision on Demand

The increases in electricity prices since the oil embargo by the Organization of Petroleum Exporting Counties, and the resulting decreases in projected growth rates, demonstrate the fact the electricity demand is responsive to price. As discussed in Section 1.2.4, BPA estiamted that almost 7,000 average MW could be saved by 1990 through marginal cost pricing. Federal regulations allow BPA to set rates only high enough to recover its cost, thus constraining BPA's ability to adopt marginal cost pricing.

The practice of charging customers the lower average price for electricity has important implications for cost-effective conservation. This is due to the fact that the average price fails to reflect the real replacement (i.e., marginal) costs for additional power which will be generated from the newer and more costly thermal plants. However, a conservation measure which is cost-effective from a regional perspective, when evaluated at marginal cost, may not be cost-effective from the viewpoint of the consumer who is evaluating potential savings at his or her average price of electricity.

Under the 1980 regional power bill, BPA is required to invest in cost-effective conservation and renewable resources. BPA will set wholesale power rates for all its customers sufficient to cover the costs of these new investments. This will result in higher rates. BPA has not announced exactly how much conservation it intends to "buy"" so the effects of these rate increases on demand are uncertain at the present time.

1.3 FEASIBILITY OF HYDROELECTRIC ALTERNATIVES

1.3.1 Alternative Hydroelectric Projects

A Staff study of alternative hydroelectric sites, both within Lewis County and throughout the State of Washington, indicates that there is no hydro alternative that would generate a comparable amount of power at a lower cost than the proposed Cowlitz Falls Project.

1.3.1.1 Within Lewis County

Staff reviewed 24 potential hydro sites within Lewis County that had been identified by the U.S. Army Corps of Engineers (1979-80). The sites were considered alternatives for further study if they had the potential to generate power at a cost comparable to the proposed Cowlitz Falls Project, and to generate at least 130 GWh annually, which is approximately 50 percent of the estimated output from the Cowlitz Falls Project.

From the initial screening, Staff selected four alternatives, including one alternative consisting of three small hydroelectric projects, whose aggregate generation would exceed 130 GWh annually. Table 1-4 lists the alternative sites considered, along with the proposed Cowlitz Falls site, and ranks the projects according to the development cost per unit of generation.

Table 1-5 shows that the Cowlitz Falls Project would be the least costly, would have the largest installed capacity, and would generate more energy than any of the alternative hydro sites located within Lewis County.

The following assessment of the environmental or licensability aspects of developing the various alternatives listed in Table 1-4 is based upon the data compiled in the Corps of Engineers' study.

Muddy Fork Cowlitz

The Muddy Fork Cowlitz Project would require the construction of an 80-foot-high dam, 34,300 feet of penstock, and a powerhouse. The project would border on Mount Rainier National Park, and would impact a proposed natural recreation area, a proposed wilderness area, and the existing Cedar Falls Natural Area. The project would have to maintain streamflows below the dam for big game winter habitat and for fish habitat. The economic feasibility of the project would depend upon the magnitude of minimum flows to be maintained between the point of diversion and the point of release.

Table 1-4. Economic comparison of alternative hydroelectric projects. 1/

Project name	Dam height (feet)	Maximum storage (acre-feet)	Power head (feet)	Capacity (MW)	Energy (MWh)	Cost 2/ ($/MWh)
Cowlitz	140.1	13,150	97	70.0	267.1 3/	15.28
Muddy Fork	80.0	1	900	34.2	149.8	17.65
Silver Falls	220.0	35,000	920	23.2	184.0	23.50
Silver Creek	10.0	1	485	13.6	59.7	
Clear Fork	10.0	1	400	13.7	59.9	29.4
Johnson Creek	10.0	1	450	13.7	59.9	(Average)
Gravel Bank	225.0	94,000	450	18.2	129.1	33.62

1/ Source: U.S. Army Corps of Engineers, 1979-80, modified by Staff.

2/ Based on 6 1/2% cost of money and 1978 price levels.

3/ Application, Exhibit L.

Table 1-5. Site Selection Survey: Combined ranking of FPC (now FERC) licensing considerations and power costs (Source: Department of Lighting, City of Seattle, 1977).

Site no.	Site name	Average annual energy (MW)	Cost of power July 1975 (mills/kWh)	Licens-ability rating
8.4	Cowlitz Falls	24 1/	16.6	1
11.5	Mud Mountain	18	17.3	1
8.13	Muddy	43.5	21.4	1
2.19	Orient	22	24.1	1
6.3	Narrows	34	13.4	2
7.10	Alvords Bridge	11	22.3	2
7.2	Little White Salmon	24	22.4	2
7.6	White Salmon	90	24.0	2
7.8	Head Box Canyon	28	24.7	2
2.1	Ben Franklin	428	17.0	3
11.15	Lower Faber	85	20.1	3
11.21	Cascade	39	20.6	3
11.40	Robe	35	20.8	3
8.10	Silver Lake	65	20.8	3
6.1	Asotin	241	21.0	3
11.12	Dallas	37	22.4	3
11.24	Lower Sauk	66	22.5	3
11.25	Lower Suiattle	59	23.7	3

1/ Average energy proposed during reconnaissance-level studies.

Silver Falls

The Silver Falls Project would entail the construction of a 220-foot high dam on the Ohanapecosh River, 26,400 feet of penstock, and a powerhouse. The project would be located in Mount Rainier National Park, would inundate recreation areas, and would have moderate impacts on a winter range for deer.

Silver Creek, Clear Fork, and Johnson Creek

Development would require the construction of three small 10-foot-high dams; 18,500, 27,700, and 12,100 feet of penstock, respectively; and three powerhouses. The economic feasibility and environmental impacts of these projects would depend upon the magnitude of minimum flow requirements between the point of diversion and the point of release.

Gravel Bank

The Gravel Bank Project would include construction of a 225-foot-high dam on the Cispus River, 28,000 feet of penstock, and a powerhouse. The project would significantly impact fish and wildlife habitat.

1.3.1.2 Within Washington State

The Department of Lighting of the City of Seattle (1977) authorized a study of potential hydropower projects within the State of Washington. A comprehensive list of 134 potential project sites within the state was used in the study; the sites were screened on technical, economic, and environmental grounds to determine sites for further investigation. The screening procedures included making field reconnaissance studies of selected sites to determine the appropriate level of development, access routes, construction materials, general foundation conditions, and special factors not shown on maps or in published information.

Those making the survey attempted to rate only the estimated impact the project could have separately on each individual consideration, using an arbitrary qualitative rating of 0 (least impact) through 3 (most impact). The licensability rating was based on an overall consideration of social, terrestrial, and aquatic considerations for each of the potential hydroelectric projects. Considerations such as the large-scale relocation of population and transportation facilities, the potential for becoming a wild and scenic river, and the disruption of an existing anadromous fishery were generally given greater importance in determining the licensability rating than other factors.

The licensability of a site was rated on the following basis:

- minimal opposition and delays expected in licensing.
- moderate opposition to licensing expected from one or more groups. Processing of license may involve the hearing process with related time delays.
- substantial opposition expected in licensing the site. Processing will involve the hearing process with substantial delays and possibility of denial in granting a license.

Table 1-5 shows the study's ranking of potential hydroelectric sites according to licensing considerations and power costs. From the study it was concluded that the Cowlitz Falls Project was the most economical of the sites examined and had a licensability rating of 1, indicating the lowest potential impact on the environment. The Muddy Fork Cowlitz Site, which was the second most economical site, has been devastated by the recent eruption of Mount St. Helens, and future development of the project is unlikely. The Orient Site on the Kettle River is 150 miles from the Applicant's service area and the Narrows Site on the Grande Ronde River is 250 miles from the service area. These sites are considered to be too far removed to be reasonable alternatives to the Cowlitz Falls Project. The Mud Mountain Project is currently being studied by the City of Tacoma and would have a proposed installed capacity of 5.8 MW.

1.3.2 Alternative Designs of the Proposed Action

1.3.2.1 Alternative Reservoir Elevations

Engineering and environmental studies were conducted by the Applicant to select the normal maximum reservoir operating level for the proposed Cowlitz Falls Project. (All reservoir elevations discussed herein are at mean sea level, and will be abbreviated as "EL.") Elevations under consideration ranged from EL 862 to EL 872. Analyses were performed for maximum reservoir water surface elevations of EL 862, EL 866, and EL 872. An economic analysis of the three alternatives, based on a comparison of capital cost and project generation at the three operation levels, is shown in Table 1-6.

The economic analysis indicates the cost of energy from the three different operating levels ranges from 65.3 to 67.4 mills per kWh, with the operating level of EL 866 producing the lowest cost energy.

Table 1-6. Cost comparison of alternative reservoir operating levels for Cowlitz Falls Project (Source: Staff).

	EL 862	EL 866	EL 872
Cost of project at on-line date of January 1988 1/	$151,000,000	$154,000,000	$170,000,000
Annual cost of project at 10.5% cost of money	$ 17,126,000	$17,450,000	$ 19,134,000
Average annual generation of project (GWh)	256.0	267.2	284.0
Project cost of energy (mills/kWh)	66.9	65.3	67.4
Incremental cost of energy (mills/kWh)	(Base case)	28.9	100.2

1/ Project costs from R.W. Beck and Associates, 1980b, updated by Staff from preliminary estimates.

1.3.2.2 Downstream Channel Modifications

The project, as proposed by the Applicant, would improve the hydraulics of the streambed downstream of the powerhouse for approximately 1 mile. This modification would allow use of the additional head available when Riffe Lake is drawn down.

The main reach of river to be modified would begin at the former footbridge at RM 88.3 and would terminate at about RM 87.5. In this reach, the river alternates between pools and riffles. A trapezoidal channel having a bottom width of 50 feet, an invert at EL 745, and side slopes of 0.5:1 on rock and 2:1 on alluvial material, would be excavated within the existing channel. Line blasting and dredging operations would take place from a barge when Riffe Lake is full (approximately EL 778.5).

At RM 88.3, a constriction on the south bank would be removed by line blasting. From RM 88.3 to the dam construction area, the Applicant's preliminary investigation indicated that the river bottom is lower than EL 745, and only a few constrictions would have to be removed. To the extent practical, material thrown into the river by blasting would be dredged out.

The estimated capital cost for the downstream channel modification is approximately $6 million in 1988 dollars. The modifications would increase the net head resulting in an additional 28.5 GWh of average annual generation at a cost of 22 mills per kWh. The modification is cost effective.

1.3.2.3 Alternative Transmission Facilities

The transmission line system proposed by the Applicant includes a new segment of transmission line corridor. Selection of this corridor was based upon an alternative transmission-line corridor evaluation that identified and evaluated interconnection points and alternative transmission line routes. The study consisted of a detailed literature search, a map and aerial photography survey, and a field reconnaissance. Alternative B, shown in Figure 1-1, was selected as the proposed corridor.

1.4 FEASIBILITY OF NONHYDROELECTRIC ALTERNATIVES

The feasibility of three nonhydrolectric alternatives has been considered. They are:

- a 25-MW steam-electric powerplant fired with woodwaste products from logging and milling operations. (Staff's analysis evaluates 40 MW of installed capacity to permit an economic comparison with the proposed project.)

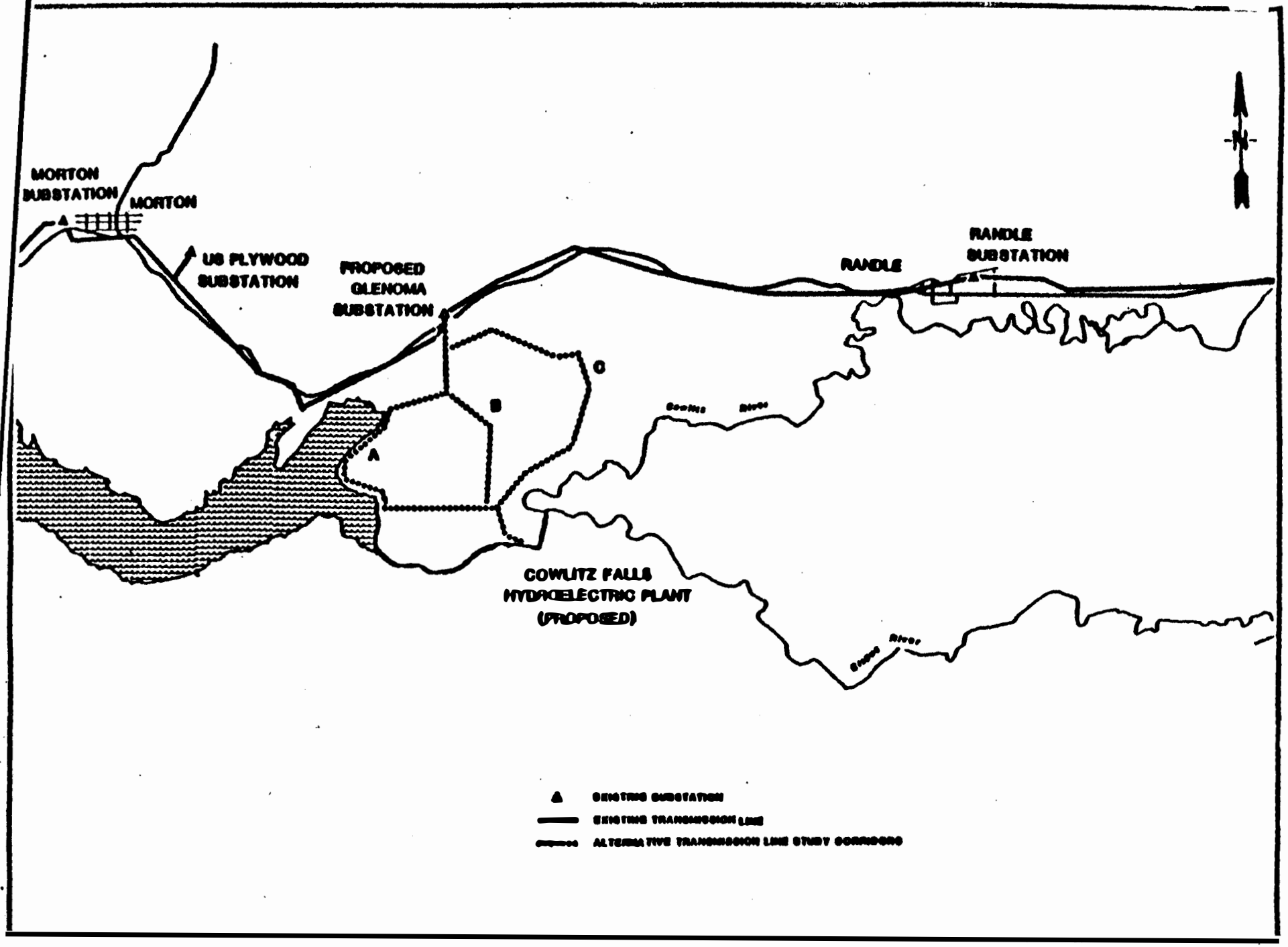


Figure 1-1. Alternative transmission corridors for proposed Cowlitz Falls Project (Source: Application, Exhibit W).

- a 45-MW share in a large (800-MW class) coal-fired steam-electric powerplant.

- 87.5 MW of wind turbines, made up of 35 individual 2.5-MW turbines, such as the Boeing MOD-2 design.

Nuclear power is not considered to be an alternative to the proposed project because the Applicant is already participating in all three nuclear projects being built by WPPSS, and additional nuclear capacity that is not currently planned could not be built in the time frame of the mid-80's.

1.4.1 25-MW Woodwaste Plant

A good deal of conceptual design work has been done on the feasibility of constructing a steam-electric powerplant to be fired by woodwaste products in Lewis County. The Electric Power Research Institute (EPRI) published a report that discussed the merits of both a cogeneration and a conventional full-condensing steam-electric plant (Rocket Research Company, 1980). The eruption of Mount St. Helens in May 1980 raised doubts about the viability of obtaining long-term woodwaste contracts with the local mill owners. Since that time, however, the project has been revived by Trans-Energy Systems, Inc. (1980), which issued an updated report. Local mill operators have been recontacted with regard to the price and availability of woodwaste on a long-term basis, and have responded favorably. A brief description of such a facility follows:

This plant would be located in eastern Lewis County, either adjacent to the Cowlitz Stud Company or across from the Mt. Adams Veneer Company. The facility would be a conventional steam-electric powerplant, rated at 26.8-MW gross and 25-MW net output, with whatever additional equipment would be required to process and handle wood and woodwaste products. The design heat rate would be 14,692 Btu per kWh. The annual output would be 175,200,000 kWh per year, using an 80-percent annual plant factor.

The boiler would be rated at 240,000 pounds per hour of steam at 1,250 pounds per square inch gage, 950° Fahrenheit, using 55-percent-moisture wood fuel. The boiler would be equipped with a traveling grate spreader stoker, retractable soot blowers, economizer, air preheater, mechanical cyclone, electrostatic precipitators, and a 180-foot stack. The turbine would be a conventional, multi-stage, utility-type condensing turbine, sized to drive the generator to a gross rate of 26.8 MW under design conditions. The condensers would reject heat into the atmosphere through conventional mechanical draft cooling towers. The generator would be a unit of 3,600 revolutions per minute (rpm), developing 29.8 millivoltamperes (mVA) at a 90 percent power factor, and would result in 26.8 MW gross or 25.0-MW net output.

This plant would provide both dependable capacity and energy to serve the Applicant's loads.

1.4.2 Coal-fired Plant

A coal-fired steam-electric plant would be a logical addition to generating capacity in the Pacific Northwest. It is assumed that, without the proposed project, the Applicant could purchase a 45-MW share of a large (800-MW) coal-fired powerplant, although such a plant is not currently planned. A 45-MW share of a coal-fired plant, operating at approximately 75 percent annual plant factor, would generate an annual amount of energy equivalent to the average annual output of the proposed project. In addition, a coal-fired powerplant would provide dependable capacity for the Applicant. For the purposes of comparison, Staff has assumed generic costs associated with building an 800-MW coal-fired plant with scrubbers and a wet cooling tower.

A coal-fired steam-electric plant would require rail or barge access for coal deliveries and would have water requirements of nearly 16 million gallons per day.

1.4.3 Wind Power

At the present time, large wind power machines are not commercially available. The production of wind power in the Pacific Northwest, however, using a wind-turbine generator (WTG) such as the Boeing MOD-2 (2.5 MW), is considered to be technically feasible. If, in the future, commercial production of wind power facilities is initiated, these facilities probably would be adopted by utilities in the area. If this happens, the 1980 regional power bill requires that preference be given to cost-effective renewable resources, such as wind power.

For utility applications, there are two basic wind-power siting options, dispersed sites and the "wind farm" concept. The current state-of-the-art indicates that each option would use a 2.5-MW WTG, with associated controls and auxiliaries. Wind-powered units are now being tested for performance in an operating electrical supply system.

Staff estimates that WTG's in Washington could likely be operated with annual capacity factors of 35 percent, based on an average wind power density of 400 watts per square meter and a conversion efficiency of 33.4 percent. Since the wind turbines can only be operated under specified wind conditions, they are considered by Staff to have no dependable capacity for system planning purposes. Thus, WTG's provide no dependable capacity in comparison to the proposed project, and a backup capacity such as that provided by combustion turbines would be required.

Power produced by WTG's, when not needed to supply load, could be used by the Federal hydro system to conserve water or to off-load steam electric plants. The limit of the Federal hydro system to absorb intermittent or dump power sources has not been analyzed by Staff.

1.5 ECONOMIC COMPARISON OF PROPOSED PROJECT AND NONHYDROELECTRIC ALTERNATIVES

An economic comparison of the proposed project and the wood-waste and coal alternatives discussed in Section 1.4 is presented in Table 1-7. Life-cycle analysis of the proposed project and of its alternatives indicates that the proposed Cowlitz Falls Project is the most economical source of additional generation to the Applicant.

1.6 EFFECT OF BONNEVILLE'S NEAR-TERM RESOURCE ACQUISITION POLICY ON THE ECONOMICS OF THE COWLITZ FALLS PROJECT

As discussed in Section 1.2, BPA currently predicts an excess of generation would be available until the early 1990's. BPA has informed the Applicant that it would not be interested in acquiring the Cowlitz Falls Project in the excess period at the project's actual cost of power (65.3 mills/kWh in 1988). Therefore, in the years from the projected project-on-line date of 1988 until the year 1992, when other generating resources will need to come on-line, the Applicant may be forced to sell the output of the Cowlitz Falls Project at a price less than the actual cost of generation.

Staff performed a life cycle study comparing the cost of Cowlitz Falls generation to the revenue that the Applicant might receive for the project. The expected revenue assumes the output of the Cowlitz Falls Project would be sold at coal fuel replacement cost during the excess period from 1988 till 1991, and at the cost of a coal plant's fixed plus variable costs from 1992 on. Staff's analysis is presented in Table 1-8. On this basis, the project still shows an advantage over the alternative during the study period, with a levelized annual benefit of 4.2 million dollars.

Table 1-7. Economic comparison of proposed project and alternatives (Source: Staff).

	Proposed Project	Wood-waste plant	Coal-fired plant
Installed capacity (MW)	70	40	45
Dependable capacity (MW)	11	40	45
Capacity adjustment for equivalence (additional supplemental capacity to make alternatives capacity equal to the proposed project) 1/	0	-29	-34
Total estimated capital cost for January 1988 on-line 2/ date			
(millions)	154.00	116.16	96.93
($/KW)	2,200	2,904	2,154
Adjusted dependable capacity	11	11	11
Generation: 50-year average (GWh)	267.2	267.2	267.2
Total cost of capacity of alternative plus supplemental capacity (millions)	154.00	96.88	74.32
1988 annual cost of alternative plus supplemental capacity and energy 3/			
(millions)	17.45	23.08	16.85
(mills/Kwh)	65.3	86.4	63.0
50-yr. levelized annual cost of alternative plus supplemental capacity and energy 4/			
(millions)	17.98	33.42	24.08
(mills/Kwh)	67.3	125.1	90.1

1/ Supplemental fossil-fueled plant dependable capacity is that amount of dependable capacity needed in addition to the steam project alternatives, to make them equivalent to the Cowlitz Falls Project alternative. The negative sign indicates a credit for additional dependable capacity.

2/ Hydro and woodwaste plant capital costs are midpoint construction level.

3/ 1986 annual cost of alternatives, plus supplemental capacity and energy, including operation and maintenance (O and M) and administrative and general (A and G) costs.

4/ 50-year present-worth levelized annual costs of alternative plus supplemental capacity and energy, based upon 10 years of escalation of 10 percent for woodwaste and coal fuel, and 6 percent for O and M.

ERRATA

2. PROPOSED ACTION AND ALTERNATIVES

2.1 COWLITZ FALLS PROJECT - APPLICANT'S PROPOSAL

2.1.1 Location

The proposed project would be located on the Cowlitz River at RM 88.6, approximately 13 miles downstream from the town of Randle in Lewis County, Washington (Figure 2-1).

2.1.2 Proposed Facilities

The proposed project would include the dam and integral spillway, reservoir, power intake, powerhouse, tailrace, and downstream channel improvements (Figure 2-2).

2.1.2.1 Dam and Reservoir

The dam would be a concrete-gravity dam with an ogee spillway overflow section, containing four radial gates. The dam would extend 140 feet above the excavated streambed, and would have a 15-foot-wide, 800-foot-long crest. The spillway would have four 60-foot-wide spillway bays, each equipped with a 60-foot-wide and 36-foot-high radial gate. The power intake would be integral with a nonoverflow, gravity section of the dam, and would consist of two rectangular, bellmouth openings, each 27 feet wide and 33 feet high, leading to 18-foot-diameter steel penstocks that would lead to the powerhouse. A steel trashrack and sediment control wall would protect the intake openings (Figure 2-3).

The reservoir would inundate the existing channel and portions of the Cowlitz and Cispus floodplains to normal maximum elevation of EL 866. The reservoir would extend about 12.3 miles up the Cowlitz River towards the town of Randle, Washington, and 1.7 miles up the Cispus River, covering 870 acres with a total volume of 13,150 acre-feet.

2.1.2.2 Powerhouse

The powerhouse would be integrated with the dam and intake structure. The powerhouse would contain two Kaplan turbines connected to synchronous generators, each with a rated output of approximately 35,100 kW. The average head on the turbines would be 97 feet.

2.1.2.3 Tailrace and Downstream Channel

A tailrace with an average width of approximately 100 feet would be excavated in rock to the river channel from the downstream end of the powerhouse draft tubes. At the draft tubes, the tail-

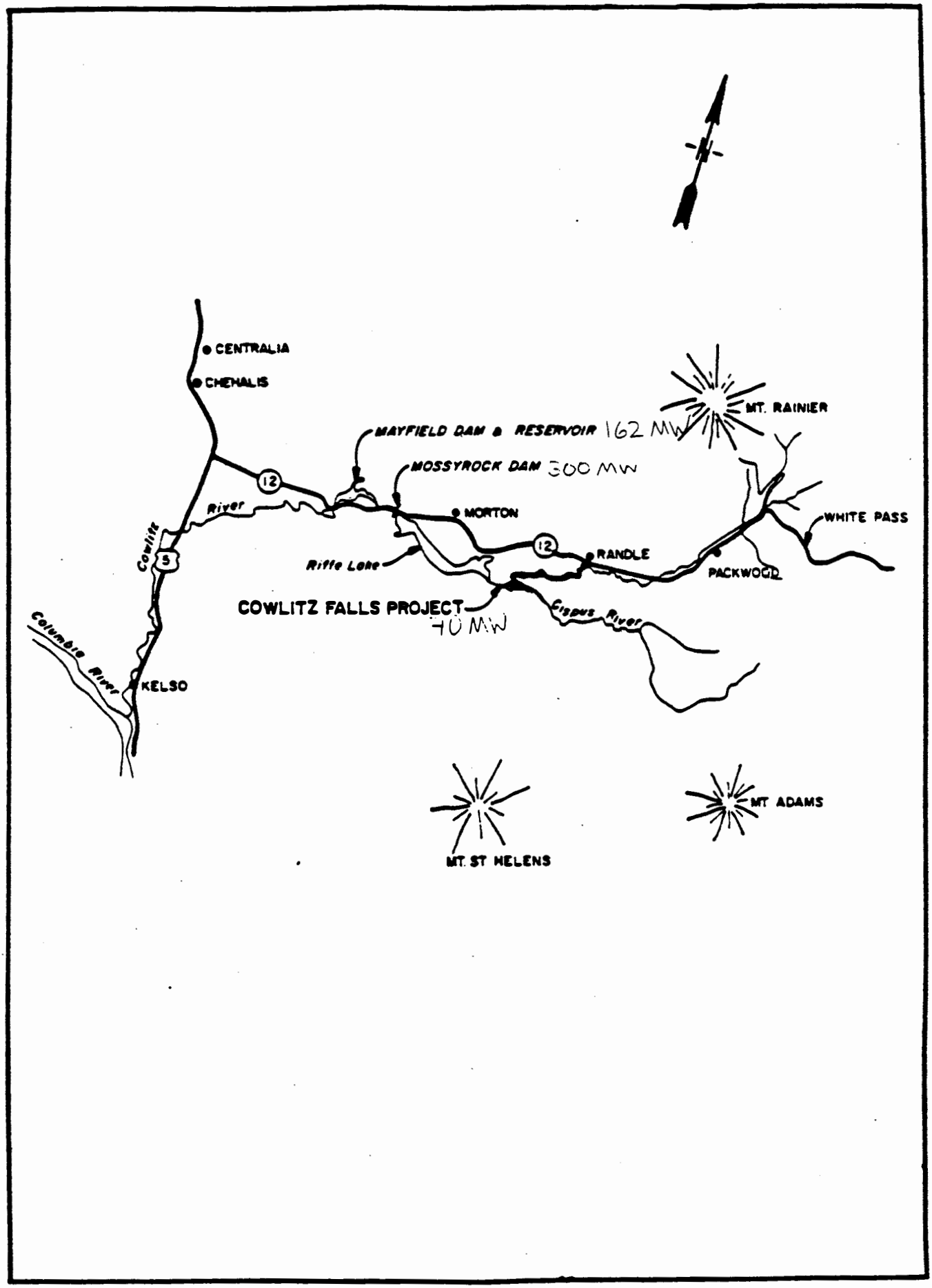


Figure 2-1. Proposed project location map (Source: Application, sheet Exhibit W).

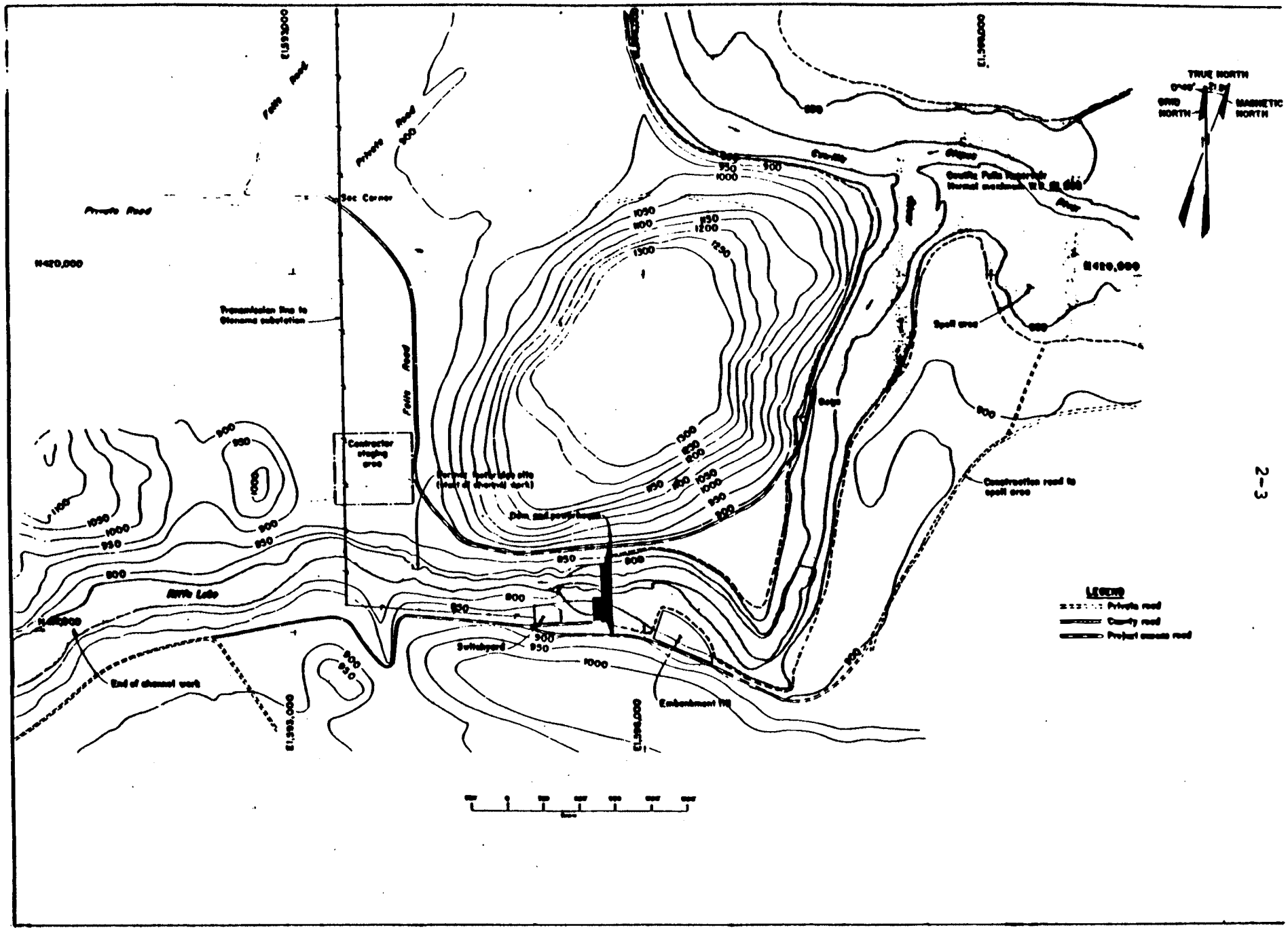


Figure 2-2. Proposed project facilities (Source: Application, Exhibit W).

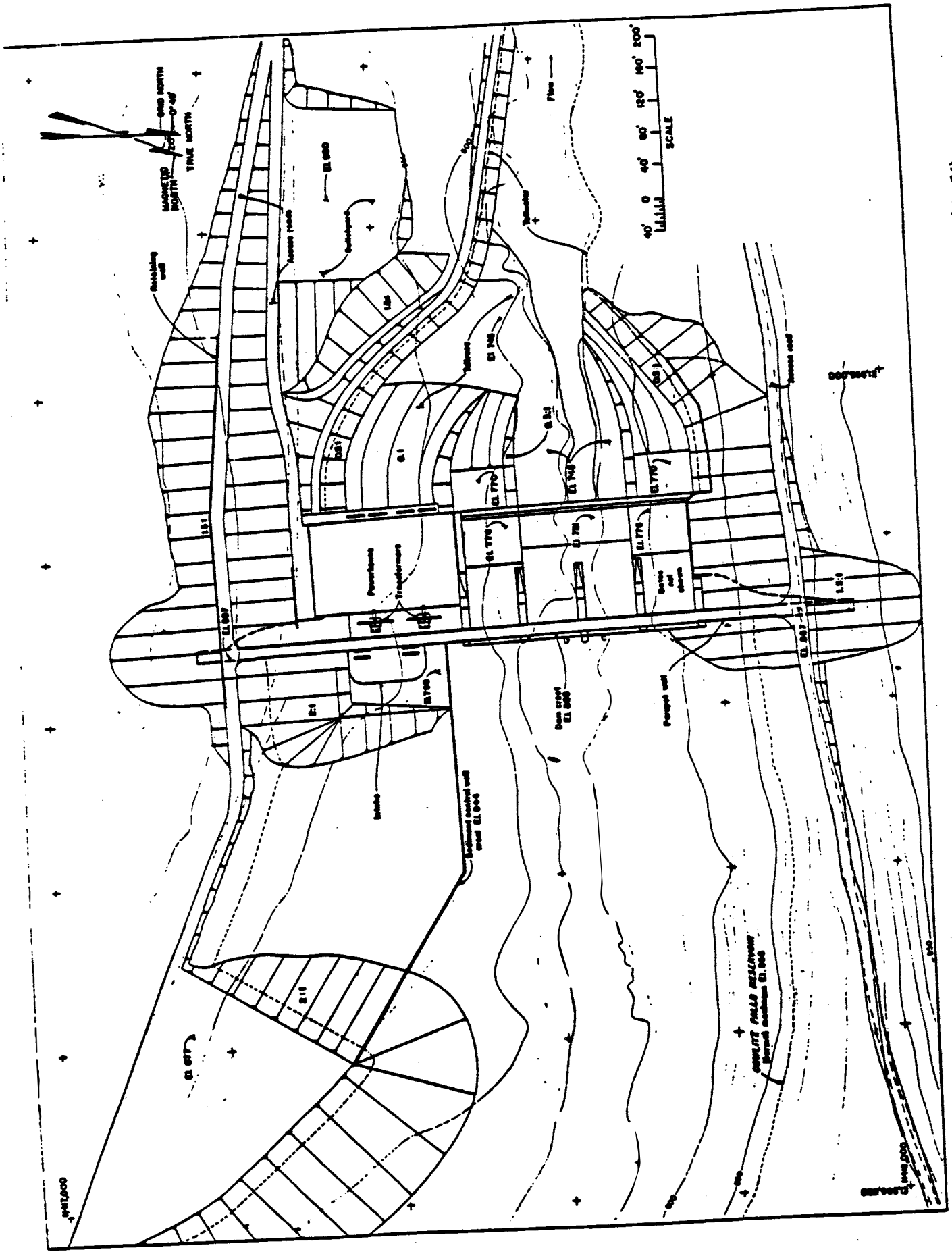


Figure 2-3. Proposed project plan (Source: Application, Exhibit V).

race would extend upward on a 6 to 1 slope to the invert of the river. The tailwater level would be approximately EL 768 at 10,000 cubic feet per second flow, resulting in a minimum tailrace depth of 32 feet.

The downstream channel would be improved by widening a few constrictions and lowering the riverbed in the riffle area for 1 mile downstream of the dam construction area (Figure 2-2).

2.1.2.4 Access Facilities

Two access roads would be provided to the project site. An existing county road (Falls Road) and private roads would be upgraded to form the north access roads. An existing logging road would be upgraded to form the south access road. The north access road would terminate about half a mile upstream of the dam near the present stream gaging station. The south access road would begin about half a mile downstream of the dam at Champion International's logging road and continue past the dam site to a spoil site 1.2 miles upstream of the dam (Figures 2-2 and 2-3).

2.1.2.5 Transmission Facilities

Transmission facilities would consist of step-up transformers and a switchyard to transform the generator output voltage to 115 kV. The transformer would be located on the roof of the dam/intake structure and the switchyard would be located approximately 500 feet downstream. The new, 115-kV single-circuit transmission line would be 5 1/2 miles long and would connect the switchyard to the Applicant's planned Glenoma Substation near the town of Glenoma. The Glenoma Substation would be connected to the existing transmission system.

Beginning at the switchyard, the transmission line would traverse westward along the south shore of the Cowlitz River for approximately 0.33 mile before turning northward, crossing the river. The line would cross a private logging road about 0.5 mile north of the river. North of this private road, the transmission line would travel northward following the Range 5E - Range 6E section line for approximately 1 mile to the farm located at the northeast corner of Section 36, Township 12 N, Range 5 E. Then the line would travel northwestward a quarter of a mile to Meade Hill Road before ascending the ridge, passing between Dog Mountain and Glenoma Peak, and intersecting an existing local service line on the west side of Meade Hill Road. This line would be upgraded to 115 kV. The line would parallel Meade Hill Road for three-fourths of a mile to Route 12, where it would connect into the proposed Glenoma Substation.

2.1.2.6 Proposed Recreational Facilities

The Applicant proposes initially to develop recreational facilities at three sites, two within the project boundary, the

Cowlitz Falls campground (113 acres) and the Cowlitz Falls boat launch (9 acres) and one outside the project boundary, a day-use park (5 acres). The locations of the proposed sites and the number of facilities to be developed at each are shown in Figure 2-4 and Table 2-1, respectively. Based on the demand criteria defined in Exhibit R, the Applicant has provided for expansion of the recreational facilities at the Cowlitz Falls campground and at two other sites within the project boundary that are reserved for future recreational development. The additional facilities to be developed in the future at the Cowlitz Falls campground are also shown in Table 2-1. Detailed plans for the recreational facilities would be developed in cooperation with the Lewis County Parks and Recreation Department to meet or exceed their design criteria. The Applicant has negotiated an agreement with Lewis County to operate and manage the project's recreational facilities.

The construction of the recreational facilities during the initial development would begin at the start of construction of the Cowlitz Falls Dam. The Applicant would be responsible for the purchase or lease of the land, the initial construction costs of recreational facilities at the three sites, and the purchase of the land reserved for future development. The Applicant would also be responsible for any operational costs in excess of user fees. Development costs, including land purchases, are estimated by the Applicant to be approximately $1,549,000, or about 2.2 percent of the total project cost.

2.1.3. Land Requirements

The project would require 1,830 acres of river-bank lands and river channels. The land within the proposed project would be used for the following specific facilities shown in Table 2-2.

No United States lands would be affected by the proposed project. The land is owned by private individuals, state and local governments, and private companies. The current ownership of the land is summarized below in Table 2-3.

2.1.4. Spoil and Borrow Areas

The total volume of spoil from the entire project is estimated to be 1 million cubic yards. The spoil disposal site is located south of the confluence of the Cowlitz and Cispus Rivers (Figure 2-2). This site would be properly stabilized and ultimately become part of the area inundated by the reservoir. Two additional sites, both located north of the Cowlitz River, at the Champion International wooden bridge, would be investigated for disposal of spoil. Most of the construction material required for the project would be imported to the site from commercial suppliers, although the Applicant plans to study the feasibility of utilizing some of the construction materials from the Ancestral Valley.

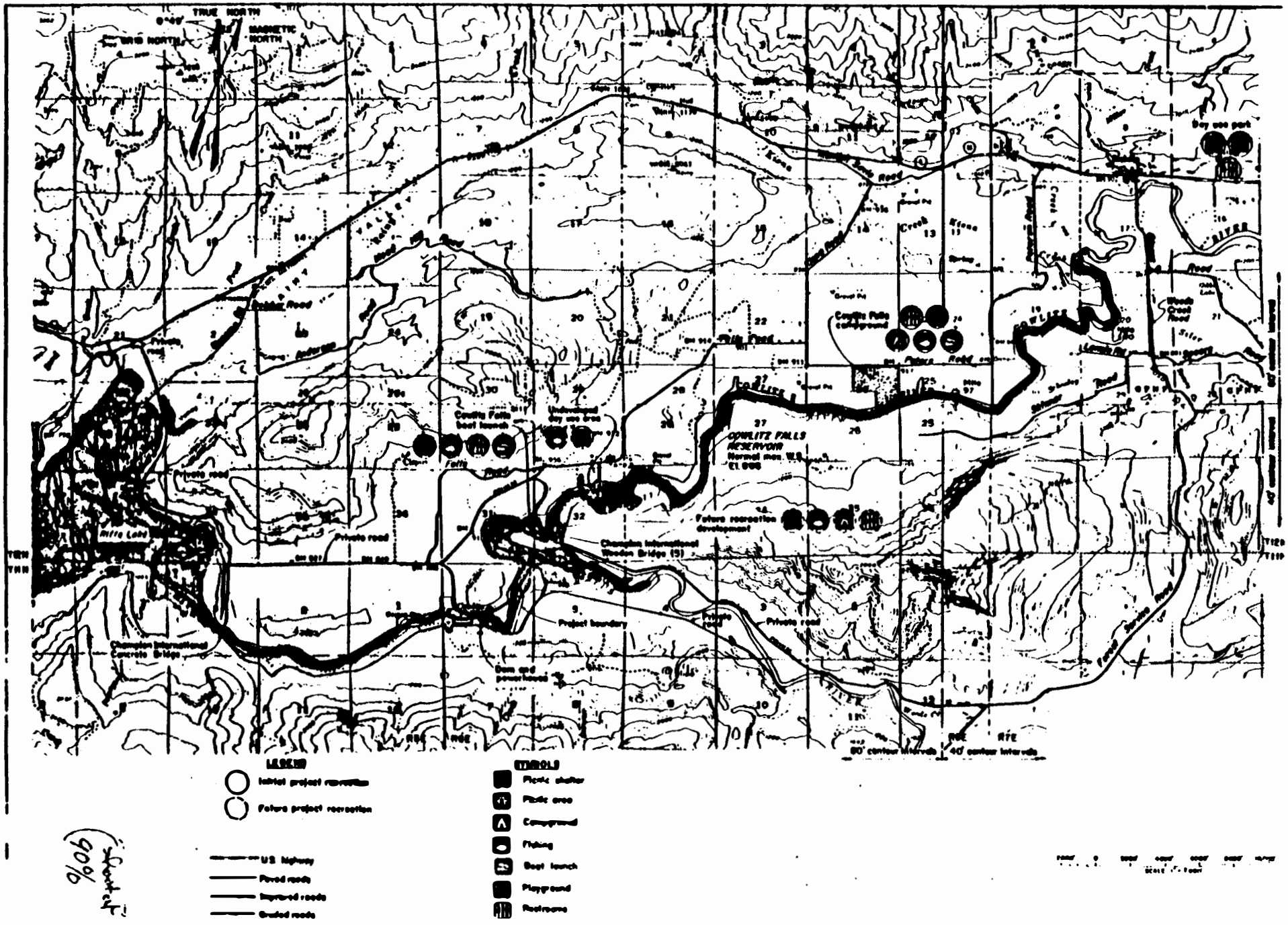


Figure 2-4. Proposed recreational facilities and areas (Source: Application, Exhibit R).

Table 2-1. Cowlitz Falls Project proposed recreational facilities (Source: Application, Exhibit R).

Cowlitz Falls Campground	Initial	Future
Boat launch (lanes)	2	
Boat launch car/trailer parking spaces	75	
Boat launch car parking spaces	15	
Trailer campsites	35	35
Tent campsites	50	50
Trailer sewage dump	1	
Park entry station	1	
Manager's residence	1	
Water system	1	
Land (acres)	113	
Picnic units	75	50
Day use parking spaces	75	125
Cowlitz Falls Boat Launch		
Boat launch (lanes)	2	
Car/trailer parking spaces	50	
Car parking spaces	40	
Land (acres)	9	
Picnic units	40	
Day Use Park		
Picnic shelter/restrooms	1	
Picnic units	6	
Multipurpose athletic field	1 1/	
Parking spaces	80	
Land (acres)	5	

1/ Personal communication with Applicant.

Table 2-2. Land requirements of the proposed project (Source: Application, Exhibit W, as modified by Staff).

Purpose	Acreage
Dam and powerhouse	20
Reservoir	870
Buffer zone/wildlife mitigation	665
Transmission corridor	36
Construction yards and roads	20
Downstream channel	44
Recreation	175
Total	1,830

Table 2-3. Current use category of the proposed project area (Source: Application, Exhibit F, as modified by Staff).

Current use category	Acres
Washington State Department of Natural Resources	540
City of Tacoma	140
Commercial timberland	750
Agricultural land	250
Rural land	150
Total	1,830

2.1.5 Work Force Requirements

The numbers of construction personnel who would be employed at the construction site would range from 15 to 195 persons and would average 130 workers. In total, the Cowlitz Falls Project would require 4,430 man-months of construction labor (Section 4.1.14.1).

2.1.6 Construction Schedule

The proposed construction schedule for the Cowlitz Falls Project as submitted in the FERC license application (Figure 2-5), is based on the expected award of a contract for final design during the summer of 1981, and on the start of commercial operation in January 1986. As of January 1983, no contract for the final design had been awarded by the Applicant. A more realistic expectation for the start of commercial operation would be January 1988.

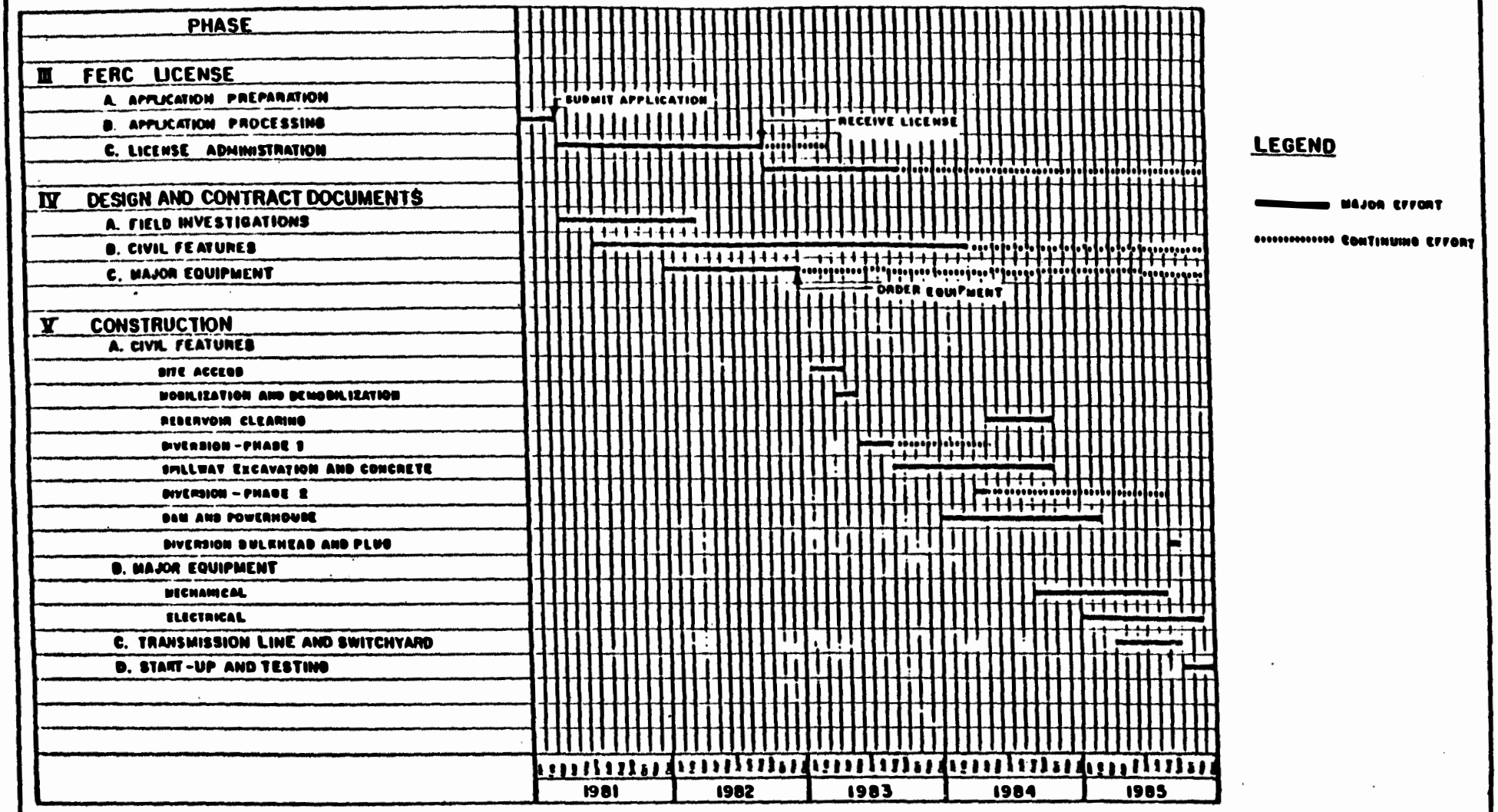


Figure 2-5. Design and construction schedule for proposed Cowlitz Falls Project (Source: Application, Exhibit W).

2.1.7 Compliance with Applicable Laws and Regulations

In addition to the pending application before the Federal Energy Regulatory Commission, the Applicant may need the following permits or authorizations:

Federal

(1) United States Army Corps of Engineers
- Section 404 (Clean Water Act) permit

(2) Federal Aviation Administration
- determination of no hazard of transmission lines

State and Local

(1) Department of Ecology

- reservoir permit
  (includes dam safety approval)
- permit to appropriate public waters
- change of permit or certification of water right
- flood control zone permit
  (may be obtained with the Lewis County Planning Department)
- state waste discharge permit
- water quality certification (Section 401 permit)
- short-term exception to water quality standards

(2) Department of Natural Resources

- forest practices application notification
- surface mine reclamation permit
- slash burning permit
- dumping permit
- right-of-way permit
- application to purchase valuable materials
- permit to temporarily change land boundary marker

(3) Departments of Fisheries and Game

- hydraulic project approval

(4) Office of Archaeology and Historic Preservation

- archaeological approval of project

(5) Department of Transportation

- permit to operate overweight vehicles on state highways
- state highways franchise/permit

(6) Department of Labor and Industries

- electrical permit

(7) Southwest Washington Air Pollution Control Authority

- burning permit
- new source construction approval

(8) Lewis County Planning Department

- shoreline substantial development permit
- shoreline management variance
- shoreline conditional use permit

(9) Lewis County Department of Public Works

- upgraded road approval
- interlocal agreement for construction on county roads
- surface water drainage plan approval
- permit to operate overweight vehicles on county roads
- temporary road closure permit
- building permit

(10) Lewis County Health Department

- sewage holding tank variance

2.1.8 Design Limitations--Seismic Risk Evaluation

The present seismicity of the western United States is largely controlled by the northward movement of the Pacific plate as it abuts the North American plate. In the Pacific Northwest, geologic processes are further controlled by the interaction and deformation of several subplates. Of particular significance is the Juan de Fuca plate, which has been driven eastward, and subducted, or thrust, beneath the North American plate. The major earthquake activity throughout the region is related to this subduction zone. Although the entire subduction zone would appear susceptible to earthquake activity, the historic record indicates that most of the earthquake activity has been concentrated in the Puget Lowland, north of the proposed project.

In published geologic literature, there are no major faults within a 25-mile radius of the proposed project site and relatively

few within a 50-mile radius. The most significant fault is probably the Olympia fault, which is inferred to be located along the southwestern boundary of the Puget Lowland. The point of the fault nearest to the proposed site would be approximately 25 miles northwest of the project. The Olympia fault is postulated to be a normal, seismically active fault with a northwesterly strike and an approximate length of 50 miles.

Detailed regional geologic mapping places a fault 15 miles northeast of the proposed site; several smaller faults also occur near Morton, Washington, 7 to 8 miles northwest of the proposed project site. These faults occur in rock of Eocene age (40 million years ago) and show no physical evidence of displacement since that time.

A shallow earthquake of tectonic origin occurred 15 miles from the site on February 13, 1981, indicating the existence of a possible active fault near the project area. Horizontal ground motion appeared to occur along the fault during the earthquake. Preliminary indications are that the fault is capable of producing shallow earthquakes (within 4 miles of the surface), with a Richter Magnitude of 6 or 7. These data will be considered in the final seismic design studies for the proposed project.

Preliminary studies by the Applicant indicate that large historical seismic events occurred at a sufficient distance so that a high level of shaking at the proposed dam would not be expected. Shaking from the nearer, smaller intensity earthquakes should cause no problems for project facilities.

The site of the proposed project is located on the boundary of Zones 2 and 3 of the 1979 Unified Building Code Seismic Risk Map of the United States. For design purposes, the conservative approach would be to consider the higher seismic risk of Zone 3.

Zone 3 is generally considered to have a potential for experiencing major damage similar to that described for intensity VIII, or higher, of the Modified Mercalli scale, and a seismic coefficient of 0.10g. According to Algermissen and Perkins (1976), there is a 10-percent chance that the level of peak horizontal ground acceleration expected at the site will be greater than 0.1 within a 50-year period.

Inasmuch as the Applicant identified no faults at the site, ground displacement beneath project features is not considered a likely event. Shaking, therefore, appears to be the only seismic condition which needs to be considered in the design. Considering the known seismic condition, a coefficient of 0.1g is recommended for use in the pseudostatic analysis in the preliminary design phase. If the proposed project is licensed, the Applicant would conduct a more thorough seismological investigation for the final design so that a maximum potential earthquake can be defined, as well as the seismic parameters that might be expected at the site.

2.1.9 Operation and Maintenance

2.1.9.1 Operation

The proposed project would be operated as a run-of-river plant, with the turbines functioning at maximum efficiency and the reservoir operated to maintain maximum head and and minimize spill. With this operation the reservoir would essentially remain at a constant elevation for the majority of the year.

During the months of August through October, inflows less than 1,500 cfs would be regulated to increase turbine efficiency if Riffe Lake filled the downstream channel; otherwise, flows below the minimum hydraulic capacity of 1,000 cfs would be spilled.

The maximum hydraulic capacity of the units at the proposed project is approximately 10,000 cfs.

2.1.9.2 Maintenance

Hydro projects typically require less maintenance than other types of generating stations. Routine maintenance of the project would consist of lubrication, painting, and minor repairs of project machinery, selective cutting of trees along the transmission line right-of-way, repair of project roads, and removal of trash from the storage reservoir to prevent a blockage of the intake and spillway structure. The generating units and other project works would be scheduled for inspection and major repairs during periods of low demand and streamflow.

2.1.10 Future Development

The Applicant does not have future plans for installing additional turbine generation in the powerhouse. The additional head available above EL 866 would not be utilized by the Applicant for power production. The proposed facilities would maximize the available water resources for EL 866. If future demand warrants, additional recreational facilities may be provided.

2.2. ALTERNATIVE DESIGN OF THE PROPOSED ACTION

2.2.1 Alternative Powerhouse Arrangements

To take advantage of the additional head that is available when Riffe Lake is drawn down for flood control purposes, seven arrangements for moving the powerhouse downstream were considered. The majority of these arrangements involve utilizing the selected dam site, moving the powerhouse downstream, and incorporating

various lengths of power canal and tunnel. If the entire dam and powerhouse were moved downstream to the lowest location at RM 85, the incremental energy would be approximately 65 GWh. When the increamental construction cost was compared to the incremental value of energy, none of these alternatives was found to be economically feasible even without minimum flow releases. With the required minimum fish release flows, these arrangements with canals or tunnels would be even less feasible. Therefore, these arrangements were not considered viable.

2.2.2 Alternative Reservoir Levels

Environmental and engineering investigations were conducted for the proposed project to select a reservoir elevation. Analyses were performed for reservoirs with maximum surface elevations at EL 862, EL 866, and EL 872. Based on comparative economic analyses, all three alternatives were found to be economically feasible, and each had a benefit-to-cost ratio of approximately 1.2 for a bond interest rate of 8 percent. The total cost of energy varied from 47 to 48 mills per kWh. Incremental analyses indicated, however, that the reservoir elevation of 866 feet would have the lowest unit cost of energy.

Impacts on agriculture were found to vary significantly with the reservoir elevation. The incremental increases in net costs that occurred at or above EL 866 are partially due to the amount and unit cost of land that would have to be purchased for EL 872 because of its impacts on agricultural land in the valley south of Randle. EL 872 would directly impact 1,070 acres of cultivated land through inundation or changes in groundwater condition. Additional noncultivated farmland would also be impacted, and 10 farms would be displaced by the project. The study concluded that neither EL 862 nor EL 866 would significantly impact agriculture because they would remain within the existing river channel above RM 95. Other environmental and land use impacts were found to vary slightly with reservoir elevation.

The Applicant claims that it has proposed EL 866 because significant reductions in environmental impact of the project are realized by lowering the reservoir by 6 feet from EL 872, which would generate the maximum amount of energy.

The Applicant did not conduct a detailed study of the 1950 Corps of Engineers' high dam proposal, which would impound water to an elevation of 1,100 feet, because such a project would cause severe environmental impacts in the project area.

2.2.3 Alternative Transmission Facilities

The transmission line system, as presently proposed, includes a new segment of transmission line corridor that was selected after conducting a study consisting of identifying and evaluating alternative interconnecting points and alternative transmission line corridors.

2.2.3.1 Transmission Interconnections

A review of Applicant's service area, the existing high-voltage facilities in the area of the proposed project, and Applicant's plans for supplying future system growth indicate the possibility of nine potential points of interconnecting the output of the proposed project with the transmission system in the area that is identified in Table 2-4.

Table 2-4. Possible interconnecting points (Source: Application, Exhibit W, Table 13-10).

Interconnection point number	Interconnection point name	Voltage (kV)	Approximate distance (miles)
1	Randle S/S	69	12.8
2	Proposed Glenoma S/S	69	5.2
3	U.S. Plywood Tap	69	10.3
4	Morton S/S (BPA)	69	12.4
5	Mossyrock S/S	69	23.6
6	Silver Creek S/S, 69 (BPA)	69	28.4
7	Silver Creek S/S, 230 (BPA)	230	28.4
8	Mossyrock Hydro Plant (TCL)	230	19.9
9	Mayfield Hydro Plant (TCL)	230	28.9

BPA = Bonneville Power Administration
TCL = Tacoma City Light

Point no. 1 was eliminated because of high capital cost, high potential environmental impact, and high transmission losses. Points nos. 3, 4, and 5 were eliminated because they would require longer, new transmission lines without giving any readily identifiable advantages over point no. 2. Points nos. 7 and 9 are basically the same as point no. 8, but would require longer transmission lines, and were, therefore, eliminated because of higher transmission losses. Thus, points nos. 2, 6, and 8 are potential interconnecting points. Point no. 2, interconnection with the Applicant's proposed Glenoma Substation, was selected because it was estimated to be the least costly and would cause the least adverse environmental impact.

2.2.3.2 Alternative Transmission Line Corridors

A new transmission line corridor is required between the proposed project site and the selected interconnection point, the proposed Glenoma Substation. (See Figure 1-1.) The factors used in evaluating three alternative transmission corridors are minimization of construction costs, minimization of transmission line length, minimization of environmental and visual impacts, and compatibility with existing land use. A summary description of each of the three transmission corridors is as follows:

Corridor A

This transmission corridor is approximately 8.7 miles in length and is approximately 54 percent greater in cost than Corridor B. Corridor A goes through a hang gliding recreational area, is approximately 67 percent longer, is visible along existing roads and the Riffe Lake shore, but has the least impact on existing dwellings. Its vulnerability to damage should be greater than Corridor B's.

Corridor B

This transmission corridor is approximately 5.2 miles in length and has the least engineering cost mainly because of its shorter length. The line's vulnerability to damage should not be great.

Corridor C

This transmission corridor is approximately 8.6 miles in length and is approximately 33 percent greater in cost than Corridor B. Corridor C also has the greatest impact on dwellings and is the least reliable of all the alternatives.

Alternative Corridor B was selected because the Applicant found it to have the least engineering cost and the least potential for adverse environmental impact. A summary of the evaluation of the transmission line corridors is given in Table 2-5.

2.3 WOOD-FIRED GENERATING PLANT

2.3.1 Location and Land Requirements

Thirty acres has been identified as the minimum site size for a wood-fired generation plant rated at 25 MW (Trans-Energy Systems, 1981). In addition, the site must have road access for logging trucks and chip vans (80,000 pound gross vehicle weight) for fuel delivery. A site would be needed for an ash disposal of 19.2 tons per day. (The Centralia landfill could serve this purpose.) The site would also have to have access to water, which would be required at the rate of approximately 600 gallons per minute. The water source could be either river water or water from wells.

Table 2-5. New transmission line corridor evaluation summary (Source: Application, Exhibit W).

Evaluation factor	Alt. study Corridor A	Alt. study Corridor B	Alt. study Corridor C
General data			
a. New line length (miles)	8.7	5.2	8.6
b. Rebuild (miles to Silver Creek Substation)	25.0	25.0	25.0
Environmental			
a. Clearing (acres)	42.5	33.4	23.8
b. New right-of-way (acres)	44.0	36.2	25.3
c. Recreation, hang gliding (miles)	2.2	0	0
d. Visibility (miles)	8.2	4.0	8.5
Engineering costs ($1,000)			
a. New transmission line	616.5	338.0	638.0
b. Clearing	126.0	106.2	66.3
c. New right-of-way	176.0	144.8	101.2
d. Access (new)	17.5	18.0	3.5
Total	936.0	607.0	809.0
Demography -- Number of dwellings	14	20	27
Reliability			
a. Line length (miles)	8.7	5.2	8.6
b. Tree-lined right-of-way (miles)	10.2	6.7	4.5
c. Existing road (miles)	5.2	1.6	7.9

Two sites have been identified by Trans-Energy Systems as potential sites for a woodwaste generating plant. Both sites are located in southwestern Washington, in the eastern portion of Lewis County. Both sites are in Township 12 N., Range 7 E., Western Meridian. Site A is located in section 15 and is adjacent to the Cowlitz Stud Company. About 40 percent of this site is currently used by the company for log storage. The remainder of the site consists of field and forest. Site B is located in section 17, and is across from Mt. Adams Veneer Company. This site is predominantly agricultural, with fringe areas of forest.

2.3.2 Construction Requirements

No additional land is required above the 30-acre site already specified. It is anticipated that all construction activities could be accomplished within the specified site boundaries.

2.3.3 Operation and Maintenance

In operation, the unit would be similar to a coal-fired generating plant. Wood fuel, when received, would be processed in order to make the fuel the proper size for introduction into the furnace. Once the wood fuel is burned, the ash would be removed, and transported to a landfill or other appropriate site for disposal. Steam produced by the boiler would expand through a standard condensing turbine, coupled directly to a synchronous generator. Heat from the condensers would be ejected into the atmosphere through mechanical draft-cooling towers. It is anticipated that the unit would be operated in baseload mode.

Maintenance for a wood-fired generator would be comparable to that for a coal-fired power plant in terms of the type and complexity of maintenance operations.

2.3.4 Relationship With Other Facilities

The operation of the wood-fired generator would depend on the local mills for its source of fuel, and therefore is related to their operation. In an effort to minimize the problem of an inadequate fuel supply, the plant would maintain a 60-day supply of fuel on site. In addition, the plant would be designed to be retrofited to burn coal, with the addition of scrubbers and coal handling equipment, if necessary, at a later date.

2.4 COAL-FIRED POWERPLANT

As an alternative to building the proposed project, Staff has also considered the effects of the Applicant's purchasing a 45-MW share of a large (800 MW) coal-fired powerplant equipped with scrubbers and cooling towers.

2.4.1 Location and Land Requirements

No specific site for a coal-fired powerplant has been considered by Staff. A typical site would be near the ocean or a river, either of which would serve as a source of cooling water. The site must have rail or barge access for delivery of the coal. Five hundred acres would be required for the plant, coal yard, and switchgear, plus an additional 2,000 acres nearby for use as a solid waste disposal site (Nuclear Regulatory Commission, undated).

For an 800-MW unit equipped with cooling towers, water requirements would be approximately 7,000 gallons per minute (GPM) lost to evaporation, plus 4,000 GPM for cooling tower blowdown, for a total water intake of 11,000 GPM (United States Water Resources Council, 1978). The amount of water required would affect the site chosen.

No land requirement for transmission has been considered, since it would vary with the site chosen and the distance from the existing transmission grid.

2.4.2 Construction Requirements

It is anticipated that construction activities would be contained within the site boundaries and that no temporary sites would be required.

2.4.3 Operation and Maintenance

A coal-fired unit of this size would be operated at or near full power continuously (i.e., baseload). Thermal steam-electric powerplants are subject to higher maintenance and more forced outages than hydroelectric plants, and would have correspondingly higher operation and maintenance expenses on a mills per kWh basis. Staff has assumed that a coal-fired powerplant operated in baseload could operate at approximately 75 percent annual plant factor.

2.4.4 Relationship With Other Facilities

The operation of a coal-fired powerplant would be relatively independent of other facilities. Its operation, however, would have to be coordinated with other units on the system to insure economical operation of the overall power grid.

2.5 NO-ACTION ALTERNATIVE

Staff believes that if new generating resources are not built and if projected loads materialize, there would be an increased probability of energy shortages above the forecast probabilities. Staff considers the probability of these shortages already to be higher than desirable. Eventually, a real shortage would materialize that would be borne by the industrial customers who have interruptible contracts with BPA. Aluminum companies are examples of such customers. Statutory preference customers, such as the Applicant, would not be affected initially. Industrial output would eventually fall below critical levels, however, at which point residential loads would probably have to be limited to available energy supplies. This unpleasant sequence of events can be avoided by pursuing cost-effective conservation and by building renewable resource projects, such as the proposed project.

3. AFFECTED ENVIRONMENT

3.1 COWLITZ FALLS PROJECT - APPLICANT'S PROPOSAL

3.1.1 Land Features

3.1.1.1 Geology and Soils

The proposed project would be located in the Cowlitz River Valley in the western part of the middle Cascade Mountains, approximately 19 miles north of Mount St. Helens and 28 miles south-southwest of Mount Rainier. The valley is oriented approximately east-west, and is bounded by steep mountain ridges. The valley has been partially refilled by several hundred feet of glacial till, outwash, and lake deposits. Closely spaced glacier end moraines, deposited by the most recent glacier in the area, form a ridge that lies across the valley approximately 5 miles upriver from the proposed dam site (Crandell and Miller, 1974). Upstream of the moraine ridge, in the upper portion of proposed reservoir area, the valley floor is generally flat, and now consists mostly of a broad river floodplain. Flooding by the river has caused low natural levees to form adjacent to the river channel in this area.

Down the valley from the moraine ridge, the terrain of the Cowlitz River valley floor, as well as that of the Cispus River, which enters from the east-southeast about 1 mile above the proposed dam, is one of undulating to gently rolling hills and terraces. The river is moderately to deeply incised in this area. Thus, the flood plain is narrow to nonexistent, and the surrounding hills and terraces rise relatively steeply, and in some cases vertically, from the river channel. About three-fourths of a mile downstream from the confluence with the Cispus River and about one-fourth of a mile upstream from the proposed damsite, the Cowlitz River enters a narrow, steep-sided valley. This valley is a relatively new route for the river, and lies south of and parallel to the broader Ancestral Valley, rejoining it about 2 1/2 miles downstream from the dam site. The two valleys are separated by a pair of high, isolated, steep-sided hills.

The river has cut a steep-sided channel through the glacial and alluvial deposits to bedrock in the young valley floor. Thus, at the proposed dam site, and for several hundred yards downstream, the river now flows within a deep, narrow channel carved in the bedrock valley floor. Flood flows through the constricted valley bottom have kept the bedrock riverbanks relatively clean of sediments and vegetation.

The proposed transmission line corridor would extend northward about 1 3/4 miles, from a saddle between the two hills that separate the Cowlitz River Valley and the Ancestral Valley, across the relatively level Ancestral Valley floor; would go about 2 miles on rough terrain over a steep mountain ridge into Rainy Valley; and would then go across the relatively level valley floor to the proposed substation.

The primary exposure of bedrock at the proposed project occurs in the young valley in the area of the proposed dam site. The rock is of volcanic origin, and consists of interbedded andesite lava and agglomerate, with occasional volcanic sedimentary rocks (Converse Ward Davis Dixon, 1980). The andesite lavas are hard, massive, fine-grained to porphyritic rocks. The agglomerates are hard to medium hard, massive rocks. They consist of cemented fragments of older volcanic rocks that formed as hot, dry, pyroclastic flows, or as mudflows of saturated volcanic debris. The sedimentary rocks vary from hard to very soft, and range from fine-grained tuffaceous shales and sandstone to coarse conglomerates that were deposited between episodes of volcanic activity. The only other outcrops of any size in the project area are some volcanic exposures on the south bank and bed of the river, about 4 1/2 miles upstream of the dam site.

Since the most recent glaciation in the proposed project area, the area has, on several occasions, been blanketed by pumice that erupted from Mount St. Helens and was carried to the area by southwest winds (Fowler and Ness, 1954). Soils on upland hills and terraces, at elevations above the flood waters of the Cowlitz River, are composed almost entirely of pumice fragments, varying from the size of a small pea to more than 2 inches in diameter. These soils are usually very loose and porous, and average between 2 1/2 and 4 feet in depth to underlying sand and gravel. On slopes, these soils commonly consist of well-drained pumicy sandy loams. In depressions and other poorly drained areas, the upland soils are usually pumicy loam. On the rough, mountainous ridge between the Ancestral Valley and Rainy Valley, the pumice layer commonly ranges from a few inches to several feet deep on permeable, well-drained, heavy silty clay loam subsoils.

Alluvial deposits of silt and sand, derived from volcanic material and rock flour from glaciers at the river's headwaters, have accumulated on the floodplain upstream of the moraine ridge, with occasional interlayered blanketing deposits of Mount St. Helens' pumice (Fowler and Ness, 1954). The floodplain soils are naturally fertile. The surface soils on the floodplain are fine sandy loam and silt loam, resting abruptly on a 4-to 10-inch layer of loose, porous pumice that occurs from 6 to 18 inches below the surface. The soils on the natural levees and other well-drained, fairly level to gently undulating areas of the floodplain 10 to 20 feet above the normal stage of the river, are generally classified as Siler Series Soils. The pumice layer beneath the Siler Surface Soils is abruptly underlain by stratified fine sandy loam, fine or very fine sand, silt loam, and occasional lenses of silt. Areas having Siler Soils have been designated as Prime Agricultural Lands (R. Pringle, Soil Scientist, U.S. Soil Conservation Service, December 3, 1981, personal communication). Soils on nearly level, poorly drained areas of the floodplain are classified as Schooley Series Soils. The Schooley Series' pumice layer is underlain by silty clay, or silty clay loam that is stratified with fine sand, silt, and clay. Although areas having Schooley Soils are not designated as Prime Agricultural Lands, primarily because of their

poor natural drainage, the installation of drainage systems has often allowed good crop production on Schooley Soils (R. Pringle, December 3, 1981, personal communication).

3.1.1.2 Geologic Hazards and Problems

Existing and potential geologic hazards at the proposed Cowlitz Falls Project include earthquakes, volcanic activity, subsurface seepage, erosion, and landslides.

No active or inactive geologic faults are known to occur within the proposed project area, although ground shaking caused by earthquake activity outside the project area may occur. Seismic risk evaluation is most applicable to the design of the proposed project, and is discussed in Section 2.1.11.

A preliminary assessment by McBirney (1980) suggests that the most likely potential volcanic hazards that could affect the proposed project would be earthquakes (see Section 2.1.11), ashflows, and mudflows or floods. Large ash falls would probably be the result of eruptions at Mount Rainier or Mount St. Helens. Mudflows and floods could originate at any of the headwaters of the Cowlitz or Cispus Rivers because of heavy rainfall on ash-covered slopes, or as a result of the rapid melting of ice and snow that might accompany volcanic activity at Mount Rainier, Mount Adams, or Mount St. Helens. The mudflows, however, would be expected to be confined to the upper headwater areas, and the impacts of associated floods would be expected to be largely absorbed by the broad valley floor upstream of the project area (McBirney, 1980).

Water flowing from springs and seeps may indicate the presence of buried seepage paths through the outwash deposits in the Ancestral Valley. Permeable strata, such as buried kames, eskers, pumice layers, or other sand and gravel deposits, are likely to occur within the outwash deposits in the Ancestral Valley. Springs and seeps occur along the north bank of the river downstream of the dam site, near the base of the slope, below the outwash-filled saddle between the two isolated hills that separate the present young Cowlitz River Valley from the Ancestral Valley.

The potential for soil erosion in the proposed project area is minimized by the general ability of the soils to take up water, and by the tendency for rapid and abundant regrowth of vegetation on cut-over land. Erosion in the proposed project area consists primarily of bank erosion along the meandering Cowlitz River channel, on the floodplain upstream of the moraine.

A large ancient landslide mass lies on the steep south side of the valley, about 7 miles upstream of the proposed dam site. The valley wall had apparently been made excessively steep by the carving action of a glacier that once occupied the valley. When the glacier melted, the stabilizing support that had been provided by the glacier ice was removed, and the slide occurred.

The slide apparently took place more than 10,000 years ago, prior to the deposition of glacial outwash deposits that partially cover the toe of the slide (Converse Ward Davis Dixon, 1980). Although minor slumping within the slide mass may have occurred after the initial slide, the Applicant reports that no evidence of present-day major slope instability problems has been found. The potential for landsliding within the proposed project boundary is relatively low, except for the bank sloughing that accompanies bank erosion along the river.

3.1.2 Land Use

3.1.2.1 Existing Uses

Existing land uses within and immediately adjacent to the proposed project boundary are shown in Figure 3-1. Table 2-3 identifies the approximate acreages of proposed project lands by general land use or ownership categories. The two dominant land-use categories in the project area are commercial timber and agricultural lands.

The commercial timberland is owned primarily by timber and wood products companies. The timberland is mostly second growth forest and contains Douglas fir, which is the prime commercially harvested tree in the area. A more detailed description of the vegetation of these forested areas is given in Section 3.1.5.1. Various stages of timber management can be seen on adjacent land parcels, including mature growth trees ready to be harvested, current cutting operations, previously clear-cut areas, and reforestation areas.

Lands classified as agricultural are privately owned and include cultivated land, unimproved pasture, rangeland, and small woodlots. Most farms on these lands are relatively small, and some produce hay and others cattle feed. Most of the agricultural land, including two dairy farms, is clustered at the upper end of the proposed project area. Some of the land classified as agricultural is generally floodplain or wetlands, although a system of drainage ditches has been used to reclaim some of this area for farming use. No farm dwellings, buildings, or other structures would be located within the proposed project boundary.

Other land-use classifications within the proposed project boundary include rural land, Washington State DNR land, and Tacoma City Light land within the Mossyrock Development of the Cowlitz Hydroelectric Project (FERC No. 2016). These lands are generally in a natural state; they contain no dwellings or permanent structures, and have few fences and other improvements. Although some U.S. Forest Service lands in the Gifford Pinchot National Forest are located in the proposed project vicinity, none would be located within the proposed project boundary. The land uses within the proposed transmission line ROW are primarily rural lands and commercial timberland in private ownership.

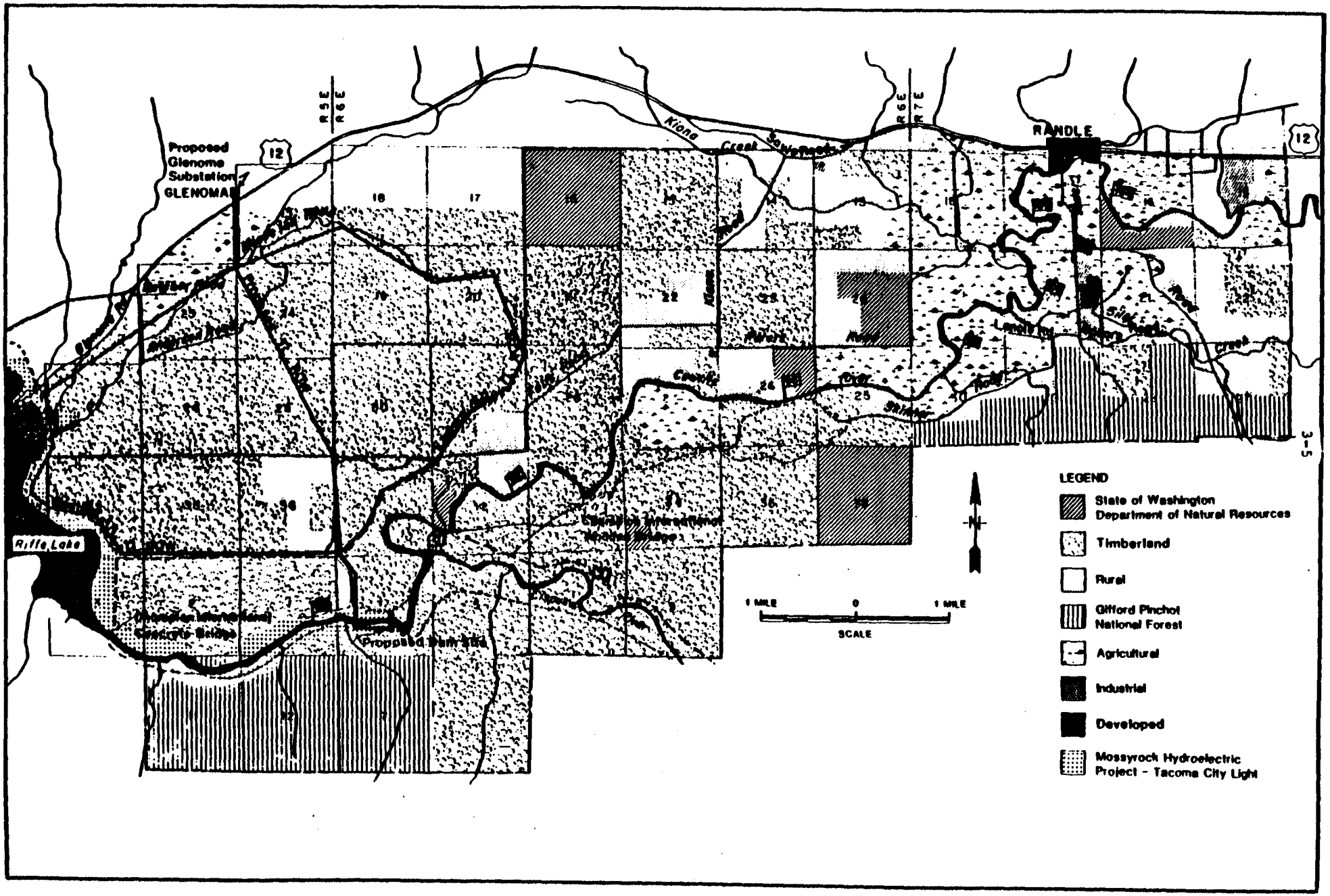


Figure 3-1. Generalized land use map of the proposed project area and adjacent land (Source: Application, Exhibit W, as modified by Staff).

The nearest community in the project area is the town of Randle, located on U.S. Highway 12, about 1 mile north of the uppermost end of the project boundary.

The majority of the access roads to and from the proposed project area are privately owned and maintained by Champion International. The actual ownership of the roads in the project area is shown in Figure 3-2.

Lewis County does not have either comprehensive zoning or a land use plan. The lands within 200 feet of the shorelines of the Cowlitz and Cispus Rivers have been designated as part of the rivers of statewide significance by the county under the State Shoreline Management Act of the 1979 Revised Code of Washington State. These lands are also included under a county-implemented Shoreline Master Program, which limits the amount of timber that can be harvested over a 10-year period, and requires that development within the 100-year floodway follow Federal guidelines. The shoreline areas within the proposed boundary are classified in the Lewis County Shoreline Master Program as "conservancy," and a conditional use permit would be required for the development of the proposed project.

3.1.2.2 Existing Recreation

The major recreational activities in the proposed project area are informal camping and bank fishing for salmon, trout, and whitefish. Bank fishermen use the Cowlitz and Cispus Rivers wherever access is possible; the areas which receive the heaviest usage for camping are the wedge of land located near the confluence of the two rivers and the area in the vicinity of the Champion International concrete bridge.

Hunting for game birds and small and large mammals is a locally popular recreational pursuit within the project area. Species sought by hunters include ruffed grouse, hare, elk, and deer. The scouting of deer and elk is also popular. The favorite hunting lands within the proposed project area are those bordering on the two rivers near their confluence (Wood et al., 1980).

Other recreational activities in the proposed project vicinity include kayaking on the Cowlitz River upstream of the confluence with the Cispus River, rafting on the rapids near the proposed dam site, and hang gliding at Dog Mountain, approximately 3 miles northwest of the proposed dam site.

U.S. Highway 12 is the primary transportation route to the proposed project area from the more populated western end of Lewis County, where the cities of Chehalis and Centralia are located.

As shown in Figure 3-3, Lewis County has a mixture of existing public recreational facilities and areas operated by Federal, state, and local agencies. Table 3-1 identifies, by

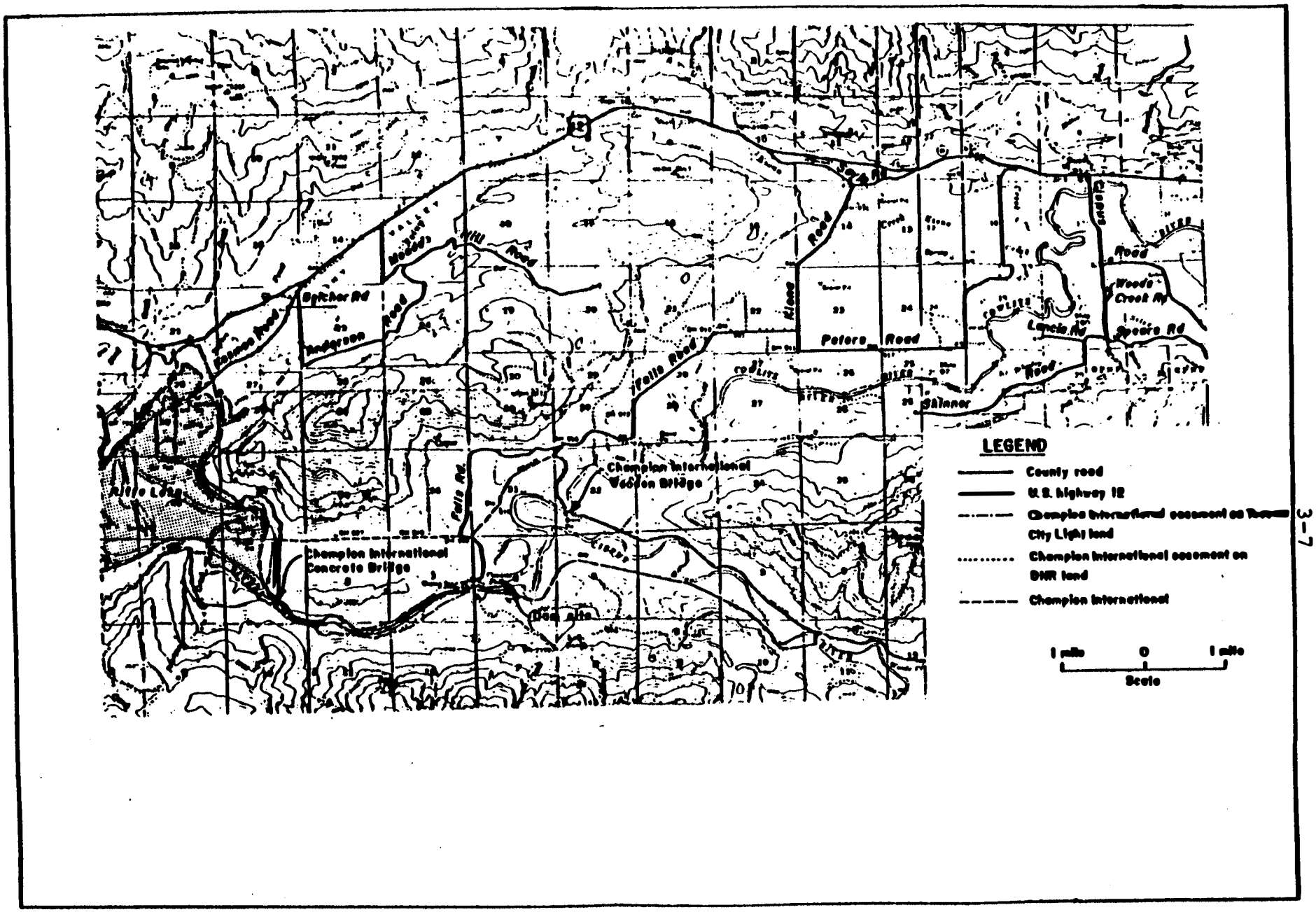


Figure 3-2. Ownership of site access roads for proposed project (Source: Application, Exhibit W).

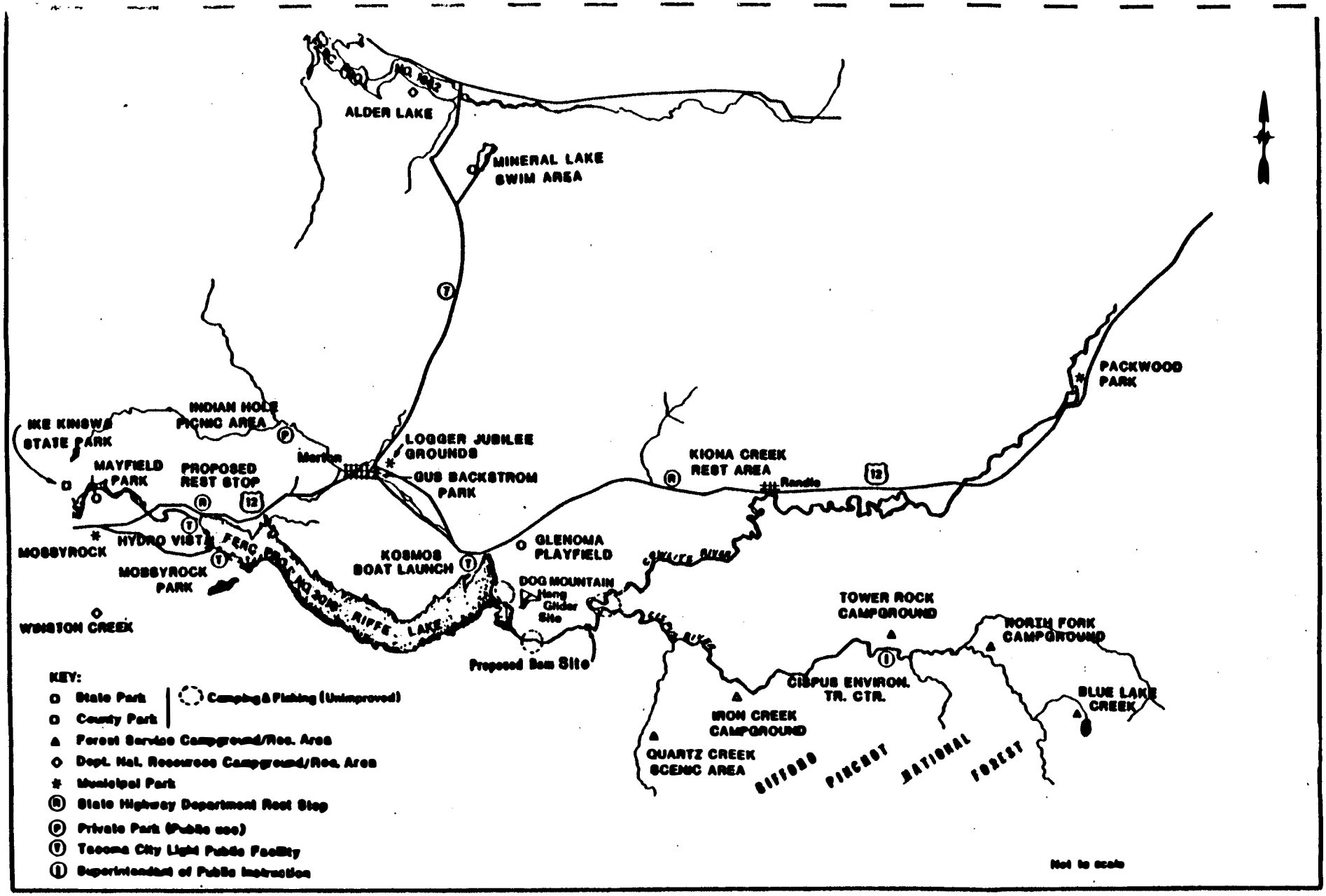


Figure 3-3. Existing public recreational facilities and areas in Lewis County (Source: Application, Exhibit W, modified by Staff).

Table 3-1. Lewis County recreational inventory. 1/

Category	Local	State	Federal	Private	Total
Number of recreational sites	66.0	17.0	19.0	27.0	129.0
Total acres	2,102.3	111,361.6	483,172.0	4,440.0	601,075.9
Designated acres	2,102.3	1,555.2	99,197.0		102,854.9
Developed acres	575.3	155.2	363.0		1,093.2
Undeveloped acres	1,527.3	1,400.4	98,834.0		101,761.7
Multiple use acres		109,806.0	383,975.0		493,781.0
Frontfeet freshwater shoreline	86,737.0	104,595.0	22,120.0		213,452.0
Onsite parking	4,201.0	1,251.0	256.0		5,708.0
Offsite parking	39.0	3.0			42.0
Athletic fields	76.0	1.0			77.0
Acreage of athletic fields	209.3	1.2			210.5
Lineal feet of swimming beach	695.0	300.0	1,000.0	200.0	2,195.0
Paved launch lanes	5.0	6.0			11.0
Unpaved launch lanes	2.0	1.0	1.0		4.0
Total launch lanes	7.0	7.0	1.0	2.0	17.0
Boat moorage slips/spaces				100.0	100.0
Boat moorage buoys					
Boat-car/trailer parking	120.0	482.0			602.0
Fishing -- shore access	12.0	9.0	18.0		39.0
Fishing — pier/dock	2.0				2.0
Picnic tables in day use areas	485.0	186.0	360.0		1,031.0
Picnic shelters	18.0	7.0			25.0
Camping units	141.0	189.0	625.0	1,686.0	2,641.0
Miles -- hiking trails	11.4	19.4	402.0	35.0	467.8
Miles -- bridle trails			335.0	25.0	360.0
Miles — bicycle trails	4.0			40.0	44.0
Miles — motorcycle trails	4.0	9.8	152.0		164.8
Miles -- four-wheel drive trails					
Miles — snowmobile trails	4.0				4.0
Miles -- cross country ski/ Snowshoe trails	4.0		89.0		93.0
Designated trailheads	7.0		5.0		12.0
Parking at trailheads	237.0				237.0
Nature trails	7.0	1.0	1.0		9.0
Horseshoe pits	6.0				6.0
Arboretums	3.0				3.0
Day camp areas	5.0				5.0
Group camp facilities	5.0	2.0	4.0		11.0
Environmental learning centers	5.0				5.0

1/ (Source: Washington State Interagency Committee for Outdoor Recreation, 1979, as modified by Staff.

categories and sponsors, the inventory of existing recreational facilities in Lewis County (Washington State Interagency Committee, 1979).

The boundary of the Gifford Pinchot National Forest, which provides numerous multiple-use public recreational areas and facilities, abuts the proposed project boundary near the proposed dam site.

Table 3-2 contains recreational visitation figures extracted from the FERC Form 80's, Licensed Projects Recreation Reports, for two developments of the Cowlitz River Project (FERC No. 2016), Mayfield and Mossyrock (Riffe Lake), which are located just downstream of the proposed project. This table shows the degree of utilization of existing recreational facilities, and provides a baseline for comparison with the proposed project's visitation estimates found in Exhibit R of the Application.

The Cowlitz and Cispus Rivers from their confluence upstream have been listed by the Heritage Conservation and Recreation Service in a nationwide rivers inventory (1980). The inventory identifies "those outstanding rivers and river segments still remaining in a relatively natural, undeveloped condition" that are suitable for further study, to determine if they would be potentially eligible for inclusion under Section 5(d) of the Wild and Scenic Rivers Act (P.L. 90-542, as amended).

3.1.3 Meteorology

3.1.3.1 Climate

The climate of the area is considered to be midlatitude, west coast, marine type, which is characterized by dry cool summers and mild moist winters. The average minimum and maximum temperatures for the summer months (June through August) are 45°F and 70°F, with a normal daily range of between 25°F and 30°F. During the winter months (December through February), the normal range of temperature is between 10°F and 15°F, whereas the average minimum and maximum temperatures for this time of the year are 25°F and 40°F (U.S. Department of Commerce, 1968).

The amount of precipitation that the project area receives during the year is controlled by the microclimatic conditions that occur in the mountainous region of the northwest. In general, the area of the Cascade Mountains that encompasses the project area receives between 50 and 112 inches of rain annually. The greatest amount of precipitation falls from November through February; the least amount of rain falls during the late spring and the summer months of May through August (U.S. Department of Commerce, 1968).

According to data obtained by the Applicant from the National Weather Service for the period from 1966 to 1980

Table 3-2. Recreational visitation at the Cowlitz River Project (Source: Federal Energy Regulatory Commission, 1973, 1975, 1977, 1979, 1981).

Years (calendar)	Annual visitation (in 1,000 of recreation days) 1/ Reported	Ultimate (est.)	Percentage of estimated capacity reached	Peak weekend (in 100's of recreation days) Reported	Ultimate (est.)
Mossyrock Development					
1972	115	178	65	14	21
1974	24	142	17	6	42
1976	24	142	17	6	42
1978	67	160	42	8	24
1980	24	142	17	6	42
Mayfield Development					
1972	229	340	67	27	40
1974	320	535	60	111	170
1976	320	535	60	111	170
1978	315	515	61	108	160
1980	360	535	67	171	220

1/ A recreation day is a visit to the project by one individual for any portion of a 24 hour day.

for the Randle area, there is little significant difference in the monthly fog frequency from one month to the next. The fog that frequently occurs at Riffe Lake is usually dissipated by mid-morning, and lasts the entire day for only 1 to 2 days a year.

3.1.3.2 Air Quality

The air quality of the project area ranges from good to excellent. Point sources of air pollution located in the Randle area consist primarily of woodwaste burners associated with the lumber industry. The Applicant states that a total of 30 emission sources has been identified by the Washington Department of Ecology. The majority of these sources is comprised of wigwam woodwaste burners. Woodburning stoves also contribute to the degradation of the air quality.

The Environmental Protection Agency was empowered by the Clean Air Act of 1970 to classify various areas of the country according to the purity of air quality. Class I areas are those that have exceptionally good air quality, while Class II and Class III areas have poorer air quality. Mount Rainier National Park, Mount Adams Wilderness Area, and Goat Rocks Wilderness Area are all Class I areas. These areas are located just east of the proposed project. The Randle area is a Class II area.

3.1.3.3 Noise Levels

The two major sources of noise in the immediate vicinity of the proposed project would be traffic on major highways and the operation of sawmills and wood products plants. Some noise would also be caused by the equipment used in the timber harvesting operations that occur throughout the project area.

3.1.4 Aquatic Environment

3.1.4.1 Water Quality and Quantity

Water Quality

The water quality characteristics of a watercourse, both chemical and physical, are primarily a function of the geology and land uses occurring in a watershed. The Cispus and Cowlitz watersheds are devoted to agriculture, forest products industries, timber harvesting, and recreational use. Pollutant inputs from these kinds of land uses are dependent upon surface runoff. Thus, in the absence of point sources of pollution, and during periods of low flow, the water quality of the Cowlitz and Cispus Rivers reflects the chemical nature of the soils in the watersheds. During periods of highflow, however, water quality is degraded through the introduction of pollutants from the land surface. Nutrients and sediments from cropland, along with bacteria from pastureland and poorly drained septic fields, are introduced into the rivers by surface runoff. In addition, runoff from the wood storage areas of various lumber industries contributes wastewater

with high levels of biochemical oxygen demand (BOD). The periodic inputs of pollutants during periods of precipitation account, in part, for the variability of such water quality parameters as the total coliform bacteria, phosphorus concentrations, and nitrogen concentrations listed in Table 3-3.

The water quality of the Cispus River meets the state standards for Class AA designation. These criteria are that fecal coliform concentrations should not exceed 50 cells per 100 ml, pH should be between 6.5 and 8.5, and dissolved oxygen concentration should exceed 9.5 mg per liter (Washington Department of Ecology, 1977). The Cowlitz River, based upon such water quality parameters as fecal coliform concentration, pH, and dissolved oxygen, as well as on the uses that the river could accommodate, could also meet the state criteria for a Class AA stream. The uses that a Class AA stream could accommodate include: water supplies for domestic, industrial, and agricultural use; wildlife habitat and stock watering; general recreation and aesthetic enjoyment; and fish production, rearing, and harvesting.

The May 18, 1980, eruption of Mount St. Helens deposited ash in the upper reaches of the Cispus and Cowlitz watersheds. Ash deposits up to 2 inches thick were observed on the southern boundary of the Cispus watershed. The exact impacts of the ash deposits on the water quality of the project area are not known at present; preliminary reports have shown, however, that the ash will chemically alter water percolating through it. Leachate of volcanic ash collected near Moses Lake was found to contain significant concentrations of such nutrients as ammonia, nitrate, and phosphate (Taylor and Lichte, 1980). According to the U.S. Geological Survey (1981), lakes located within 9 miles of Mount St. Helens showed marked increases in conductivity and nutrient levels, but a lake 37 miles away failed to show any significant changes in water quality. The proposed reservoir would be located approximately 20 miles north of the volcano.

Debris

The Cowlitz and Cispus Rivers carry a large load of organic debris (boles and slash) during periods of high flow. Staff's aerial and ground inspection of these rivers in the proposed project area, and in the upper reaches of the watershed, indicated that trees or slash ranging from 4 to 90 feet in length are transported down these watercourses during high flow periods. Large amounts of organic debris had collected in the extinct meanders of the Cowlitz River that are located near the main channel of the river. Many large trees with attached root systems were scattered across the braided portions of the river channel; "debris islands," usually comprised of accumulated debris on one large tree, are also common along the channel. Relatively large amounts of debris apparently enter the Cowlitz River from small tributaries that

Table 3-3. Water quality data for Cowlitz River near Randle (depth 1 foot)[Source: EPA Storet System].

Parameter	Units	Number	Maximum	Minimum	Mean	From	To
						Mo. Day Yr.	Mo. Day Yr.
Temperature	° Centrigrade	72	10.0	1.9	0.1	11/0/60	4/9/79
Flow (inst.)	cfs	16	21,200	1,040	5,257	11/0/60	1/29/74
Turbidity	JTU	51	60.0	0.0	0.2	9/19/73	9/13/78
Conductivity	Micromho (at 25°)	73	79.0	27.0	53.1	11/0/60	4/9/79
Dissolved oxygen	mg/l	61	13.4	9.9	11.7	9/19/73	5/0/79
pH	Standard Units	72	7.0	6.0	7.3	11/0/60	4/9/79
CO_2	mg/l	23	5.4	0.6	2.3	10/16/74	9/16/75
Total alkalinity	mg/l	30	30.0	14.0	22.9	11/0/60	9/16/75
Bicarbonate	mg/l	30	36.0	17.0	27.0	11/0/60	9/16/75
Total nitrogen	mg/l	19	0.49	0.05	0.17	12/19/73	4/9/79
Organic nitrogen	mg/l	20	0.59	0.0	0.12	12/19/73	4/9/79
Ammonia nitrogen	mg/l	43	0.20	0.0	0.05	12/19/73	4/9/79
Nitrite nitrogen	mg/l	2	0.01	0.0	0.005	12/19/73	2/20/74
Nitrate nitrogen	mg/l	2	0.06	0.05	0.055	12/19/73	2/20/74
Total nitrogen (Kjel.)	mg/l	20	0.64	0.00	0.015	12/19/73	4/9/79
Ortho phosphate	mg/l	43	0.12	0.00	0.33	12/19/73	4/9/79
Total phosphate	mg/l	50	0.99	0.01	0.06	9/19/73	4/9/79
Dissolved phosphate	mg/l	43	0.04	0.00	0.01	12/19/73	4/9/79
Total hardness	mg/l	30	40.0	13.0	21.0	11/0/60	9/16/75
Non-carbonate hardness	mg/l	30	12.0	0.0	1.0	11/0/60	9/16/75
Calcium	mg/l	30	14.0	3.0	6.0	11/0/60	9/16/75
Magnesium	mg/l	30	2.9	0.3	1.17	11/0/60	9/16/75
Sodium	mg/l	30	6.4	1.6	3.0	11/0/60	9/16/75
Potassium	mg/l	30	1.2	0.2	0.63	11/0/60	9/16/75
Chloride	mg/l	37	4.2	0.4	1.4	11/0/60	9/16/75
Sulfate	mg/l	37	4.2	0.4	2.1	11/0/60	9/16/75
Fluoride	mg/l	15	0.1	0.0	0.53	11/0/60	9/17/70
Silica	mg/l	14	17.0	9.6	13.7	11/0/60	9/17/70
Chromium	mg/l	2	0.0	0.0	0.0	3/24/69	11/19/69
Copper	mg/l	2	0.0	0.0	0.0	3/24/69	11/19/69
Silver	mg/l	4	10.0	10.0	10.0	3/15/77	9/13/77
Zinc	mg/l	2	0.0	0.0	0.0	3/24/69	11/19/69
Total coliform	per 100 ml	51	1,600	2.0	161.0	9/19/73	9/13/78
Fecal coliform	per 100 ml	22	50.0	1.0	0.4	10/16/74	9/16/75
Dissolved solids	mg/l	10	52.0	31.0	44.1	3/24/69	9/17/70
Suspended solids	mg/l	17	10.30	1.0	23.6	9/21/76	6/3/79

drain clearcut areas. Much of the debris in excess of 50 feet in length probably comes from stands of old-growth timber located along the banks of the Cispus and Cowlitz Rivers.

Riffe Lake now accumulates approximately 10 acres of debris annually. During the 1977 flood, when the flow of the Cowlitz River exceeded 89,000 cfs, 80 to 90 acres of debris accumulated in Riffe Lake (Application, Exhibit W).

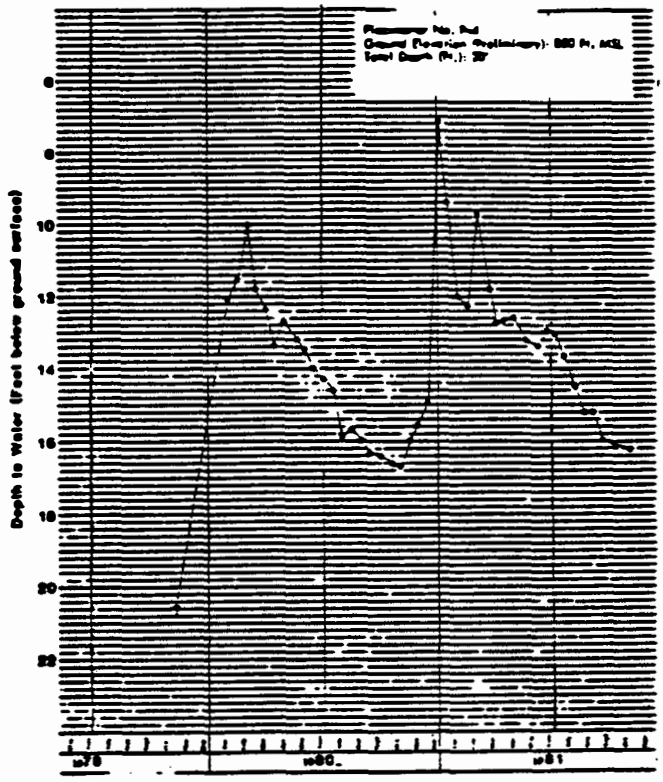
Sediment

The Applicant's investigation showed that the annual sediment load of the Cowlitz River was approximately 911,000 tons per year under nonflooding conditions and approximately 6,188,000 tons per year under flooding conditions (Application, Exhibit W). A significant amount of the sediment that is transported by the river is currently deposited in the headwaters of Riffe Lake. The sediment that is transported by the Cowlitz originates from a variety of sources. The glaciers that exist in the Mount Rainier and Mount Adams areas of the Cowlitz River watershed yield significant amounts of sediment. Runoff from disturbed land surfaces and from streambank erosion, particularly in the Randle area, also contributes to the sediment loads of the river.

Groundwater

The groundwater table, according to two years of collected data, ranges from 2 to 18 feet below the land surface in the Big Bottom area. Seasonal variations in the water table range from 3 to 4 feet, with the lowest elevation occurring during July, August, and September. The fluctuations of the water table were found to correlate closely with precipitation, as indicated by the piezometer graph in Figure 3-4. During months of high precipitation, a marked increase in the height of the groundwater table results in response to the infiltration of rainwater through the permeable fluvial deposits and into the saturation zone. Figure 3-5 demonstrates this phenomenon very clearly, particularly for the latter portion of 1980 and for 1981. The peak monthly precipitation occurring during November and December 1981 resulted in the maximum heights of the water table. Peak amounts of precipitation occurring in February, April, and June corresponded closely to peaks in the water table elevation for those months. In the following months, March, May, and July, when a lesser amount of precipitation occurs, the water table elevation declines in response to the discharge of groundwater to streams and drainage channels. The close response of the fluctuations of the water table to precipitation indicates that precipitation is the principal source of recharge to the water table in the project area.

The permeability of the water-bearing fluvial deposits of the Big Bottom area ranges from 3×10^{-6} to 6×10^{-3} centimeters per second. This is considered to be the general range of permeability for unconsolidated deposits such as glacial till and silty sand



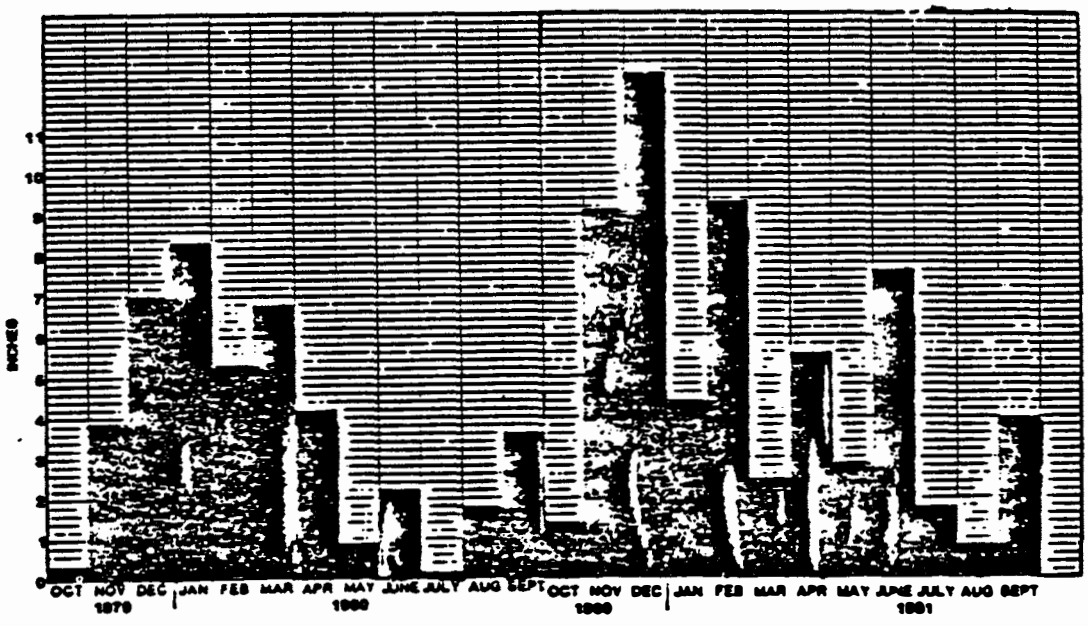


Figure 3-4. Water surface elevation graph for piezometer (above) and precipitation data (below), for sampling period of October 1979 to September 1981 (Source: Letter from R. W. Beck and Associates to Lon Crow of FERC staff, November 24, 1981).

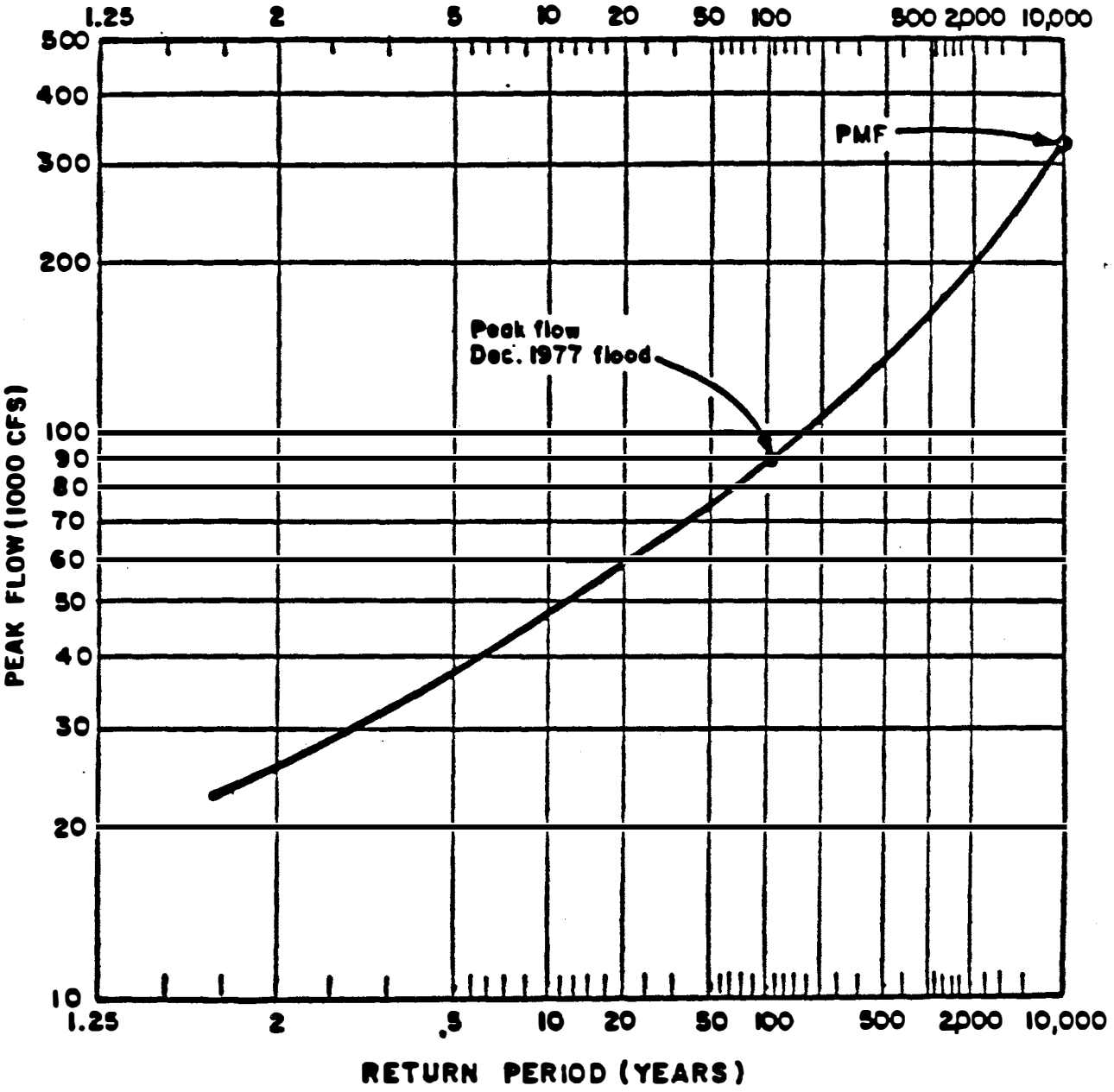


Figure 3-5. Frequency of flood flows for the Cowlitz River (Source: Application, Exhibit W).

(Freez and Cherry, 1979). The permeability of these deposits appears to be enhanced by the presence of a pumice layer that is quite variable in thickness and depth. This deposit is believed to account for a significant amount of the drainage of low-lying areas in the Big Bottom area.

Water Quantity

The discharge of the Cowlitz River is governed by the occurrence of surface runoff, groundwater discharge, snowmelt, and glacial melt. The average annual flow of the Cowlitz River is approximately 4,610 cfs, based upon 40 years of hydrologic data (Table 3-4). As indicated in the table, high flows occur between the months of November and June, and the highest peak flows occur as a result of winter rain storms in November, December, and January. The average monthly flow for the high flow period is 5,744 cfs. Low flows occur from July through October, and the average monthly flow for this period is approximately 2,342 cfs. The highest flow on record, 90,000 cfs, was on December 24, 1977; the lowest flow on record, 518 cfs, was on November 29, 1952.

As a result of the topography of the area and the hydrologic characteristics of the watershed, the Big Bottom area is flooded frequently. As indicated in Figure 3-5, the high flow of December 1977 represents a 100-year flood. The 5- and 10-year floods occur at flows of 39,000 cfs and 49,000 cfs, respectively. According to the Applicant, significant amounts of overbank flooding occur in the Randle area at a flow of 35,000 cfs or higher. Thus, overbank flooding in the Randle area can be expected to occur about once every 5 years. During the 100-year flood, when the flow of the Cowlitz River approached 90,000 cfs, approximately 3,700 acres of land in the Randle area was flooded. Maximum water depths were 16 feet at Siler Creek, 15 feet at Kiona Creek, and 14 feet at Schooley Creek.

The primary uses for surface waters in the proposed project area are irrigation and domestic use, and the majority of the sources of water used for these purposes are springs and tributaries of the Cowlitz River such as Siler Creek and Kiona Creek. Water is obtained directly from the Cowlitz River for irrigation use only. Limited amounts of water in the proposed project area are used for fish propagation and industrial fire protection. The maximum amount of water that is devoted to consumptive use in the proposed project area is approximately 8.0 cfs, most of which is used for irrigation.

3.1.4.2 Fishery Resources

Resident Fishes

The Cowlitz and Cispus Rivers and tributary streams that would be affected by the proposed project are coldwater fisheries habitat. Both rainbow (Salmo gairdneri) and cutthroat trout (S. clarki) are found in the mainstem Cowlitz and Cispus Rivers, although cutthroat are also widely distributed in the tributary

Table 3-4. Discharge data for Cowlitz River at U.S. Geological Survey Gauge Station No. 1423340 (Source: Application, Exhibit W).

YEARS	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	AVG
1929	3234	1710	1211	2069	2332	2444	2081	1281	3446	3981	10411	9146	3612
1930	3495	1811	1168	954	800	2503	1985	8097	4041	6314	5111	4331	3384
1931	2308	1352	1814	1156	1517	1540	4194	3751	4186	7289	6198	3557	3178
1932	1985	1244	1039	1502	3045	3021	4027	4268	8207	7508	9466	9178	4541
1933	4309	1727	999	1439	9100	5719	6052	2369	3743	5161	7667	13320	5151
1934	7296	3172	2259	5211	5696	21277	13362	5299	6789	6416	4377	2760	6993
1935	1817	1286	1086	3562	8710	6640	5922	4907	3444	3821	7249	7237	4640
1936	3664	1705	1307	962	1130	1699	5701	2597	4824	6832	11864	9082	4280
1937	3242	1676	1258	902	610	3425	1599	2198	4662	7809	9768	11449	4850
1938	4547	1924	1519	1413	8293	7100	6929	2922	3794	7521	8596	6263	5068
1939	2882	1565	1185	1254	2867	4606	4872	3901	4325	5688	7111	5527	3815
1940	3258	1532	1204	1145	1461	5163	3137	6129	5655	4774	5958	2870	3523
1941	1619	1180	1092	1216	2267	3577	3141	2028	2029	2163	3383	2863	2213
1942	1725	1197	1896	3096	3863	7579	2679	3038	2510	3811	4597	6403	3533
1943	3482	1765	1150	938	7183	6651	3995	5230	3928	8816	6494	7468	4759
1944	6998	1945	1269	1298	1801	3238	2617	2876	2670	3477	4927	4095	2934
1945	1976	1247	1352	1169	1961	2539	5225	5172	3389	4563	10787	5627	3751
1946	2646	1451	1528	1398	4505	5790	6132	4126	4773	5582	11123	9119	4848
1947	5871	2197	1381	2389	5474	12365	4769	5912	3971	5671	6027	4022	5064
1948	2745	1442	1409	5045	7511	5121	5140	4007	3252	4208	9995	11699	5131
1949	4323	2249	1481	2450	6009	4197	1947	3618	5656	7497	13765	8736	4994
1950	4740	2228	1623	2291	6146	4913	4744	5934	7679	6474	9091	12751	5718
1951	7582	2925	1669	4275	8589	10547	5829	9487	3783	6791	8443	5957	6323
1952	3008	1607	1199	4210	4386	5179	2088	5014	2958	7087	8598	5939	4266
1953	3508	1686	1117	844	649	1100	11234	7721	3116	4715	7615	7119	4202
1954	5433	2179	1385	1577	3571	9417	5076	7137	4716	5999	9431	9275	5433
1955	7178	3091	1904	2179	4398	3640	3535	4252	2270	4185	7030	12448	4675
1956	6808	2709	1688	5605	10469	10898	5857	2720	4129	8670	13568	11079	7016
1957	6773	2564	1581	2491	4024	8988	2569	3959	6429	6302	9421	5189	5024
1958	2402	1501	1159	1171	1949	4861	5643	7084	3385	6107	9610	5626	4208
1959	2378	1517	1157	1835	10367	8984	9303	3612	3574	6300	7216	7621	5322
1960	3806	1677	2881	6303	9008	5967	2702	5597	4339	6291	8160	7738	5372
1961	3191	1717	1383	1742	7401	4452	6355	11003	6132	5852	8376	8565	5514
1962	3465	1805	1309	1661	2884	6069	6640	3888	2522	7643	5783	6424	4174
1963	3598	1976	1360	2493	7691	6676	3138	7563	3354	5458	5927	4157	4449
1964	2297	1515	1203	1291	4284	4270	5891	4029	3064	4538	7256	11767	4284
1965	6732	2994	1902	2347	3192	10256	8546	7574	4071	6527	6717	6256	5593
1966	3070	1748	1156	1118	2198	2613	3261	2311	4314	7146	8930	6251	3676
1967	3772	1704	1268	1398	3173	8032	7341	5531	3631	2894	8201	10050	4750
1968	4029	1767	1262	3695	4318	5533	6650	10573	5204	3693	5802	6604	4927
	3986	1957	1499	2725	6571	8955	5068	4968	4499	5797	8091	7409	4610

streams. Both species successfully spawn and rear in waters of the project area, and maintain self-sustaining populations. The Washington Department of Game (WDG) also periodically stocks hatchery-reared rainbow trout in the upper Cowlitz River and tributaries. Annual stockings of rainbow and cutthroat trout are made as part of the mitigation obligation of the City of Tacoma for the Mayfield and Mossyrock Projects. Wood et al. (1981) estimated that there were 1,240 cutthroat in the reach of the Cowlitz and Cispus Rivers to be inundated by the project, and 790 to 885 trout (rainbow and cutthroat combined) in the affected tributary streams. Cutthroat were the dominant species in the main river and tributaries.

Other common fishes of the Cowlitz and many of its tributaries include mountain whitefish (Prosopium williamsoni), largescale sucker (Catostomus macrocheilus), and sculpin (Cottus sp.). Less common fishes include western brook lamprey (Lampetra richardsoni), the bridgelip (Catostomus columbianus) and mountain sucker (C. platyrhynchus), northern squawfish (Ptychocheilus oregonensis), longnose dace (Rhinichthys cataractae), speckled dace (R. osculus), and largemouth bass (Micropterus salmoides).

Anadromous Fishes

Prior to the construction of Mossyrock Dam in 1968, the Cowlitz River and tributaries in the proposed project area were utilized for spawning and rearing by chinook (Oncorhynchus tshawytscha) and coho salmon (O. kisutch), steelhead trout (S. gairdneri), and sea-run cutthroat trout. As shown in Table 3-5, recorded annual escapements of salmon, including jacks, to the upper Cowlitz River through the Mayfield Dam fish facilities (1961-1968) ranged up to 20,671 spring chinook, 10,706 fall chinook, and 43,043 coho (Easterbrooks, 1980). An average of about 11,000 steelhead per year were passed at Mayfield during the same period (Buckley et al., 1979).

Since the completion of the Mossyrock Dam and the Cowlitz Salmon Hatchery, all anadromous fishes have been intercepted at the hatchery downstream of the Mayfield Dam, and adults have been held for hatchery spawning. Periodic stockings of adult and jack salmon have been made in the proposed project area in recent years, but these are usually done on an irregular basis when fish in excess of hatchery needs are available. Excess hatchery fry have also been stocked annually by the Washington Department of Fisheries (WDF). The average annual fry stockings from 1974 to 1978 were 2.4 million coho and 0.9 million chinook (Application, Exhibit W). These plants have resulted in the production of small numbers of smolt that pass downriver through Mossyrock and Mayfield Dams, and may eventually contribute to the anadromous fishery of the lower Cowlitz River. Most of the salmon, however, remain in the upper Cowlitz River and in Riffe Lake, providing a significant sport fishery for "landlocked" salmon.

Restoration of anadromous salmonid production to the upper Cowlitz River is under consideration by WDF. Possible programs would entail the stocking of adult salmon in the upper watershed

Table 3-5. Number of salmon passed by the Mayfield Dam fish facilities, 1961 to 1968. 1/

Year	Species		
	Spring chinook 2/	Fall chinook 2/	Coho 3/
1961	-	5,935	23,366
1962	3,738	2,798	22,701
1963	4,799	5,171	22,083
1964	13,617	10,335	25,546
1965	20,671	10,706	22,774
1966	11,691	10,265	43,043
1967	7,313	10,004	25,381
1968	8,440	7,866	18,059

1/ Easterbrooks, 1980.

2/ Includes adults and jacks.

3/ Only adults reported in 1961 to 1965; adults and jacks reported from 1966 to 1968.

for natural spawning, or stocking hatchery fry in the upper watershed. Either program would require the collection of emigrating smolt at the proposed Cowlitz Falls Dam, and transportation of these fish to the lower Cowlitz River downstream of all the dams. Returning adults would be intercepted at the Cowlitz Salmon Hatchery barrier dam, and either held in the hatchery or trucked to upriver locations for natural spawning. WDF and WDG estimated that the Cowlitz River watershed upstream of the proposed dam site could support a maximum adult production of 55,555 spring chinook, 63,818 fall chinook, and 202,262 coho, and an average of 12,900 steelhead and 6,000 sea-run cutthroat (Easterbrooks, 1980; Weller and Reed, 1980; Wood et al., 1981).

Sport Fishery

As previously mentioned, the "landlocked" salmon of Riffe Lake and the upper Cowlitz River support a sizable sport fishery in the immediate project area. Creel surveys conducted at various intervals from August 1979 through June 1981, indicated that about 86 percent of the fishing effort in the proposed project area occurs downstream of the dam site primarily in the vicinity of the Champion International concrete bridge at the head of Riffe Lake. This fishery likely intercepts salmon and trout ascending the Cowlitz River from Riffe Lake. A significant concentration of anglers also occurs at the confluence of the Cowlitz and Cispus Rivers, a popular informal camping area. Landowners upstream of the confluence also fish the mainstem Cowlitz River.

The combined angler effort estimated by the above surveys was 15,121 angler trips and 33,961 angler hours. A total catch of 23,521 fish was reported, 22,835 of which were salmon (Wood et al., 1981). An earlier creel survey of the Riffe Lake fishery (Tipping and Buckley, 1979) indicated that about 95 percent of the salmon taken by anglers were coho; the remainder were chinook. Rainbow and cutthroat trout have comprised a minor portion of the sport catch. The size range of salmon taken was 150 to 350 mm (6 to 14 inches) in length, with most in the 150 to 230 mm (6 to 9 inches) range. Most of the trout taken range from 200 to 350 mm (8 to 14 inches) [Tipping and Buckley, 1979].

3.1.5 Terrestrial Environment

3.1.5.1 Vegetation

The Cowlitz Falls Project site lies entirely within the Western Hemlock Vegetation Zone, as defined by Franklin and Dryness (1973). This vegetation zone extends from British Columbia south through Oregon on the west side of the Cascade Mountains. Coniferous forests, dominated by western hemlock on moist sites and Douglas fir on drier sites, represent the climax vegetation of this zone.

A variety of vegetation types have been identified in the project area. Generally these types can be grouped into one of four major land features: upland forest; lowland forest; wetlands/riparian; and agrarian/meadow.

The predominant land features in the project area are upland forest and agrarian/meadow. The lowland forest and wetlands/ riparian features are less prominent in the project area.

Upland Forest

Upland forest includes the following vegetative types: Douglas fir-pole size (second growth), red alder/Douglas fir, red alder, Douglas fir-sapling, western hemlock/big leaf maple, and clearcut forest. Generally, these types occur above elevation 880 feet msl. The exact location of each type within the project area is shown in Figure 3-6.

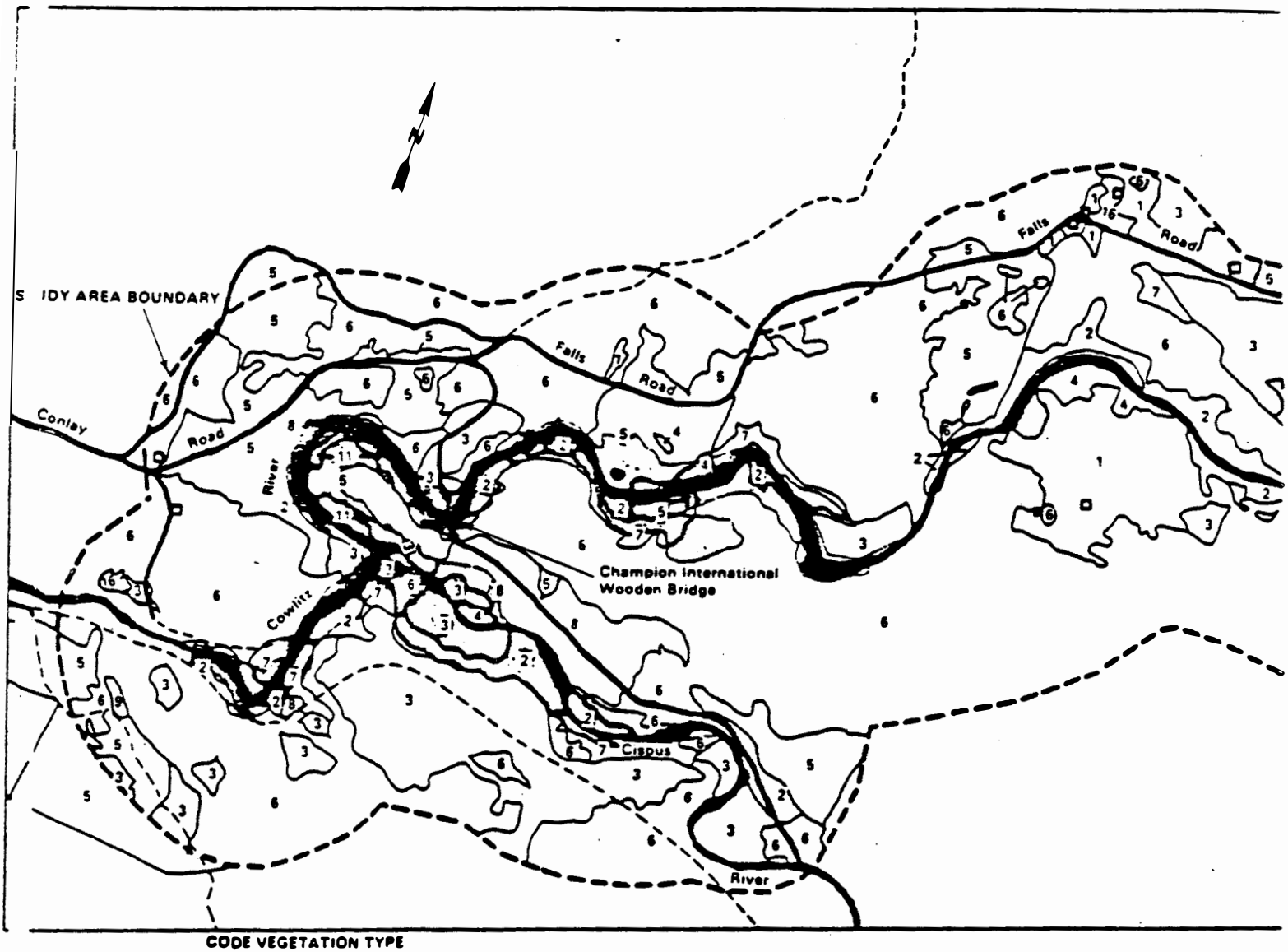
Three vegetative types of the upland forest, the Douglas fir-pole size, red alder/Douglas fir, and Douglas fir-sapling, together comprise most of this land feature, with the red alder/ Douglas fir type alone covering the majority of the area. These types generally represent three levels of succession for the Douglas fir (Pseudotsuga menziesii) forest. The Douglas fir-pole represents an old growth or late successional stand of Douglas fir; the red alder/Douglas fir type represents a middle successional stage; and the Douglas fir-sapling type is an early successional stage.

The Douglas fir-pole size and red alder/Douglas fir vegetation types are similar in terms of total plant species present, and in composition of dominant trees in the tree or overstory layer. Prominent tree species of both types include Douglas fir, western red cedar (Thuja plicata), western hemlock (Tsuga heterophylla), and red alder (Alnus rubra). Major differences between these two types and the Douglas fir-sapling type are in terms of major shrub and forb species. This species variation among the three types is shown in Table 3-6.

A fourth upland forest vegetative type is the western hemlock/big leaf maple. This type occurs on moist slopes, and is found at only three sites along the southern shore of the Cowlitz River, just upstream from the confluence of the Cowlitz with the Cispus River. Western hemlock, big leaf maple (Acer macrophyllum), western red cedar, and Douglas fir comprise the major trees in this type.

Some areas of the upland forest feature are occupied by the red alder vegetation type. Red alder is the major tree species, but western hemlock and big leaf maple are also prominent.

Large clearcut areas are common in the upland forest. All merchantable timber was removed from these lands first, followed by removal of the remaining trees. After clearcutting, these lands are normally planted with Douglas fir, and competition species, such as the red alder, are removed on a regular basis to maintain pure stands of Douglas fir.



CODE VEGETATION TYPE

1 Grass/Hay/Pasture
2 Big leaf maple/Red alder
3 Douglas fir-pole size
4 Big leaf maple
5 Clearcut
6 Red alder/Douglas fir
7 Red alder
8 Douglas fir-sapling
9 Grass/Sedge/Juncos
10 Swamp
11 Western hemlock/Big leaf maple
12 Cottonwood
13 Willow
14 Hazel/Blackberry/Grass
15 Sandbar
16 Residential/Developed
Residential Structure
Existing surface water
Proposed reservoir EL 886
Hard Surface or Gravel Roads
Dirt Roads

1 MILE 0 1 MILE
SCALE

ure 3-6. Locations of major vegetation types within the proposed project area (Source: Application, Exhibit W, as modified by Staff).

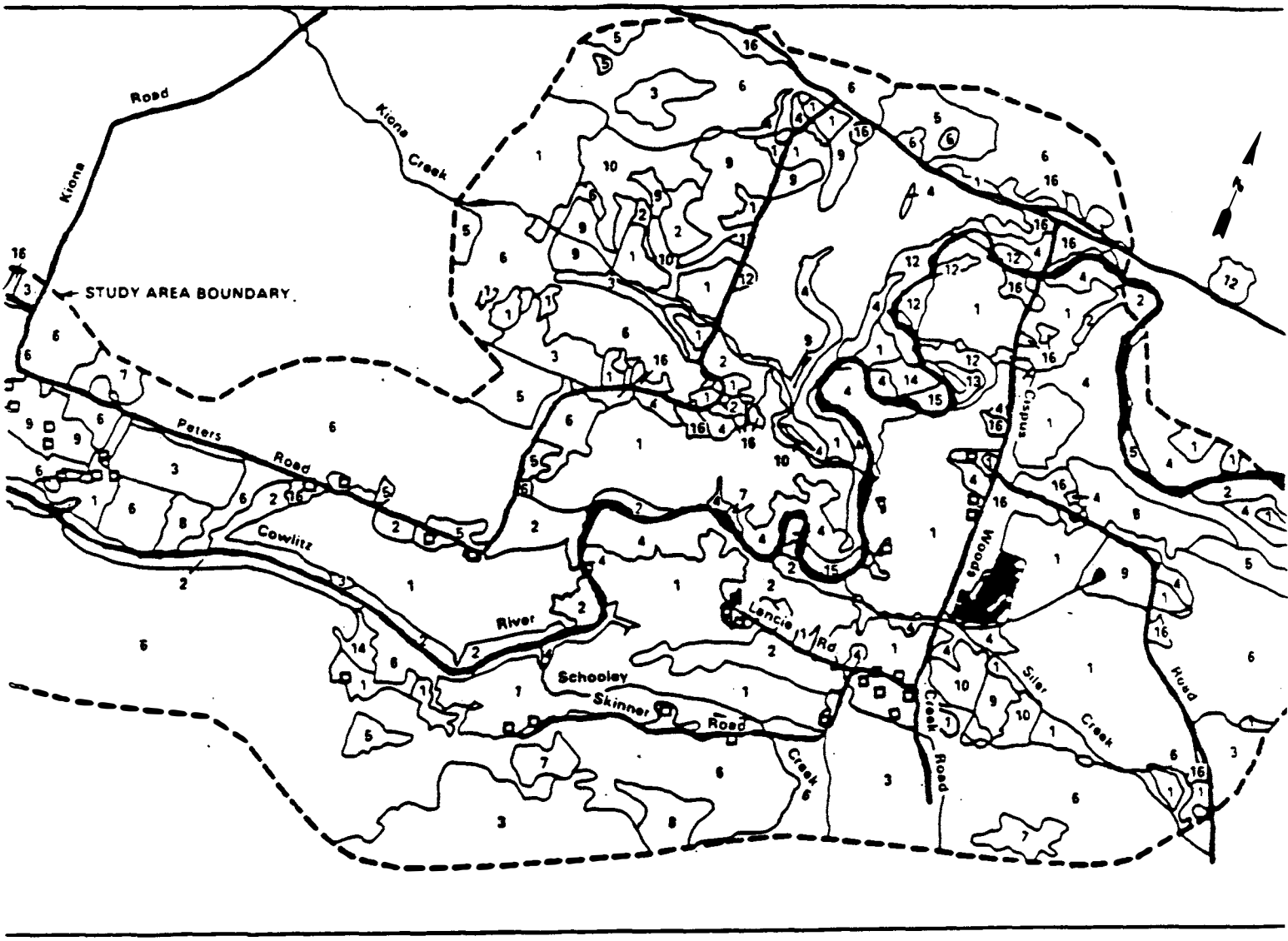


Figure 3 6 continued

Table 3-6. Major species of trees, shrubs, and forbs of the major vegetation types that occur in the proposed Cowlitz Falls project area. 1/

Vegetation Type 2/	Major Trees	Major Shrubs	Typical Forbs	Total Species
1 - Agricultural land/ pasture	None	Rosa pisocarpa (fence row) Sambucus cerulea (fence row) Symphoricarpos albus (fence row)	Agropyron repens Alopecurus aequalis Aequalis pratensis Bromus carinatus Dactylus glomeratus Festuca arundinacea Lolium perenne Poa pratensis Equisetum arvensis Trifolium pratensis	33
2 - Big leaf maple/ red alder	Acer macrophyllum Alnus rubra Abies grandis Populus trichocarpa Thuja plicata	Acer circinatum Symphoricarpos albus Rubus spectabilis Rubus parviflorus Rubus ursinus Philadelphus lewisii Physocarpus capitatus	Dicentra formosa Hydrophyllum tenuipes Montia sibirica Polystichum munitum	50
3 - Douglas fir- second growth	Pseudotsuga menziesii Tsuga heterophylla Thuja plicata Acer macrophyllum	Gaultheria shallon Holodiscus discolor Berberis nervosa Vaccinium parvifolium	Pteridium aquilinum Smilacina racemosa Polystichum munitum Viola sempervirens Galium aparine	29
4 - Big leaf maple	Acer macrophyllum	Acer circinatum Symphoricarpos albus Rubus spectabilis Osmaronia cerasiformis	Cardamine angulata Circaea pacifica Urtica dioica Equisetum arvense	21
5 - Clearcut	Pseudotsuga menziesii (planted)	Rubus laciniatus Rubus leucodermis Rubus ursinus	Cirsium arvense Pteridium aquilinum Arctium minus Digitalis purpurea Holcus lanatus	29

Table 3-6 continued.

Vegetation Type 2/	Major Trees	Major Shrubs	Typical Forbs	Total Species
6 - Red alder/ Douglas fir	Pseudotsuga menziesii Alnus rubra Tsuga heterophylla Thuja plicata	Acer circinatum Berberis nervosa Sambucus racemosa Gaultheria shallon Rubus ursinus Rubus spectabilis Vaccinium parvifolium	Polystichum munitum Galium aparine Montia sibirica Achlys triphylla Oxalis oregana Vancouveria hexandra	29
7 - Red alder	Alnus rubra Tsuga heterophylla Acer mecrophyllum	Acer circinatum Berberis nervosa Rubus ursinus Rubus parviflorus	Polystichum munitum Oxalis oregana Galium aparine Montia sibirica Vancouveria hexandra	25
8 - Douglas fir-saplings	Pseudotsuga menziesii (saplings) Populus trichocarpa (girdled) Acer macrophyllum Fraxinus latifolia	Acer circinatum Rubus ursinus Rubus parviflorus Ribes sanguineum	Pteridium aquilinum Anaphalis margaritacea Cirsium arvense Senecio jacobaea	44
9 - Sedge/rush	None	Rubus laciniatus Symphoricarpos albus	Carex obnupta Juncus effusus Phalaris arundinacea Festuca arundinacea Veronica americana	31
10 - Swamp	Fraxinus latifolia Alnus rubra	Physocarpus capitatus Spiraea douglasii Lonicera involucrata Cornus stolonifera	Lysichitum americanum Athyrium filix-femina Oenanthe sarmentosa Veratrum californicum Angilica arguta	23
11- Western hemlock/ big leaf maple	Tsuga heterophylla Thuja plicata Acer macrophyllum Pseudotsuga menziesii	Acer circinatum Rubus ursinus Symphoricarpos albus Gaultheria shallon	Pteridium aquilinum Adenocaulon bicolor Oxalis oregana Hypochaeris radicata	42

Table 3-6 continued.

Vegetation Type 2/	Major Trees	Major Shrubs	Typical Forbs	Total Species
12- Cottonwood	Populus trichocarpa Alnus rubra Fraxinus latifolia Acer macrophyllum Rhamnus purshiana	Symphoricarpos albus Physocarpus capitatus Cornus stolonifera Osmaronia cerasiformis	Urtica dioica Hydrophyllum tenuipes Stachys colleyae Glecoma hederacea Lapsana communis	34
13 - Willow	Salix lasiandra Cornus stolonifera (seedlings) Alnus rubra Populus trichocarpa (seedlings) Acer macrophyllum (seedlings)	Salix Scouleri Salix sitchensis Salix piperi Symphoricarpos albus Rubus lacimatus	Arctium minus Achillea millifolium Hypochaeris radicata Phalaris arundinacea Cirsium arvense Agrostis alba Rumex acetosella Plantago lanceolata	2?
14 - Hazel/blackberry/ grass	Acer macrophyllum (one)	Corylus cornuta Rubus laciniatus Symphoricarpos albus Osmaronia cerasiformis	Dactlys glomeratus Festuca arundinacea Cirsium arvense Verbascum thapsus	21

1/ Source: Application, Exhibit W, modified by Staff.

2/ Vegetation types established by the Washington Department of Game, Cowlitz Falls Study Team.

Although most of the upland forest vegetation types are similar in terms of overstory composition, major distinguishing features occur in the density of overstory species and the composition of shrubs and forbs. Representative shrubs and forbs for each type are listed in Table 3-6.

Lowland Forest

Lowland forest vegetation types, which include bigleaf maple, bigleaf maple/red alder, and cottonwood, are located along the stream corridors of the project area, generally below EL 880. The areal extent of the lowland forest feature is much less than the upland forest feature. Exact locations of these types in the project area are shown on Figure 3-6.

The big leaf maple and bigleaf maple/red alder vegetation types are similar in that bigleaf maple is the major component of the overstory for both types. The main difference between the two types is that with the bigleaf maple/red alder type, several other trees [red alder, grand fir (Abies grandis), black cottonwood (Populus trichocarpa), and western red cedar] are prominent. These two vegetation types also share several major species [vine maple, snowberry (Symphoricarpus albus), and salmonberry (Rubus spectabilis)] that are prominent in the shrub layer.

Only a few small areas are characterized by the cottonwood vegetative type. The overstory is dominated by black cottonwood and red alder; Oregon ash (Fraxinus latifolia), bigleaf maple, and cascara (Rhamnus purshiana) are also common.

Typical forbs and other prominent shrub species of the lowland forest vegetation types are listed in Table 3-6.

Wetlands/Riparian

Vegetation types of the wetlands/riparian land feature are located in the upper portion of the project area. The grass/sedge/juncus, swamp, willow, and sandbar vegetation types are included in this land feature. Groundwater levels in these areas are usually above, at, or just below the ground surface, and therefore support vegetation tolerant of such conditions.

Areas occupied by the grass/sedge/juncus vegetation type normally are in close proximity to agricultural land. These areas lack trees, support few shrubs, and are characterized by a predominance of forbs. Evergreen blackberry (Rubus laciniatus), and snowberry are major shrubs, while rough slough sedge (Carex obnupta), common rush (Juncus effusus), and reed canary grass (Phalaris arundinacea) are typical forbs of this vegetation type.

The swamp vegetation type occurs in areas adjacent to the grass/sedge/juncus vegetation type, but its vegetational composition is quite different. Oregon ash and red alder are major trees, and a variety of species listed in Table 3-6 typify the shrub and forb layers.

Only one small area of the willow vegetation type was identified in the project area. Prominent features of this type are several species of willow that occupy the tree and shrub layers. Red willow (Salix lasiandra) is common in the overstory and scouler's willow (Salix scouleriana) and sitka willow (Salix sitchensis) are major species of the shrub layer. Typical forbs and other major species of trees and shrubs of this type are listed in Table 3-6.

A number of sandbars occur along the Cowlitz River in the upper portion where the river meanders. These areas support little if any vegetation, primarily because of periodic inundation by the waters of the river, and because of major movements and additions of the sediment at these sites.

Agrarian/meadow

A fourth major land feature in the project area is the agrarian/meadow. This land feature generally includes cultivated cropland, pastures, and open ground or meadows not presently being cultivated. Most of these areas are in a continual state of change because of the various agrarian practices being utilized by the local farmers. As a result, most natural vegetation that occurs is found along fence rows, small stream edges, or in fields that have not been cultivated for one or more years.

In the agricultural land/pasture type, the fence row vegetation generally lacks trees but contains a number of shrubs and forbs. Major shrubs include clustered wild rose (Rosa pisocarpa), blue elderberry (Sambucus cerulea), and snowberry.

The hazel/blackberry/grass type is essentially void of trees, but is occupied by a variety of shrubs and forbs. Prominent shrubs include California hazel (Corylus cornuta) and evergreen blackberry, and typical forbs are orchard grass (Dactylis glomeratus) and alta fescue (Festuca arundinacea).

Other species of shrubs and forbs that occur in either the agricultural land/pasture or hazel/blackberry/grass vegetation types are listed in Table 3-6.

3.1.5.2 Wildlife Resources

The project area is a mosaic of forest and agricultural patches in various stages of vegetative succession. The interspersion and juxtaposition of the different terrestrial and aquatic habitats satisfies the annual and seasonal habitat requirements of a wide diversity of resident and migratory wildlife species.

Black-tailed deer (Odocoileus hemionus) and Roosevelt elk (Cervus elaphus) are the two most economically important species in the project area. Past forest management practices have created excellent habitat for these species. Most deer and elk spend the summer months in the highlands adjacent to the project area, and

migrate to the lowlands surrounding the Cowlitz and Cispus Rivers during late fall in response to deep snow and severe weather conditions. After snowmelt (late February to early March), deer and elk return to the highlands. Few individuals use the project area year-round.

Wood et al. (1980) reported that the project area was critically important as a wintering area for elk and deer during severe weather conditions. During the abnormally severe winter of 1979-80, deer and elk were forced to the valley bottom in search of food and a more favorable microclimate. Heaviest elk and deer use was in the western third of the project area, especially within close proximity of the shoreline. Elk and deer were found to use forested habitats, clearcuts, and agricultural lands. WDG estimated that at least 150 deer and 85 elk utilized the project area during the severe winter. Significantly fewer deer and elk used the project area during the milder winter of 1980-81 (Wood et al., 1981).

The project area supports good populations of furbearers. The beaver (Castor canadensis) is the most common aquatic furbearer. Mink (Mustela vison), river otter (Lutra canadensis), and muskrat (Ondatra zibethicus) are also commonly found. The most common terrestrial furbearers include the coyote (Canis latrans), raccoon (Procyon lotor), and bobcat (Lynx rufus). Other economically important mammals known to utilize the project area include the snowshoe hare (Lepus americanus), black bear (Ursus americanus), and mountain lion (Felis concolor).

Over 160 bird species are potentially found in the vicinity of the project (Wood et al., 1980), including a variety of songbirds, raptors, waterfowl, and shorebirds. Agricultural land and adjoining riparian areas receive the greatest use by wintering birds, while shoreline areas provide the most productive habitat for breeding birds (Wood et al., 1980). Ruffed grouse (Bonasa umbellus) and band-tailed pigeons (Columba fasciata), the most common game birds, utilize the forested areas. Wood et al. (1980) indicate that the general project area is superior grouse habitat (9 per 100 acres of forested habitat), compared to other areas in western Washington.

The rapid and riffle areas of the Cowlitz and Cispus Rivers are utilized by the dipper (Cinclus mexicanus), common (Bucephala clangula) and Barrow's (B. islandica) goldeneye, bufflehead (B. albeola), and common (Mergus merganser) and hooded (Lophodytes cucullatus) merganser. Breeding waterfowl, which are limited in the project area, include the mallard (Anas platyrhynchos), wood duck (Aix sponsa), and both species of mergansers. The rivers receive increased use by wintering waterfowl. Other species that are frequently found along the shoreline include the spotted sandpiper (Actitis macularia), belted kingfisher (Megaceryle alcyon), great blue heron (Ardea herodias), and killdeer (Charadrius vociferous). Osprey (Pandion haliaetus) are commonly found throughout the region.

Other wildlife species found in the project area include a variety of small mammals, snakes, lizards, turtles, frogs, toads, and salamanders. Although these species are not of economic or recreational importance, they play an important role in the functioning of the ecosystem.

Additional detailed information describing the wildlife resources of the project area can be found in Exhibit S of the Application and in reports prepared by WDG (Buckley et al., 1979; Wood et al., 1980, 1981).

3.1.6 Threatened or Endangered Species

By letter dated November 26, 1981, the U.S. Fish and Wildlife Service (FWS) indicated that the bald eagle (Haliaeetus leucocephalus) is the only threatened species occurring in the project vicinity that is protected by the Endangered Species Act of 1973, as amended (ESA).

The Cowlitz River appears to be a foraging area and flight pathway for wintering bald eagles that use the proposed project area from late January through the end of March. Eagles have been sighted either flying parallel to the river or perched close to the shoreline on the taller, more open trees and snags (Wood et al., 1980). Concentrations of as many as seven eagles have been observed in the project area feeding on carrion. No communal roosts have been identified. WDG personnel made 31 eagle sightings (13 to 15 individual birds) in 1980, and 23 sightings (8 individual birds) in 1981, while performing various field studies (Wood et al., 1981). The sightings included occasional transient individuals during the spring and summer. Downstream reservoirs receive heavier eagle use than the project area.

Historically, eagles have nested in the Cowlitz River Basin. No nests nor regularly occurring adult eagles during the summer have been identified in the project area, however (Wood et al., 1980).

Staff's assessment of the potential effects of the project on the bald eagle, pursuant to Section 7(c) of the ESA, is included in Section 4.1.11.

3.1.7 Visual Resources

The proposed project area, located in the foothills of the Cascade Mountains, exhibits four primary viewsheds. [A primary viewshed refers to areas that contain similar visual relationship (foreground, middleground, background views) and similar visual features and qualities.]

The upper viewshed is a farm valley flatland referred to locally as the Big Bottom. The Cowlitz River meanders through this viewshed in a 120- to 140-foot-wide channel cut through the glacial and alluvial materials. Eroding banks have spawned sand and gravel

bars, particularly along wide bends of the river. The water color ranges from milky brown in the summer to blue green in the fall and winter (Application, Exhibit V). The town of Randle and the farm buildings, active fields, and man-made drainage channels that lie outside it show human activity. The drainage ditches, which grid individual parcels of land geometrically, visually dominate the foreground when viewed from lands higher than the bottom land. The farmland, both cropland and pasture, is interspersed with occasional stands of trees and other vegetation, particularly along the edge of the river channel and the older drainage ditches. Dense vegetation covers most of the surrounding hillsides; however, some clearcut areas, when visible, can be dominant in the same viewshed.

In the next viewshed the Cowlitz River straightens for about 3 miles, flows through several S bends, and finally moves through an oxbow turn to its confluence with the Cispus River. The channel along most of this stretch of river is between 160 and 480 feet wide, with its surface generally 10 to 20 feet lower than the channel's upper edge. Riffles and rapids appear in this viewshed, and at the oxbow, the channel banks become steeper and higher (30 to 35 feet in some places). The water color is similar to that described for the upstream viewshed. In most places, dense riparian vegetation solidly lines the banks of the river channel, rendering it relatively inaccessible. A private timber company road crosses the river at a right angle to the Champion International wooden bridge, just before the beginning of the oxbow. Approaching views of the river in this area are limited by the vegetation. Views from the bridge or from either abutment are relatively interesting; the water surface-vegetative interface is in the middle ground, and the surrounding vegetated hillsides, shrouded occasionally with low clouds, are in the background. Across the bridge to the south are several unimproved roads that lead to either the wedge of land between the Cowlitz and Cispus Rivers or to the banks of the Cispus itself. With the exception of a 200-foot-wide strip of vegetation within its periphery, the wedge of land within the oxbow has been clearcut. Looking westward from this area, or from the Champion International wooden bridge, a viewer can see a rounded, densely vegetated hill. This geologic feature is visually interesting because it sits by itself in the middle of the valley.

The view along the Cispus River contains many riffles and occasional rapid and pool areas. Generally the views are dominated by the water in the foreground rushing over and against the rock-cobbled streambed. The rushing water contrasts with the tree-lined banks of the middle ground, eroded in some places, and the gently to moderately sloped, vegetated hillsides in the background. The water of the Cispus River has been clouded by ash fall from the Mount St. Helens volcano. Prior to the ashfall, during the summer months, the confluence of two rivers was reported to show distinctive coloration patterns caused by the mixing of the clear Cispus River water and the milky brown water of the Cowlitz River (Application, Exhibit V).

The last viewshed encompasses the stretch of the Cowlitz River from its confluence with the Cispus River to the Champion International concrete bridge at the upper end of Riffe Lake. Less than a mile from the confluence, the river bends sharply, entering the area called Cowlitz Falls. This short river section (about 0.3 mile in length) is visually the most interesting section of the Cowlitz River within the proposed project area. Rock ledges, 15 to 20 feet high, and a constricted channel, only about 40 feet wide in places, cause the water to boil and churn as it flows through this section. The topography and the action of the water tend to draw a viewer's eye to the river. The northern bank is the fairly steep vegetated slope of the rounded hill mentioned previously. The southern bank is also vegetated, but does not rise as steeply or as high. Logging roads located on either side of the Cowlitz Falls area are not heavily traveled by the public.

From the end of the falls area the river continues for another 2.5 miles to the Champion International concrete bridge. This part of the Cowlitz River is controlled by the operation of the Mossyrock Dam, and is actually part of the backwater of Riffe Lake during the spring and summer months. The vegetation, bank characteristics, and water color are similar to those previously described for the second viewshed, except for fall and winter, when the elevation of Riffe Lake is lowered by as much as 60 feet. During these times, the river is reduced to a series of rapids, pools, and runs, and its banks are bare of vegetation up to the Riffe Lake high water mark (Application, Exhibit V).

The proposed 5.2-mile-long transmission line ROW is shown on Figure 1-1, and the route is described in Section 2.1.2.5. For about 1.3 miles of its total length, the ROW would parallel existing minor roads, passing in sight of approximately 17 habitable buildings and homes located mostly on Falls Road and Meade Hill Road. Leaving Falls Road the ROW would cross pasture land and head toward Meade Hill Road, traveling across the ridge between Dog Mountain and Glenoma Peak. The lower south and the north slopes of the ridge are densely forested; the upper portion of the south slope has been clear-cut and is readily visible from Falls Road looking northward. The point at which the proposed ROW would descend the north slope is also visible to a viewer looking southward from U.S. Highway 12 and from Meade Hill Road. Except for the Cowlitz Falls river section downstream of the proposed dam site, before the point where the ROW would cross the river, there are no particularly unique, diverse, or distinctive visual resources along the proposed ROW or within the surrounding viewshed.

Additional information on the visual resources of the proposed project area, and a visual resource assessment utilizing the Visual Management System of the United States Forest Service, can be found in Exhibit V of the Application.

3.1.8 Cultural Resources

The proposed project area, as shown in Figure 3-7, is located in an area once occupied by the Cowlitz Indians. The Cowlitz Tribe was composed of four divisions--Lower, Upper, Lewis River, and Mountain--and Cowlitz Falls was the approximate dividing line between the territories of the Lower and Upper Cowlitz groups. Lower Cowlitz winter villages apparently were located along the Cowlitz River, and an early map of the area shows the farthest upriver village near the present Mayfield Dam. Details about the settlement pattern of the Upper Cowlitz are lacking, but it is known that Cowlitz Falls was an important salmon fishing spot for the Upper Cowlitz (Fugro Northwest, Inc., 1980).

Initial Euroamerican settlement in the project area did not occur until the 1880's, primarily because of a lack of transportation facilities. Pioneers generally came to the Big Bottom area from the Southern Appalachian region, attracted by the same type of steep mountain valleys and alluvial bottomlands that were typical of their homeland. Homesteading in the Upper Cowlitz region increased after 1914, when the Big Bottom was removed from Forest Service jurisdiction, and settlers could clear the bottomlands for pasture and cultivation. Throughout the twentieth century, agriculture and logging have dominated the economy and lifestyle of the project area (Furgo Northwest, Inc., 1980).

Six archeological sites and two isolated archeological artifacts were inventoried in cultural resource surveys conducted for the Applicant in 1980. One previously reported site, 45LE56, failed to yield any evidence of cultural material during the survey. The majority of the archeological sites and the isolated artifacts were found on uplands above the Cowlitz River; two sites in the vicinity of Cowlitz Falls were found in streambank topographic units; and no sites were located in the upriver streambank and floodplain areas. The characteristics of the inventoried sites are summarized in Figure 3-8.

One archeological site is eligible for inclusion in the National Register of Historic Places. The Cowlitz Falls South Site, 45LE209, covers a large area, and its midden consists of organically enriched soil that contains numerous fire-cracked rocks, pieces of split mammal bone, and fragments of charcoal. Surface inspections revealed a hammerstone, grind stone, and worked flakes, as well as a human mandible. Subsurface testing found artifacts to a depth of approximately 6 feet, or to bedrock.

Site 45LE211, Cowlitz Falls North, contains a midden characterized by organically enriched soil and firecracked rock. An exposed firehearth at the site contained ash and burned fish bone, and the survey team found cryptocrystalline flakes and a chalcedony projectile point. Another archeological site, Manasha (45LE212), showed evidence of firecracked rocks, and yielded artifacts such as a cobble chopper, chalcedony knife, chert scraper, and numerous flakes.

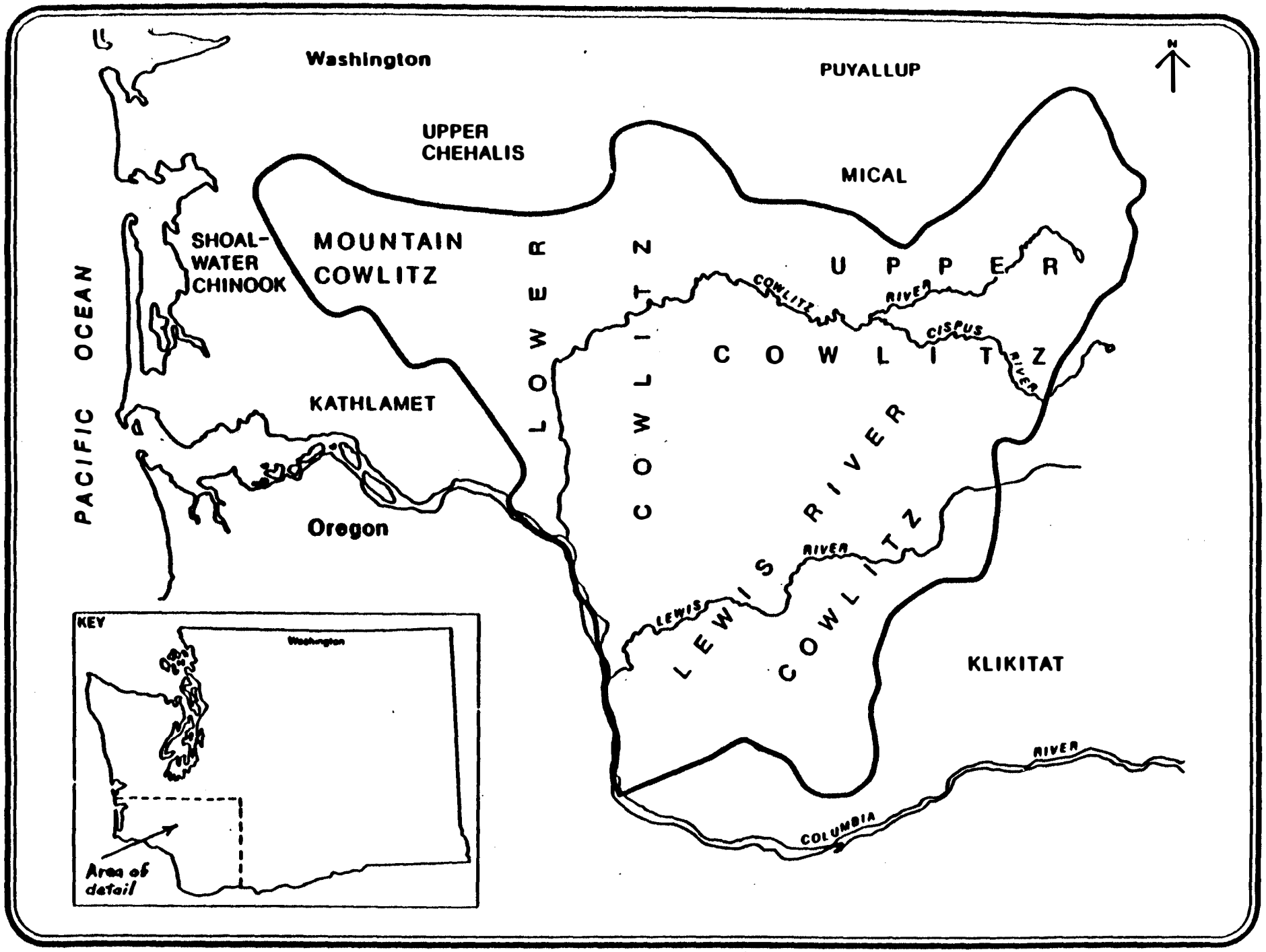


Figure 3-7. Tribal distribution of the Cowlitz Indians (Source: Fugro Northwest, Inc., 1980).

Figure 3-8. Summary information on archeological sites (Source: Fugro Northwest, Inc., 1980).

Site	Legal Description	Elevation	Site Type	Micro-Environment	Area & Depth	Tools	Remains Observed/Reported: Other Artifacts	Remains Observed/Reported: Features	Present Condition
Cowlitz Falls South 45LE209	T11N, R6E, Sec. 6	870 ft	Midden	Streambank: Cowlitz Falls	>3,000m^2 Up to 100 cm deep.	Pestle, grinder, worn flakes	Numerous volcanic and cryptocrys - talline flakes, firecracked rocks, mammal bone, human mandible	None	Disturbed to unknown extent by railroad construction and logging
Cowlitz Falls North 45LE211	T11N, R6E, Sec. 6	890 ft	Midden	Streambank: Cowlitz Falls	>300m^2 up to 70 cm deep	Chalcedony projectile point	Several crypto-crystalline flakes, fish bone, mammal bone, firecracked rocks	Firehearth	Disturbed to unknown extent by logging
Manasha 45LE212	T12N, R6E Sec. 32	880 ft	Lithic	Upland: terrace above riverbottom	unknown	Cobble chopper, chalcedony knife, jasper scraper	Numerous volcanic and cryptocrystalline flakes, firecracked rocks	None	Potentially undisturbed
Vanderpool 45LE213	T12N, R7E, Sec. 20	890 ft	Lithic	Upland: terrace above riverbottom	unknown	2 crypto-crystalline projectile points	Jasper flakes, obsidian flakes, 2 copper-covered glass beads	None	Essentially undisturbed
Thompson 45LE214	T12N, R7E, Sec. 21	885 ft	Lithic	Upland: terrace above riverbottom	>3,000m^2	Chert scrapper, projectile points	Jasper resharpen-ing flake, jasper chunk, basalt flake, obsidian chunk, a variety of flakes, numerous firecracked rocks	None	Disturbed to unknown extent by road and house construction
Siler 45LE215	T12N, R7E, Sec. 27	1100 ft	Lithic	Upland: terrace above riverbottom	>200m^2 up to 30 cm deep	ca. 35 projectile points, several scrapers, Pestle	Numerous flakes, numerous firecracked rocks	None	Disturbed by road construction

One previously recorded site, along with 14 newly inventoried historical sites and structures, was also located by surveys carried out in the project area. The majority of these properties are associated with settlement and development of the Big Bottom area, and they date from the turn-of-the century period. Many of the properties discovered in the surveys, particularly those found upstream in the vicinity of the Cowlitz River near the town of Randle, are outside of the project's zone of potential impact. Figure 3-9 contains summary information on the historic sites and structures identified in the surveys. None of the historic sites is eligible for inclusion in the National Register.

3.1.9 Socioeconomic Factors

Economic, demographic, and fiscal impacts of the proposed project would occur primarily within the Mossyrock-Morton-Glenoma-Randle area of Lewis County, Washington (the project impact area). The most significant socioeconomic characteristics of this area and of Lewis County as a whole are discussed below.

3.1.9.1 Demographic Considerations

The 1980 Census of Population found that on April 1, 1980, a total of 55,279 persons permanently resided within Lewis County (Table 3-7). Approximately two-thirds of these persons lived within the eastern portion of the county in the vicinity of Interstate Highway 5. Within this corridor is the Centralia-Chehalis urban area, the county's commercial-industrial core, with almost 24,000 residents.

The 1980 population of the project impact area totaled 8,815. The area's only incorporated places are Morton and Mossyrock. The 1980 populations of these two cities were, respectively, 1,264 and 463 persons (U.S. Department of Commerce, 1981a).

During the 1960-1970 decade, Lewis County's population expanded by 3,609 persons (8.6 percent). Natural population growth (i.e., births less deaths) accounted for about two-thirds and net in-migration about one-third of the total increase.

During the 1970's, Lewis County's population increased by 9,812 persons (21.6 percent). Approximately two-thirds of this gain resulted from net in-migration. The population influx, in turn, resulted from expanding mining and manufacturing employment opportunities in Lewis County, as well as from increased commutation to jobs in Thurston County.

State planners expect that the population of Lewis County will reach 66,075 persons by 1990 and 76,425 persons by the year 2000 (State of Washington, 1981).

Figure 3-9. Summary information on historic sites and structures (Source: Fugro Northwest, Inc., 1980).

Name	Location	Elevation	Description	Date
Thompson Peters Homestead Barn	T12N, R6E, Sec. 18	885 ft	Barn with octagonal silo	ca.1900
Rhine Post Office Site and	T12N, R6E, Sec. 25	880 ft	Farmhouse	1920s
Beksinski Barn			Barn	1890s
U.S. Plywood-Woods Creek Road Bridge	T12N, R6E, Sec. 32	860 ft	Wooden bridge	early 1950s
Tom Tumwater (Indian) "Homestead" site	T12N, R6E, Sec. 32	860 ft	A few apple trees	unknown
Jim Satanus (Indian) Homestead site	T11N, R6E, Sec. 6	870 ft	No remains located	1892
Walter Koher Homestead site	T12N, R6E, Sec. 27	875 ft	Four deteriorated sheds/cabins; barn foundation	unknown
Skinner Barn	T12N, R7E, Sec. 29	890 ft	Barn	ca.1910
Backhaus Barn	T12N, R7E, Sec. 30	880 ft	Barn	1920s
R.T. Siler Homestead site	T12N, R7E, Sec. 20	870 - 880 ft	Two story frame house, and Horse barn with gambrel roof.	1908 ca. 1900
			No remains located of cabins, Vance post office, church or ferry crossing	1885-1890

Figure 3-9. continued.

Name	Location	Elevation	Description	Date
Randle-McMahan Homestead site	T12N, R7E, Sec. 17	885 ft	Two-story hipped-roof house;	1912
			Large barn with steeply pitched gabled roof and hooded loft cover; no remains located of J.L. Randle homestead buildings,	1920s
			Vance post office, or ferry crossing	1890 pre-1913
James McMahan Barn	T12N, R7E, Sec. 17	885 ft	Barn with steeply pitched gabled roof	1905 –
A.L. McCall Homestead House and Farm Shed	T12N, R7E, Sec. 19	880 ft	Two-story frame farm house,	1910-1920
			shed	1920
Barnes House and Farm Buildings	T12N, R7E, Sec. 19	880 ft	One-and-a-half story bungalow,	ca.1900
			Barn with gambrel roof and decorative cupolas,	ca.1900
			Grainery shed	ca.1900
Davis Homestead House	T12N, R7E, Sec. 21	880 ft	White, two-story frame farm house with medium gabled roof	ca.1900
Town of Randle	T12N, R7E, Sec. 8	885 ft	A few buildings remain from early settlement (1899):	
			McKay Building,	unknown
			United Methodist Church,	ca. 1910
			Lambert House	ca. 1900

Table 3-7. Past and projected population of Lewis County, Washington, 1960-2000.

Year	Population
1960 1/	41,858
1970 1/	45,467
1980 2/	55,279
1990 3/	66,075
2000 3/	76,425

1/ U.S. Department of Commerce, 1971.

2/ U.S. Department of Commerce, 1981a.

3/ State of Washington, 1981.

3.1.9.2 Employment and Income

In 1979, Lewis County's economy generated an average of 23,119 jobs (Table 3-8). This number included (1) full-and part-time employees of private establishments and government agencies and (2) self-employed persons. Volunteer and unpaid family workers, however, were excluded. According to unpublished data provided by the U.S. Bureau of Economic Analysis, persons employed in Lewis County in 1979 earned a total of $322,261,000, or an average of $13,939 per worker (U.S. Department of Commerce, 1981b).

Manufacturing, particularly lumber and wood products, is Lewis County's most important industry. During 1979, the county's manufacturers generated labor and proprietors income totaling $101,059,000. The manufacturing sector also was responsible for 1,246, or 21 percent, of the county's net employment gains during the 1969-1979 period.

The economy of Lewis County traditionally has been based on forest products. Since 1970, however, it has become more diversified. For example, mining employment in Lewis County increased by 600 as a result of the development of a strip mine near Centralia. This facility supplies coal to a steam-electric power plant built by the Pacific Power and Light Company in the early 1970's. Also, the county's favorable location and excellent highway and rail accessibility to the Seattle and Portland metropolitan areas have stimulated the growth of manufacturing establishments that are not part of the lumber and wood products sector (e.g., National Fruit Canning Company, Bank Check Supply, Soloy Conversions, and Photoway Corporation).

The economy of eastern Lewis County is primarily based on logging Douglas fir and processing the logs into lumber, plywood, and veneer. As shown in Table 3-9, the area has seven wood products manufacturers, mainly sawmills, that usually employ a total of approximately 800 persons. Because of the current severe national housing slump, and the resultant reduced demand for building products, four of these firms have contracted or suspended production, thereby causing 250 workers to become unemployed.

Tourism also is an important source of personal income for residents of eastern Lewis County. Many of the area's employment opportunities, particularly those for women, are generated by retail and personal service establishments situated between Mossyrock and Packwood.

Lastly, dairy farming and beef cattle ranching provide some jobs for area residents.

Table 3-8. Employment trends by industrial sector, Lewis County, Washington, 1969-1979. 1/

Industrial sector	Full-and part-time employment 2/ 1969	1979	change
Agriculture 3/	1,912	1,668	-244
Farm services, forestry, and fishing	110	292	+182
Mining	25	639	+614
Construction	887	683	-204
Manufacturing	4,147	5,393	+1,246
Transportation and public utilities	604	854	+250
Wholesale trade	384	1,102	+718
Retail trade	2,335	3,426	+1,091
Finance, insurance, and real estate	341	552	+211
Personal, repair, business, medical, legal, educational, and tourist services 4/	1,943	2,621	+678
Federal civilian government	249	324	+75
Federal military government	245	194	-51
State and local government	2,303	3,076	+773
Non-farm proprietors	1,693	2,295	+602
Total	17,178	23,119	+5,941

1/ U.S. Department of Commerce, 1981b.

2/ Excludes volunteer and unpaid family workers.

3/ Includes farm proprietors and employees.

4/ Includes workers employed by privately owned and operated establishments. Excludes employees of public schools and public hospitals, etc

Table 3-9. Employment and current status of wood products manufacturers located in eastern Lewis County. 1/

Name of firm	Location	Products	Employment 2/	Current status 3/
Champion International Corp.	Morton	lumber, plywood, veneer,	250-300	Veneer plant operating on a week-on, week-off schedule.
Cowlitz Stud Company	Randle	lumber	125-130	Operating all regular shifts.
Packwood Lumber Company	Packwood	lumber	130	Operating all regular shifts.
Cowlitz Stud Company	Morton	lumber	65-70	Operating all regular shifts.
Mt. Adams Veneer Company	Randle	plywood	60-90	Operations have been suspended.
Tubafor Mill, Inc.	Morton	lumber	60	Operating one shift rather than two.
RDW Mill	Randle	lumber	55	Operations have been suspended.
Total			745-835	

1/ Survey conducted by the Lewis County Planning Department in October 1981, and an article from the October 1, 1981, Morton Journal entitled "Job Outlook Is Bleak," by Dell Burner.

2/ Number of persons employed during normal economic conditions.

3/ Status as of October 1, 1981.

3.1.9.3 Housing Availability

Although the Centralia-Chehalis urban area offers substantial housing opportunities, it is about 60 minutes by car from the Cowlitz Falls site. Surveys of construction personnel at other hydroelectric projects indicate that relatively few relocating workers would reside that far from the proposed project. Instead, they would seek housing in the project impact area.

A survey of local realtors, conducted by the Lewis County Planning Department in June 1981, found that there were 34 to 46 vacant homes available for sale, and 26 to 32 vacant housing units available for rent in that area. The minimum estimate, 60 available housing units, is considerably greater than the supply needed to meet the area's normal housing demands.

Hotels and motels, particularly older facilities, may rent some or all of their rooms on a monthly basis. Five of the 10 motels in the project impact area have a total of 26 rooms that could be made available for monthly rental (Telephone survey conducted by Applicant, July 27, 1981).

Mobile home parks and trailer courts may be an important source of housing for relocating construction workers. There are currently 16 mobile home parks in the project impact area that have been approved by the Lewis County Health District. Ten of these have less than 10 spaces; three have 10 to 15 spaces; and three have 20 to 30 spaces. A telephone survey of these parks, conducted by the Lewis County Planning Department on June 23, 1981, found that they had a total of 20 vacant spaces. Specifically, three parks each had one vacant space, one park had two vacant spaces, and one park in Mossyrock had 15 vacant spaces.

Recreational vehicle (RV) campgrounds that offer long-term site leases also may attract relocating construction workers. Only one of the three RV parks in the project impact area rents sites on a monthly or seasonal basis. Each of its 19 sites that are available by the month has electric, water, and sewer hook-ups (Telephone survey conducted by Applicant, July 27, 1981).

3.1.9.4 Local Government Services

The current expenditures of all local government entities within Lewis County (i.e., the county government, nine incorporated places, school districts, fire districts, and other special districts) during Fiscal Year 1976-77 totaled $561.38 per county resident (Table 3-10). Approximately $327, or almost 60 percent, of the total amount was spent on education. Per capita outlays for road maintenance and repair and for law enforcement were next in magnitude, accounting for $65.50 and $32.43, respectively. The significant expenditures for roads reflect the county's low overall population density and its heavy timber truck traffic. Public facilities and services in the project impact area are discussed below.

Table 3-10. Per capita current expenditures by function of all local government entities within Lewis County, Washington, during Fiscal Year 1976-77. 1/

Function	Expenditures
Education	$327.09
Libraries	0.32
Public welfare	0.77
Health 2/	6.81
Highways	65.50
Police protection	32.43
Fire protection	15.46
Correction	5.13
Protective inspection and regulation	0.71
Sewerage	11.35
Solid waste disposal	9.66
Natural resources	6.49
Parks and recreation	8.61
Housing and urban renewal	1.21
Financial administration 3/	16.14
General control 4/	20.83
General public buildings	4.32
Other	28.55
Total	$561.38

1/ U.S. Department of Commerce, 1979. Includes the direct expenditures of the county government and those of the cities, school districts, fire districts, and other special districts that operate within the county. Expenditures exclude: (1) payments among the governmental units within the county; (2) capital expenditures; and (3) interest and amortization payments on outstanding debt.

2/ Includes health services other than hospital care, including clinics, nursing, and immunization.

3/ Includes wages and salaries and other expenditures of agencies concerned with tax assessment and collection, accounting, auditing, budgeting, purchasing, and other central finance activities.

4/ Includes expenditures for the governing body, courts, office of the chief executive, and staff and agencies concerned with personnel administration, law, recording, planning and zoning, and the like.

With the exception of U.S. Highway 12, which is maintained by the State of Washington, Lewis County constructs and maintains all public roads in the county east of Morton. According to Applicant's Exhibit W, no major road construction is currently scheduled for the vicinity of the proposed project.

Public water supply is available in the cities of Morton and Mossyrock (through municipally owned and operated systems) and in the unincorporated area of Randle (through the Lewis County Public Water District No. 1). Residences and business establishments situated outside these areas must rely on private wells.

Waste water collection and treatment facilities are available only in Morton and Mossyrock. Homes and businesses located outside these two incorporated places must use individual septic systems or some other type of on-site sewage disposal.

Law enforcement is the responsibility of: the Mossyrock City Marshall (one full-time officer); the Morton Police Department (three full-time officers and seven reserve personnel); and the Lewis County Sheriff's Substation, located 2 miles east of Morton on U.S. Highway 12 (seven full-time deputies with 7 patrol cars).

Fire fighting capability is provided by four all-volunteer entities. These include the Morton Fire Department and Lewis County Fire Protection Districts 3, 14, and 18, which are headquartered in, respectively, Mossyrock, Randle, and Glenoma. In addition, the Washington State Department of Natural Resources provides forest fire protection during the summer.

Ambulance and rescue service is supplied by Lewis County Fire Protection District No. 14. In addition, a private ambulance service is based in Morton.

The only hospital is Morton General Hospital, a short-stay full-service facility with 20 beds that is owned and operated by Lewis County Hospital District No. 1. A larger general hospital is located in Centralia, however, about 70 minutes from the Cowlitz Falls site.

Public education is the responsibility of three independent school districts (Mossyrock, Morton, and White Pass). The White Pass School District, which serves eastern Lewis County from just east of Morton to the Cascade crest, would experience the most significant enrollment impacts resulting from the in-migration of construction personnel for the Cowlitz Falls Project. This district currently operates three elementary schools (kindergarten through grade 6) and one junior-senior high school (grades 7 through 12). As shown in Table 3-11 below, enrollment at three of this district's four schools has declined recently; consequently, the district has some excess capacity.

Table 3-11. Enrollment trends and capacity of public schools operated by the White Pass School District. 1/

School	Total enrollment 5/1/80	Total enrollment 6/1/81	Capacity (No. of students)
Randle Elementary	269	233	275
Glenoma Elementary	148	164	160
Packwood Elementary	130	110	160
White Pass Jr.-Sr. High	465	410	500
Total	1,012	917	1,095

1/ Charles R. Ten Pas, District Superintendent, 1981, personal communication.

3.2 ALTERNATIVE DESIGN OF THE PROPOSED ACTION

3.2.1 Reservoirs EL 862 and EL 872

Land Features

The geology, soils, and geologic hazards and problems associated with reservoirs at either EL 862 or EL 872 are generally the same as those described for the proposed project (Section 3.1.1).

Land Use

The existing land uses that would be affected by the EL 862 reservoir were shown in Figure 3-1, and are similar to those described in Section 3.1.2 for the proposed project. Less total land (about 565 acres) would be included within the project boundary, and a smaller amount of land would be inundated.

At EL 872, the land within the project boundary would total about 3,300 acres, and the proposed reservoir would extend across the Big Bottom area to affect about 2,470 acres of existing agricultural land. Some industrial land occupied by a wood veneer plant also would be partially inundated. The expanded reservoir at EL 872 would probably affect several existing farm residences and outbuildings, and would inundate a short section of Cispus Road. Additional timberland, DNR land, and some privately-owned land would either be flooded or fall within the project boundary.

Aquatic Environment

The groundwater and surface water resources of the project area are described in Section 3.1.4.1, and would be similar for a project at either of the two proposed alternative reservoir elevations.

The proposed dam is a common feature of the alternative arrangements of the project. Thus, the description of the fishery resources contained in Section 3.1.4.3 would also apply to the alternative reservoir levels. The only differences would be that less fisheries habitat of the Cowlitz and Cispus Rivers and tributaries would be inundated at reservoir EL 862, and more habitat would be inundated at EL 872.

Terrestrial Environment

The description of vegetation and wildlife resources for a reservoir at EL 866 contained in Section 3.1.5 would also apply for the alternative reservoir elevations. A difference in vegetation types affected would occur with either alternative, and descriptions of these impacts are included in Section 4.2.9.

Visual Resources

Existing visual resources for both reservoir level alternatives are generally the same as those described in Section 3.1.7 for the proposed project.

Cultural Resources

The cultural resource surveys described in Section 3.1.8 identified properties that would be affected by any of the alternative reservoir levels. The surveys assumed a project reservoir at EL 872, and therefore the cultural environment described for the proposed project would apply for any of the reservoir alternatives.

Socioeconomic Factors

Socioeconomic characteristics and trends in Lewis County are discussed in Section 3.1.9, and would essentially be the same for either of the reservoir level alternatives.

3.2.2. Transmission Line Corridors

Land Features

The geology and soils for the eastern corridor are generally the same as for the proposed corridor. The route over the eastern end of the ridge from the Ancestral Valley to Rainy Valley would be longer than for the proposed corridor, but would be in less severe terrain. The erosion hazard would be expected to be less.

The geology and soils of the western corridor are generally the same as for the proposed corridor. The corridor would pass around the west end of the ridge between the Ancestral Valley and Rainy Valley. The terrain around the west end of the ridge would be steeper than would be encountered along the proposed route. The erosion hazard would be expected to be more severe.

Land Use

The two alternative transmission line ROW's (shown in Figure 1-1) are both longer routes than the Applicant's chosen ROW to the proposed Glenoma substation.

The eastern alternative ROW (approximately 8.6 miles in length) would parallel minor private roads for its entire distance, crossing timberland and possibly some privately owned rural property. All three ROW's would be the same for the last six-tenths of a mile, and would parallel the county's Meade Hill Road, crossing rural and agricultural lands. Near the intersection of Meade Hill Road and State Highway 12, the eastern alternative ROW would cross the highway to the proposed Glenoma substation area.

The western alternative ROW (approximately 8.7 miles in length) would follow roads owned by private timber companies for most of its length. For about 2 miles, this ROW would probably be located on lands within the boundary of Tacoma City Light's Mossyrock Development. From this point until it would join a common segment, the ROW would cross timberland or agricultural land. The ROW also would cross an area near Dog Mountain that is a popular hang glider landing site.

Visual Resources

The viewshed of the proposed western alternative ROW is dominated by densely forested land on both sides of the roads the ROW would parallel. In the vicinity of Dog Mountain, the viewshed is characterized by fairly steep forested terrain to the north and northeast, and the flat surface of Riffe Lake to the west and southwest. After leaving the private road, the western alternative ROW would go through a flat, partially forested valley until it reaches Meade Hill road and joins the section of ROW common to all three alternatives. Although there are no unique or particularly diverse visual resources within the viewshed of the western alternative ROW, the area along Riffe Lake is often used by recreationists during the summer.

The eastern alternative ROW would follow minor private roads through mostly forested land until it joins Meade Hill Road. It would pass within view of more residences than either the western alternative alignment or the Applicant's proposed alignment. There would be no significant or diverse visual resources within the viewshed of the eastern alternative ROW.

3.3 WOOD-FIRED STEAM-ELECTRIC PROJECT

3.3.1 Land Features

Both of the alternative sites for a wood-fired generating facility are located upstream of the glacier moraine ridge on the broad, flat Cowlitz River floodplain. The geology, soils, and geologic hazards generally would be the same as those described for that area in Section 3.1.1.

3.3.2 Land Use

The Applicant has selected two locations near Randle for the proposed siting of a wood-fired plant. Both sites are located near existing wood processing plants. In addition, both plant sites are within the Cowlitz River flood plain, but on high ground that reportedly has never been flooded. The minimum amount of land required in either location would be about 30 acres for the plant, plus an unspecified amount of land for ash disposal (about 19 tons per day). Site A (about 50 acres) is adjacent to the Cowlitz Stud Mill east of Randle and is used for log storage. Site B is located on Woods Creek Road, 1 mile south of Randle, and is currently agricultural land.

3.3.3 Meteorology

The climate, air quality, and noise levels of the proposed woodwaste plant are more fully described in Section 3.1.3.

The exact location of a woodwaste plant, or any facility that has the potential to emit significant amounts of air pollutants, is governed in part by the quality of air in the area. Under the Clean Air Act, the operators of a facility must show that emissions for the plant will not significantly degrade the air quality of the area.

The Randle area has been classified as an attainment area, which means that it has lower pollutant levels than those specified as acceptable standards for protecting health. Some amount of degradation of ambient air quality thus would be permitted.

The operator of a facility must also demonstrate that emissions from the facility would not degrade the air quality of Class I areas. In the general vicinity of the proposed woodwaste plant, Mount Rainier National Park, Goat Rocks Wilderness Area, and Mount Adams Wilderness Area are Class I areas.

3.3.4 Aquatic Environment

3.3.4.1 Water Quality and Quantity

Characteristics of groundwater and surface water resources of the area are more fully described in Section 3.1.4.1.

3.3.4.2 Fishery Resources

Since a woodwaste facility probably would be situated in the vicinity of an existing lumber mill, no significant fishery resources would be potentially affected.

3.3.5 Terrestrial Environment

3.3.5.1 Vegetation

Based upon October 13, 1978, aerial photos (U.S. Army Corps of Engineers, 1979), Site A is approximately 50 percent (25 acres) forested, 40 per cent (20 acres) existing log storage, and 5 percent (5 acres) field/pasture. In comparison, Site B is predominantly agricultural, with fringe areas of forest. At least one man-made structure occurs on each site.

3.3.5.2 Wildlife Resources

The proposed sites have only marginal value as wildlife habitat, and there are no available studies of the wiidlife in the proposed project area.

3.3.6 Threatened or Endangered Species

No threatened or endangered species are known to occur.

3.3.7 Visual Resources

The existing visual resources at the two potential plant sites are considered to be limited by the existence of wood-processing plants at each. The respective viewsheds at both sites include these industrial areas. Neither viewshed includes particularly diverse or interesting visual characteristics.

3.3.8 Cultural Resources

The two locations identified as possible sites of a woodwaste generating plant have not been surveyed for cultural resources. Site A is currently used for log storage, and any resources located there have been subject to disturbance by past and present land uses. Site B, which is agricultural, presumably has not been disturbed recently, but the number and nature of any resources located at the site are unknown.

3.3.9 Socioeconomic Factors

Socioeconomic characteristics and trends in Lewis County are discussed in Section 3.1.9.

3.4 COAL-FIRED STEAM-ELECTRIC PROJECT

No specific location has been identified for a coal-fired steam-electric plant, and the environmental resources and values associated with the mining of coal, and with the construction and operation of a coal-fired facility, are site specific. It is not possible, therefore, to describe the existing environment that would be affected by the coal-fired alternative. In general, however, an 800-MW coal-fired facility would require: an adjacent mine, or a mine site located along a rail-transportation corridor; approximately 2,500 acres of land for the plant site; an indeterminate amount of land for a transmission line ROW; and, a source of water for operating and cooling functions.

Since the Applicant would be purchasing only a small portion of the output of a large coal-fired plant, it is also difficult to determine what impacts should be attributed to the purchase of 45 MW of power. Section 4.4 discusses the generic impacts of a coal-fired facility, without attempting to account for the percentage of impacts resulting from the Applicant's power purchases.

4. ENVIRONMENTAL IMPACTS

4.1 COWLITZ FALLS PROJECT - APPLICANT'S PROPOSAL

4.1.1 Geology and Soils

4.1.1.1 Beneficial and Adverse Impacts

Construction activities, excavation work, channel modification, spoil disposal, and reservoir clearing operations would disturb soils, alter natural slopes and drainage, and remove protective vegetative cover and supportive root systems, thereby increasing the potential for erosion of soils and other unconsolidated materials. Reservoir clearing could also result in some bank sloughing.

Bank sloughing would continue to occur along the new reservoir shoreline. Some new sloughing would be expected to develop in the lower end of the reservoir, downstream of the moraine ridge where the reservoir would inundate slope areas that now lie above high water levels. Saturation of materials on the steeper slopes, such as the high banks cut in the glacial outwash deposits at the oxbow bend in the Cowlitz River, and at a terrace on the north side of the river upstream of the Champion International concrete bridge, could cause the slope to become weakened and unstable. Any sloughing would be expected to diminish as the slopes restabilize with the establishment of a new shoreline. Large cobbles and boulders, within the outwash materials that would be sloughing, would tend to accumulate along the bases of the slopes, and would provide increasing natural rip-rap protection and support of the slopes.

The raised water level from the filling of the reservoir would cause an increase in the subsurface flow (or seepage) of water that now apparently exists through the outwash deposits in the Ancestral Valley. Resultant seepage and spring flow increases could occur, and new seepage could develop along the north bank of the river in the saddle area downstream of the dam. High seepage flows from the bank could result in unstable slope conditions and possible slope failure. Some increase would also occur in flows that probably exist through subsurface seepage paths through the Ancestral Valley-fill, and that extend to Riffe Lake. This seepage may raise the water table within the Ancestral Valley enough to form new swampy areas or to enlarge existing swamps.

The elevated water level in the reservoir would result in a subsequent rise in the groundwater table within the reservoir banks and adjacent land areas. Raised groundwater tables would reduce the crop-producing capability of soils if the resultant groundwater tables are too shallow. The soils most likely to be affected would be the Schooley Series; undrained areas with Schooley Soils would tend to become swampy. The effectiveness of existing manmade drainage systems that now allow agricultural use of some of the Schooley Soils would be reduced and, in some areas, precluded. Some areas with Siler Soils, now designated as Prime Agricultural Lands, might also experience rises in groundwater levels sufficient to reduce their agricultural production capability. The farmland on the south side of the river, just upstream and across the river from the moraine ridge, would be the most severely affected Prime Agricultural Land.

4.1.1.2 Mitigative Measures Proposed

The Applicant has proposed general measures to minimize project-induced impacts on geology and soils. Revegetation would be used to control erosion. The Applicant would consult with the local district office of the Soil Conservation Service during the final design and permit the acquisition stage of the project to formulate an erosion and sediment control plan. Excavation of slopes at the dam would be made only to slope angles considered to be safe. Investigations would continue of seepage through the Ancestral Valley. Relief drains would be installed if seepage in the saddle area causes destabilization of the bank. Any commercial timberland impacted by seepage coming to the surface in the Ancestral Valley would be drained or purchased.

The Applicant would monitor groundwater levels before project construction, and for at least 1 year after reservoir filling, in order to determine the precise amount of farmland that would be adversely affected by project-induced groundwater impacts. The Applicant states that most adverse groundwater impacts could be mitigated by installation of drainage works, or by purchase of the adversely impacted lands. The Applicant estimates that about 170 acres of farmland would be adversely affected by reservoir-induced groundwater impacts, and that about 20 acres of farmland would be inundated. The Applicant proposes to consider other mitigation possibilities on a case-by-case basis, if impacts to farmlands prove to be more extensive than the Applicant's current estimate.

4.1.1.3 Unavoidable Adverse Impacts

Minor erosion would occur during construction before mitigation measures, such as revegetation, could be implemented. Some minor erosion would be entirely unavoidable in areas where constant construction activities would preclude effective mitigation measures. Minor unavoidable bank erosion and sloughing would be expected to occur along the reservoir shoreline. Unless suitable drainage systems are installed, new swampy areas could develop in the Ancestral Valley, and unstable slope conditions could develop in the saddle area of the right bank of the Cowlitz River downstream from the dam. Adverse groundwater impacts on soils may not be entirely avoidable or mitigatable because of a permeable pumice layer that underlies the soils of the Big Bottom area, and that could minimize the effectiveness of drainage systems. Inundation of some Prime Agricultural Lands would be unavoidable in the lower portion of the reservoir.

4.1.2 Land Use

4.1.2.1 Beneficial and Adverse Impacts

Approximately 1,830 acres of land would be directly impacted by the proposed project. These lands would be converted from the existing uses described in Section 3.1.2 to project use, and would be inundated, used for project facilities, set aside for recreation, or utilized for wildlife habitat. Additional land would be temporarily affected when used for construction staging areas and for project access. Proposed buffer zone lands initially would be utilized for either recreation or wildlife habitat; however, the Applicant has also proposed that certain lands might be allowed to retain their current uses. This proposal is discussed further in Section 4.1.2.2. There is also a possibility that secondary effects of the proposed project's development may include elevated ground water levels that could render some agricultural lands (about 170 acres) unfit for continued cultivation or growing of existing crops.

The construction of a new impoundment could create additional development pressure for recreational cottage sites or related types of commercial land development in the vicinity of the project. Based on an assessment of competing sites and similar types of developments located nearby, it is unlikely that development would occur at an accelerated rate.

4.1.2.2 Mitigative Measures Proposed

The Applicant proposes to mitigate land use impacts by minimizing, to the extent allowable, the width of the buffer zone, by granting easements for specific compatible uses of the buffer zone lands to adjoining land owners, by leasing back improved agricultural lands within the buffer strip, by buying or providing compensation for lands adversely impacted by groundwater changes, and by locating proposed recreational areas primarily on land that is now owned by the state, thereby reducing the taking of private land. The Applicant also considers its choice of a reservoir elevation to be a form of mitigation because a reservoir at the 866 level would directly impact less land than a reservoir at EL 872.

The Applicant's proposed purchase and management of the buffer zone would limit uncontrolled or unapproved access to the proposed reservoir, and would therefore tend to dampen adjacent commercial and residential land development pressures.

The Department of the Interior recommended that the Applicant acquire conservation easements to compensate for the loss of river segments identified in the National River Inventory as potentially eligible for inclusion in the National Wild and Scenic Rivers System. The Applicant states that its provision for a buffer zone fulfills the intent of this recommended mitigation.

4.1.2.3 Unavoidable Adverse Impacts

Approximately 870 acres of land, including about 445 acres outside of existing river channels, would be inundated. A total of 1,830 acres would be included within the proposed project boundary, thus limiting its use to project and project-related purposes. Alternative land uses of construction staging areas and access routes would be limited until proposed construction is completed.

4.1.3 Recreation

4.1.3.1 Beneficial and Adverse Impacts

The construction phase of the proposed project would cause some short-term impacts on existing recreational uses in and around the project area. The construction activities would cause temporary increases in dust, noise, soil erosion, and turbidity. These construction-related effects would degrade the scenic quality of the area and would reduce the use of this area by fishermen and hunters.

Construction of the proposed project would preclude further consideration of sections of the Cowlitz and Cispus Rivers for inclusion in the National Wild and Scenic Rivers System.

Existing recreational uses of the project area would be adversely impacted by the proposed project. Some popular locations for recreational activities would be inundated, and others would be altered significantly by the proposed channelization downstream of the proposed dam site. Any opportunities for kayaking or rafting would be eliminated. It is expected that some informal camping and stream bank fishing would continue at other locations, or would be replaced by use of the proposed project's recreational areas and facilities.

Hunting in and around the project area would be expected to continue, although some displacement resulting from inundation of popular hunting sites would also occur.

According to the Applicant's estimates, there would be about 460 vehicle trips per peak summer weekend day attributable to use of the project's recreation facilities. This volume of traffic would not be expected to adversely affect the local road systems. Private roads within the project area have been open to recreationists using the Cowlitz and Cispus shorelines, and thus they probably receive usage comparable to that which would be expected after construction of the proposed project. The possible closing of private road access to proposed recreation facilities or areas could adversely affect their potential for development or continued operation.

4.1.3.2 Mitigative Measures Proposed

The loss of existing recreational resources in the project vicinity would be compensated for, to some extent, through the implementation of the Applicant's recreation plan (Application, Exhibit R). The multi-purpose athletic field was proposed as mitigation (although not in kind) for the loss of existing recreational resources, after the Applicant consulted with, and received recommendations from, the Lewis County Parks and Recreation Department.

The Applicant also proposes to acquire lands to be held in reserve for future recreational development, if and when development becomes necessary. These lands would remain in a natural state, and could be utilized for hunting and primitive camping. This would mitigate, to some extent, for the loss of other existing hunting and primitive camping locations.

The Applicant proposes to minimize any impacts to existing private roads by placing directional signs to proposed recreational facilities only on public access routes (letter from R.W. Beck and Associates to James Haimes of FERC Staff, November 6, 1981).

4.1.3.3 Unavoidable Adverse Impacts

The proposed project would eliminate potential white-water kayaking and rafting on the Cowlitz River within the project area. It would also eliminate river bank fishing on approximately 12.3 miles of the Cowlitz River shoreline, and on about 1.7 miles of the Cispus River. The proposed development of recreational facilities would eliminate some wildlife habitat, and, during the recreation season, usage of the proposed facilities would impact wildlife through displacement. The proposed reservoir would permanently inundate popular existing, but unimproved, camping, hunting, and fishing sites.

The development of the project would permanently render ineligible previously identified sections of the Cowlitz and Cispus Rivers for inclusion in the National Wild and Scenic Rivers System.

4.1.4 Air Quality

4.1.4.1 Beneficial and Adverse Impacts

Construction of the proposed dam and powerhouse would result in the temporary degradation of the air quality of the area by the emission of hydrocarbons, nitrous oxides, and particulates from the construction equipment. Earth moving activities and the burning of slash would also increase particulate levels.

The presence of the reservoir in the Cowlitz River Valley would ultimately increase both the occurrence of fog and the amount of land area that would be encompassed by the fog. The surface area of a water body is one of the factors that governs the amount of fog that would be produced. The surface area of the Cowlitz River would be approximately doubled as a result of construction of the reservoir (from 425 acres to 870 acres); the increase in the amount of fog produced, however, would not approach the increase that resulted from the filling of Riffe Lake, which has a surface area of 11,335 acres.

4.1.4.2 Mitigative Measures Proposed

Emissions from the construction equipment would be expected to come within the limits prescribed by the Federal Government. The burning of the slash would be performed in accordance with applicable regional statutes.

4.1.4.3 Unavoidable Adverse Impacts

Construction of the facility would result in the introduction of air pollutants into the atmosphere, although the amount of pollutants emitted from construction equipment and slash burning would be minimized by adherence to state and Federal statutes. In addition, filling the reservoir would increase the occurrence of fog in the Randle area.

4.1.5 Noise Levels

4.1.5.1 Beneficial and Adverse Impacts

Short-term local increases in noise levels would occur during project construction from the use of heavy equipment and blasting. It is expected that all construction equipment would comply with recommended EPA noise criteria and would be within limits considered safe by OSHA.

4.1.5.2 Mitigative Measures Proposed

No specific mitigative measures for controlling potential increases in noise levels were proposed by the Applicant.

4.1.5.3 Unavoidable Adverse Impacts

Construction of the facility would increase noise above ambient levels for the duration of the construction period. Adherence to appropriate regulations and statutes would ensure that the increase would be within safe limits.

4.1.6 Water Quality and Quantity

4.1.6.1 Beneficial and Adverse Impacts

Water Quality

Construction of the proposed facility would result in a temporary increase in the suspended solid load of the Cowlitz River. The sediment would originate from excavation of the dam foundation, construction and dismantling of the cofferdams, widening of the tailrace channel, and erosion from haul roads and areas cleared of vegetation that would be inundated by the proposed reservoir. The sediment that would be suspended by the construction process would ultimately be deposited in the headwaters of Riffe Lake.

The initial inundation of the project lands would introduce organic matter and nutrients associated with the soils into project waters. The amount of these substances introduced into the water column would depend upon the amount and type of soil inundated, the rate at which the reservoir would be filled, and the

retention time of the reservoir. During the initial operation of the project, the release of nutrients into the water column would promote primary production. Biodegradation of organic matter associated with the inundated soils would cause a decrease in the oxygen concentration of the water at the soil-water interface. These kinds of impacts would diminish in time.

Filling of the proposed Cowlitz Falls Reservoir would increase the surface area of the river from 425 acres to 870 acres and the depth to a maximum of 80 feet. The pool area of the reservoir, located at the confluence of the Cispus and Cowlitz Rivers, is where the greatest increase in surface areas and depth would occur. This area of the reservoir is expected to stratify weakly during the late summer and winter months. The upper reaches of the Cispus River, and particularly of the Cowlitz River, that would be located within the project boundaries, would be contained within the original riverbanks, and as a result are expected to retain riverine characteristics with regard to temperature profiles. It is not expected that the reservoir would significantly impact the temperature regime of the Cowlitz River.

Operation of the reservoir is expected to have a negligible impact on the chemical quality of the Cowlitz River because of the low retention times of the proposed reservoir. The concentration of dissolved gases in the river could increase to supersaturation levels when the hydraulic capacity of the powerhouse (10,000 cfs) is exceeded, and water is spilled over the spillway.

The amount of supersaturation that occurs is dependent chiefly upon the height of the spillway and the depth of the plunge pool. Increases in either the spillway height or the plunge-pool depth would increase supersaturation. The proposed Cowlitz Falls Dam would have a spillway height of 60 feet and a plunge-pool depth of between 35 and 50 feet. Based upon a comparison of the structural characteristics of Mossyrock Dam and the proposed Cowlitz Falls Dam, and taking into account the fact that the spillway would be designed to minimize the supersaturation effect, it is not likely that the gas saturation of the river would exceed the maximum allowable state standard of 110 percent.

Creation of the reservoir would reduce the turbidity of the Cowlitz River under normal operating conditions because of the settling of a portion of the sediment load within the reservoir. During high flows, however, when it is proposed that the reservoir would be returned to riverine conditions by opening the floodgates, the sediment that was deposited in the reservoir during the low-flow periods would be resuspended, and transported downstream of the dam into the headwaters of Riffe Lake. The resulting increase in turbidity of the Cowlitz River would probably exceed the turbidity levels of the Cispus and Cowlitz Rivers above the reservoir during these periods.

Groundwater

Filling of the Cowlitz Falls Reservoir would increase the water surface elevation of the river, which, in turn, would increase the elevation of the groundwater table. Figure 4-1 illustrates the relationship among the water surface elevation of the reservoir, the seasonal depths of the water table, and the projected water table elevation as a result of project operation. As can be seen in Figure 4-1, impacts associated with the changes in the elevation of the water table that would occur as a result of filling the reservoir depend, in part, on the seasonal fluctuations of the water table. During the drier summer months, the water surface elevation of the reservoir would determine the water-table depth in the low-lying portions of the floodplain, when the elevation of the reservoir exceeds the elevation of the seasonal low-water table. The increases in the water table elevation would also reduce the infiltration capacity of some of the lower-lying soils by reducing the volume of the unsaturated zone. This reduction would result in an increase in the amount of ponding that would occur during periods of high precipitation and snowmelt.

Those areas where the groundwater table elevation was projected to be within 4 feet of the land surface would be adversely impacted by the proposed project, and are identified in Figure 4-2. The predominant use of land in the Cowlitz Falls Valley is for farming, and the 4-foot figure is based upon the minimum level that can be tolerated by perennial crops grown in the area (Malcolm McPhail, soil scientist and agronomist, Washington State University Cooperative Extension Service, December 1, 1981, personal communication).

The areas of low topographic relief that would be located adjacent to the proposed reservoir are expected to be impacted to the greatest extent. These areas are located between Randle and RM 93, in the Big Bottom area. The topography of the land in the area of the Cispus River, and between the proposed dam and RM 93 of the Cowlitz River, is of such relief that the surface area of the impact zone, with regard to the adverse impacts associated with increased elevation of the water table, is negligible. There does exist the potential for seepage of water into the Ancestral Valley at RM 90; seepage could result in high groundwater levels (Section 4.1.1.1).

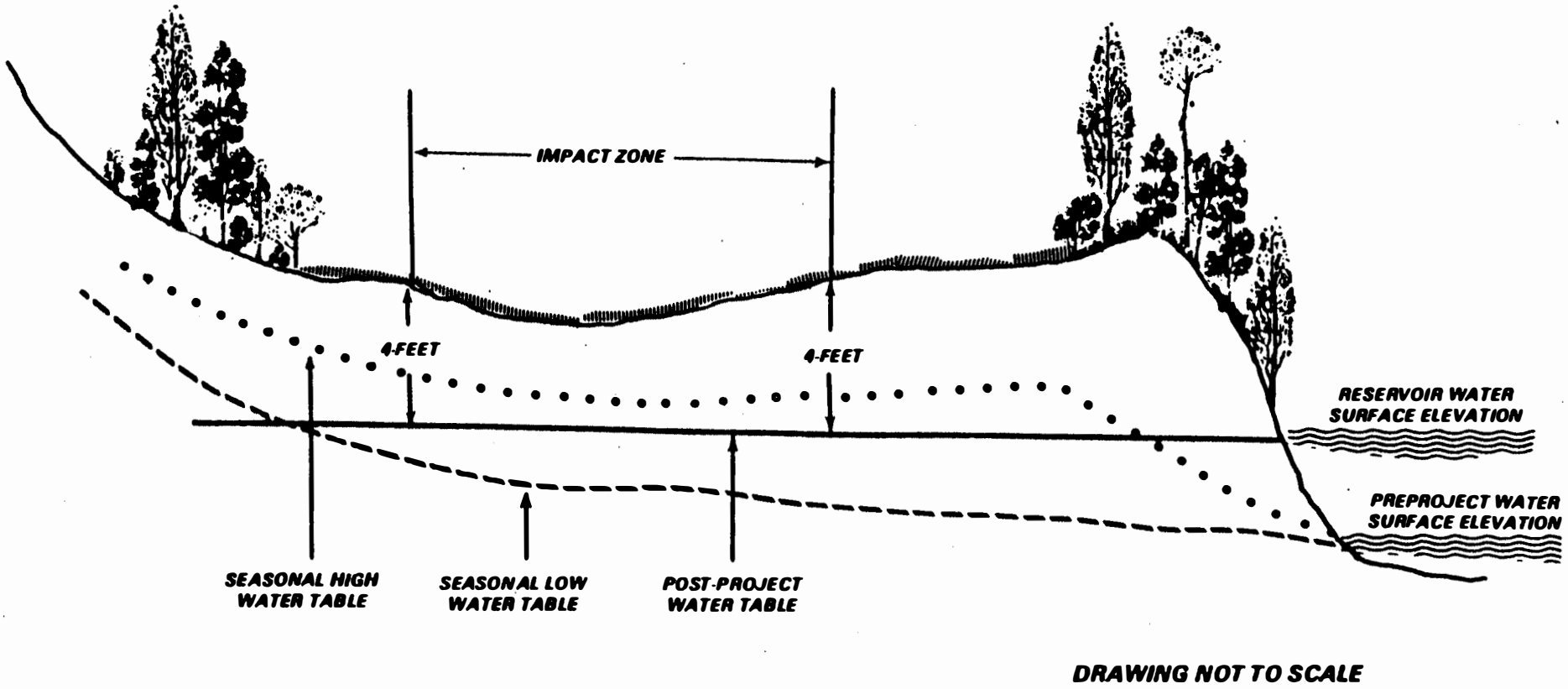


Figure 4-1. Schematic diagram of the relationship between preproject and postproject water table elevations and the land surface of the proposed project area (Source: Staff).

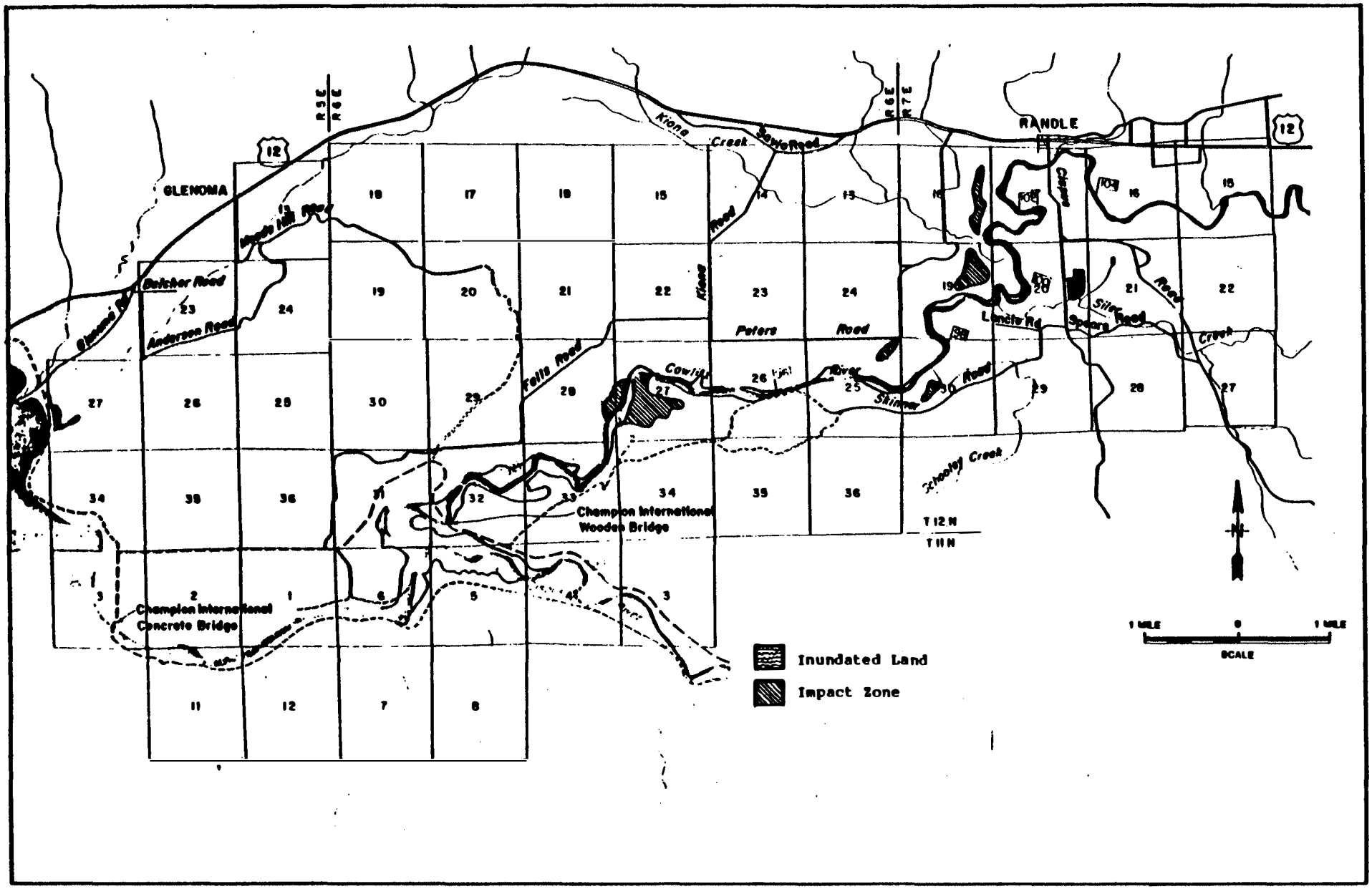


Figure 4-2. Portions of the Big Bottom area where land would be affected by water tables raised by proposed reservoir EL 866. Location and size of the impacted areas were derived from draft topographic maps supplied to Staff (Source: Letter from R. W. Beck and Associates to Lon Crow of FERC staff, November 24, 1981).

Increases in the elevation of the water table could also adversely impact domestic water wells and septic systems of the few dwellings in the area.

Debris

Construction and operation of the proposed Cowlitz Falls Reservoir could increase the amount of debris that would enter the Cowlitz River. This increase would result from the inundation of cleared areas, where slash would remain, and from the uprooting of trees in the riparian zone caused by the destabilization of the reservoir banks. The amount of debris that would enter the Cowlitz River as a direct result of project construction and operation, however, would be insignificant when compared to the annual loading of debris that originates from the watershed.

The Applicant has proposed to design the dam so as to minimize the blockage of the spillway by debris; no measures, however, have been proposed to prevent debris from reaching the dam.

Therefore, large boles and debris islands that are carried by the Cowlitz River during periods of highflow could potentially block the spillway of the proposed dam. Blockage of the spillway could aggravate flooding in the Big Bottom area of the Cowlitz Valley.

Sedimentation

Construction of the proposed project would temporarily increase the sediment load of the Cowlitz River. Most of the sediment introduced into the river during the construction period would ultimately be deposited in the headwaters of Riffe Lake.

Operation of the proposed project would deposit within the reservoir significant amounts of the sediment transported by the Cowlitz River. The greatest amount of sediment would be deposited in the deep pool area of the reservoir that is delineated by the significant change in slope of the river that occurs at the Champion International wooden bridge. The Applicant has estimated the amount of sediment that would accumulate in the reservoir to be approximately 2,500 acre-feet, or 12.5 percent of the reservoir, and that this amount could be deposited within a 7-year period.

Staff's independent hydraulic analysis, and a detailed review of the Applicant's sedimentation studies, shows that accumulation of sediment in the backwater areas of the reservoir could aggravate flooding in the Randle area. The Applicant's conclusion that operation of the project as proposed would preclude the accumulation of sediment in the backwater areas thereby having no impact on flooding in the Randle area, is not supported by the assessment

performed by Staff. Staff's hydraulic analysis, using an assumed depth of sediment believed to be the lower limit of deposition, demonstrates that operation of the project at EL 866 could increase the frequency with which high flows would overtop the river banks, and that significant accumulations of sediment could significantly increase the water surface elevation of the river during major flood events. Such impacts on the flood stage of the Cowlitz River would necessitate the Applicant obtaining flood easements.

4.1.6.2 Mitigative Measures Proposed

Water Quality

The Applicant proposes to use methods of vegetative clearing and similar practices to minimize the loss of soil from disturbed land surfaces and subsequent increase in the sediment load of the Cowlitz River. In addition, the Applicant proposes to monitor the water quality of the reservoir for 2 years following reservoir filling, to cooperate with the State of Washington Department of Ecology, and to operate the reservoir so as to maintain state water quality standards.

To ensure that nitrogen saturation would be minimized during periods of spill, the Applicant would modify the spillway as necessary to minimize the downward plunging of water into the stilling basin pool.

Groundwater

The Applicant proposes to monitor groundwater levels before, and for at least 1 year after, filling of the reservoir, to determine what impacts the project would have on the elevation of the water table. In addition, if any lands are determined to be adversely impacted by elevated water tables or seepage through the Ancestral Channel, the Applicant proposes to purchase or drain these impacted areas.

Any septic fields that would be adversely impacted by changes in the height of the water table would be modified or relocated by the Applicant. To mitigate for possible adverse impacts to domestic water wells, the Applicant has proposed to characterize the water quality of all wells that would be adversely impacted by elevated water tables before the filling of the reservoir and, if the potability of the water is found to be adversely impacted, the Applicant proposes to seal the affected well or relocate improperly sealed wells.

Debris

The Applicant proposed to design the spillway to allow for passage of floating logs and other debris. In addition, the

Applicant has stated that routine maintenance of the facility would include surveying the reservoir and upper river areas for debris longer than 60 feet, and removing such debris.

Sedimentation

The Applicant proposes to operate the spillway so as to return the Cowlitz River to a riverine condition at flows in excess of 15,000 cfs. According to the Applicant, operation of the project in this manner would preclude the accumulation of sediment in the back water areas of the reservoir.

4.1.6.3 Unavoidable Adverse Impacts

Water Quality

During the construction and initial operation of the proposed reservoir, the water quality of the river in the project area would be temporarily degraded by the introduction of sediment from disturbed land surfaces, and by the release of organic matter and nutrients from inundated soils into the water column. The return of the reservoir to riverine conditions during periods of drawdown would increase the turbidity of the river. The concentration of dissolved gases may exceed saturation levels under certain flow conditions, but it is expected that the level of gas supersaturation would be minimal, and within the state's allowable standard of 110 percent.

Groundwater

Areas contained within the project boundaries, and adjacent areas where the water would be elevated to within 4 feet of the land surface, would be restricted with regard to what crops could be grown. The draining of these lands by the placement of drainage tiles or similar measures would decrease the amount of ponding that would occur during periods of high precipitation or snowmelt; these measures, however, would have minimal effect on the perennial depth of the water table that would result from operation of the reservoir.

Seepage of water through permeable deposits and into the Ancestral Valley would increase the groundwater levels of that area, as discussed in Section 4.1.1.3.

Debris

Collection and removal of large debris in the reservoir and upper river during operation of the facility would reduce the potential for blockage of the spillway of the proposed Cowlitz Falls Dam during periods of high flow. The use of the 60-foot length as a criterion for selecting what debris would be removed, however, would not be sufficient to ensure that floating debris would not reduce the flow of floodwaters through the spillway. Trees of a dendritic or branched form that are less than 60 feet in length could accumulate sufficient debris so as to block 60-foot-wide spillway gates.

Sedimentation

A significant portion of the volume of the main body of the reservoir below the wooden bridge would be eliminated through the deposition of sediment carried by the Cowlitz River. The amount of sediment contained within the main body of the reservoir would be controlled, however, by the erosive forces of the river during periods of drawdown or high flow.

Based on Staff studies, the project with a normal maximum operating level of 866 could not be modified to preclude the buildup of sediment in the upper reaches of the Cowlitz River. The sediment buildup would cause aggravation of flooding in the Randle area.

4.1.7 Fishery Resources

4.1.7.1 Beneficial and Adverse Impacts

Construction

Major adverse effects of project construction would occur at the dam site, and immediately downstream in the reach of the river where channel modifications are proposed. The river diversion around the dam site would result in the dewatering, for about 1 year, of 2,000 feet of the Cowlitz River (Phase I). Fishes unable to escape from the affected reach would be lost at the time of diversion, and the reach itself would be removed as fisheries habitat for the duration of the diversion. Upstream fish passage through the dam site would be blocked by high water velocities during Phase I of the construction period. Fish passage might be possible only at lower river flows during Phase II, when the river has been returned to its channel, and all flow would be passed through the partially completed dam (1.5 year duration). Salmon and trout attempting to ascend the Cowlitz River from Riffe Lake would thus be blocked during most of the construction period, resulting in the loss of sport fishing in the immediate area of construction, and a loss of salmon fishing upstream of the construction site. Diversion of flow from 2,000 feet of the Cowlitz River would also remove the reach from fishery production, resulting in a small loss of resident fishes.

Modification of about 1 mile of the river channel downstream of the dam site would result in the direct loss of some fishes from blasting, excavation, and high turbidity during the anticipated 4-month construction period, although many fishes would probably avoid the area during the peak of construction. Construction work would also preclude sport fishing activities in this area.

Operation

Adverse effects of a run-of-river project operation at EL 866 would include: inundation of riverine habitat by the reservoir; obstruction of upstream movement of fishes from Riffe Lake; some mortality of downstream migrating fishes through the powerhouse; transformation of the 1-mile reach of the Cowlitz River downstream of the dam site into a straight, uniform-depth channel; and, disruption of sport fishing activities now occurring in the proposed project area.

A total of 12.3 miles of the Cowlitz River, 1.7 miles of the lower Cispus River, and 1.5 miles of tributary creeks would be inundated at EL 866. This would convert several miles of riverine habitat to reservoir, or slowmoving stream habitat. The boulder/rubble/gravel substrate that now predominates between the proposed dam site and RM 94 on the Cowlitz River, and on the lower Cispus River, would eventually be covered by sediment, resulting in a sand/silt substrate throughout most of the proposed reservoir. Portions of the river would no longer be suitable for trout spawning and rearing, or for salmon rearing. This would result in the probable displacement of fish to upstream riverine areas, and in the loss of some trout production. Trout and salmon could exist in the proposed reservoir, although feeding conditions would likely be better in upstream riverine areas. Other resident fishes, such as squawfish, suckers, and bass, would readily adapt to a reservoir environment, and could experience population increases.

The presence of the proposed Cowlitz Falls Dam would block upstream fish migration from Riffe Lake. The present upriver migration of salmon from Riffe Lake provides an important sport fishery at the head of the lake near the Champion International concrete bridge, at the confluence of the Cowlitz and Cispus Rivers, and at least as far upstream as the town of Randle. The dam would block the salmon migrations and thus eliminate the

salmon fishery that now exists above the dam site. The presence of the dam, however, should not affect the fishery at the concrete bridge, and could provide an additional fishing area at the base of the dam, where upstream migrating fish would congregate. This would, however, depend on the suitability of the river reach for angling after modification of the channel, and on the provision of appropriate angler access.

The proposed Cowlitz Falls Dam would have some effect on downstream fish passage during portions of the year, although it probably would not adversely affect the fishery. Significant spill is expected to occur during the months of November through February, and April through June, in an average water year (Application, Exhibit W). The April through June period coincides with the greatest downstream movement of salmon to Riffe Lake. Fish passing the project during spill periods would likely pass through the spillway with minimal mortality (about 2 to 3 percent). Those fish migrating during nonspill periods would pass through the turbines (assuming bypass facilities are not installed), and could experience a mortality rate of 10 to 15 percent. The effect of this mortality on the Riffe Lake fishery is difficult to predict, but is not likely to be significant.

Modification of the 1-mile reach of river downstream of the dam would adversely affect fish utilization of the reach. When Riffe Lake is drawn down from late fall through spring, the 1-mile reach is a diverse, free-flowing stream of alternating pool and run that is probably utilized by trout, salmon, and other resident fishes. When Riffe Lake is at or near its maximum elevation, this river reach is inundated and resembles a deep, slow-moving stream. Excavation of the reach to create a uniform-depth, straight channel, is likely to result in decreased use of this reach by fishes, except during either upstream or downstream migration. Sport fishing success would also be less in the modified channel, since fish would not likely remain in an area with high water velocities and little cover.

In addition to the impacts on the sport fishery, fishing above the dam would be adversely affected by inundation of a popular fishing and camping area at the confluence with the Cispus River. Although this area would be lost, and salmon would be denied access to the river above the dam, fishing for resident trout could continue on the reservoir, or on sections

of stream above the reservoir. Trout populations within the reservoir could be lower than existing populations in the affected reach of river, but the project probably would not adversely affect trout populations upstream of the reservoir.

Operation of the project in a run-of-river mode would have little effect on fishery resources upstream or downstream of the dam. The Applicant would provide a continuous minimum flow of 1,000 cfs to protect aquatic resources in the downstream river channel. Riffe Lake also would back up water to the base of the dam at its maximum elevation. The proposed reservoir would only fluctuate vertically about 1 foot or less during normal run-of-river operation. Greater drawdowns could occur during flooding conditions, but the effects of flooding would likely outweigh those of any additional drawdown.

Effects on Anadromous Fish Restoration

The presence of the proposed Cowlitz Falls Dam could be beneficial for a future anadromous fish restoration program. Past attempts to maintain anadromous fish runs above the Mossyrock Dam failed because emigrating salmon smolts were unable to find their way through Riffe Lake to collection facilities, and either took up residence or died (Weller and Reed, 1980). The construction of downstream migrant collection facilities at the Cowlitz Falls Dam would allow salmon smolt to be collected at the dam and transported downriver, thus avoiding the need for passage through Riffe and Mayfield Lakes. The Applicant has proposed to construct the project so that a louver collection system could be added, if and when a decision is made by state and Federal fisheries agencies to proceed with a restoration plan. The source of funding for a restoration plan, including the cost of installing the louver collection system, has not yet been determined.

A problem that could be encountered with a louver collection facility at the project is the variability in collection efficiency due to changing river flows or debris loads. Weller and Reed (1980) indicate that with the proposed powerhouse capacity of 10,000 cfs, spillway discharge would occur about 7 days during May, and 3 days during June, under median flow conditions. If an additional discharge bay with 5,000 cfs capacity was included in the louver facility, spillway discharge would occur only about 2 days in May and 1 day in June. Variability in

spillway discharge would occur, however, resulting in differing efficiencies in the fish collection facility. In years of high spill, many smolt would pass through the spillway and into Riffe Lake, resulting in the loss of most of these fish to the anadromous program. In dry years with little spill, collection efficiences would be higher, and could result in the successful capture of emigrating salmon smolt. Efficient collection of smolt would, however, affect the "landlocked" salmon emigrating from the upper Cowlitz River. This could be mitigated, however, by direct stocking of salmon into Riffe Lake, if the state fishery agencies decided to maintain the existing fishery.

4.1.7.2 Mitigative Measures Proposed

Construction

The Applicant has proposed to utilize good construction practices to minimize erosion and resultant turbidity and sedimentation of project waters. An interim fish stocking program is also proposed by the Applicant to compensate for the immediate effects of construction activities on fish populations and sport fishing.

Operation

The Applicant proposes that the project design be considered mitigation, since proposed EL 866 would result in fewer adverse impacts than EL 872. The spillway would be designed to minimize nitrogen supersaturation below the dam.

Other measures proposed by the Applicant to mitigate project impacts include stream habitat improvement, fish stocking, and development of recreational facilities. Aquatic habitat within the project reservoir, and in five tributary streams within or in close proximity to the project area, would be improved to allow for greater fish utilization of these areas, thus providing the potential for increased fish production. Reservoir improvements would include preservation or enhancement of riparian habitat along the new shoreline, and the construction of diked, shallow impoundments within the reservoir. These measures would provide ideal habitat for warm-water species such as largemouth bass. Habitat improvements in tributary streams would consist of the preservation or enhancement of riparian vegetation, and the installation of structures to create pool habitat. Creeks considered for these improvements include: Goat, Tumwater, Crystal, Kiona, and Siler (Figure 4-3). Kiona and Siler Creeks are partially located within

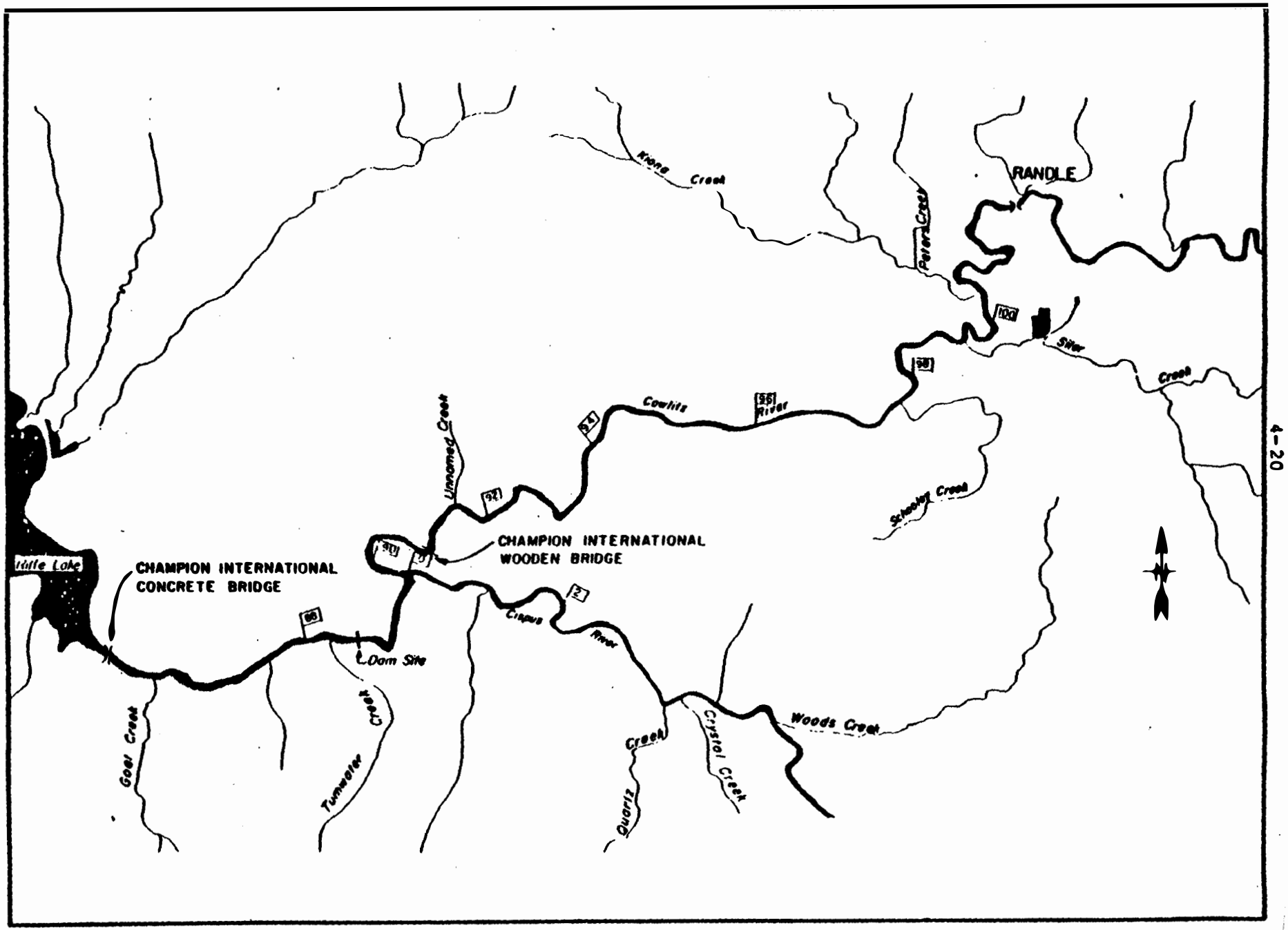


Figure 4-3. Creeks and rivers in the proposed project area (Source: Application, Exhibit W).

project boundaries, and the Applicant proposes to improve only the portions of these creeks within project boundaries. Habitat improvements within tributary streams would benefit resident trout populations and potentially would increase trout production.

The Applicant's fish stocking program could include, in addition to interim stocking, both trout and salmon stocking programs. Although these plans have not been completed, the trout program likely would be a reservoir stocking of rainbow trout, to provide a reservoir trout fishery. The maximum annual stocking would be about 40,000 legal-sized trout (8,000 pounds), to be planted in various locations within the reservoir. The success of the program would be evaluated for 2 years, and changes would be made in the program accordingly. The salmon stocking program is proposed only if studies to be conducted by the Applicant indicate that the project has had a negative impact on the existing salmon fishery in the project area. The Applicant has also considered substituting trout for salmon. The final plan, however, would be drawn up in cooperation with state and Federal fishery agencies.

The development of proposed recreational facilities would include two boat launches and fishing access sites, thus providing additional angler access to the reservoir.

A fisheries enhancement measure proposed by the Applicant would be to design the project so that a louver collection system could be installed in the future, if an anadromous fish restoration program is initiated. The powerhouse structure would be designed so that such a collection system could be installed without major modification of project works.

The Applicant proposes to employ a fishery biologist during the 3-year construction period and for the first 2 years of operation to monitor and implement mitigation programs. At 5-year intervals thereafter, a biologist would be retained to review and supervise any adjustments to the mitigation programs.

4.1.7.3 Unavoidable Adverse Impacts

Construction

Unavoidable impacts of the proposed dam construction would include the diversion of the river and loss of about 2,000 feet of fishery habitat for about 1 year, and the blockage of

upstream fish passage during most of the 2.5 year construction period. Modification of the 1-mile reach of river channel downstream of the dam would result in the unavoidable loss of some fishes due to blasting and excavation, and the possible avoidance of the area by fishes. The loss of sport fishing opportunities would be unavoidable in the construction area.

Operation

The inundation of riverine habitat by the reservoir, the obstruction of upstream movement of fishes from Riffe Lake, the creation of unsuitable fisheries habitat in the modified river reach downstream of the dam, and the loss of fishing opportunities above the dam would be unavoidable adverse effects of project operation. These impacts would likely result in a reduction in the native, resident trout populations in the river reach to be inundated, although this reduction could be offset by the stocking of hatchery trout proposed by the Applicant. The salmon fishery that now exists above the dam would be lost, but the fishery could continue downstream of the dam where most fishing effort is now concentrated.

4.1.8 Vegetation

4.1.8.1. Beneficial and Adverse Impacts

Construction of project facilities, including the transmission line (Corridor B), would require the removal of approximately 313 acres of vegetation, about 33 acres for the transmission line ROW, and 280 acres for remaining project facilities such as the powerhouse, switching station, and dam abutment. Construction of the project reservoir at EL 866 would require the removal of about 439 acres of existing vegetated areas (excluding the river channel and sandbars).

The proposed project facilities and transmission line would be constructed primarily in areas occupied by the red alder/Douglas fir vegetation type, with about 14 acres of clear-cut land affected by the ROW. The proposed reservoir at EL 866 would affect large amounts of both the upland and lowland forest features, a small amount of the riparian/ meadows features, and none of the wetlands/riparian feature. About 139 acres, or 31 percent of the vegetation impacted, would be the big leaf maple/red alder type, followed by 72 acres (16 percent) of Douglas fir-pole size. Only about 42 acres (9 percent) of the total vegetation loss would include the grass/hay/pasture type. Remaining vegetation types that would be impacted at EL 866 are presented in Table 4-1.

Table 4-1. Vegetation loss by land feature and vegetation type for each reservoir alternative of the proposed project area (Source: Letter from R.W. Beck and Associates to Patrick Murphy of FERC staff, November 25, 1981).

Land feature and vegetation type	Acreage of vegetation loss by reservoir alternative 1/ EL 862	EL 866	EL 872
Upland forest feature			
Douglas fir-pole size	72	72	88
Red alder/Douglas fir	18	50	100
Red alder	18	22	35
Douglas fir-saplings	29	30	66
Western hemlock/big leaf maple	10	10	13
Clearcut	37	37	68
Subtotal	184	221	370
Lowland forest feature			
Big leaf maple/red alder	118	139	251
Big leaf maple	6	43	147
Cottonwood	0	0	13
Subtotal	124	182	411
Wetlands/riparian feature			
Sedge/rush	0	0	47
Swamp	0	0	11
Willow	0	0	10
Subtotal	0	0	68
Agrarian/meadow feature			
Grass/hay/pasture	31	36	606
Hazel/blackberry	0	0	2
Subtotal	31	36	608
Total	339	439	1,457

1/ Acreage amounts do not include rivers, creeks, sand bars, or non-reservoir project facilities.

Operation of the project at EL 866 is expected to cause a rise in the water table of adjacent land areas, particularly lowland forest and agricultural lands. The Applicant has estimated that about 170 acres of agricultural land would be impacted by an increased water table. About 130 acres of the total impacted agricultural land is presently being cultivated, primarily for forage crops (e.g., alfalfa, grass/clover mixes). Some adverse impact from higher groundwater would occur on the lowland forest vegetation types and to a minimal extent on the upland forest vegetation types. The extent of impacts on these types would vary, depending to a large extent on soil type and affected vegetation species.

Another area of possible impact with high groundwater is in the Ancestral Valley of the Cowlitz River between the proposed reservoir and Riffe Lake. Seepage from the reservoir via the long path to Riffe Lake might surface before reaching the lake, causing high groundwater levels. If this occurs, additional vegetation would be lost initially, but the impacted area would naturally revert to a wetland type vegetation in time.

A major beneficial impact of the proposed project would be the formation of new riparian vegetation along the shoreline of the reservoir. The natural establishment of such vegetation would require a number of years, but ultimately, more riparian vegetation would occur with the project than without it.

4.1.8.2 Mitigative Measures Proposed

Two general mitigative measures for vegetation impacts proposed by the Applicant are: the minimization of vegetation clearing; and the establishment and management of new and existing areas. Both measures are proposed primarily for the benefit of wildlife populations, but such measures would also benefit the aesthetics of some areas. Mitigation measures for wildlife and aesthetics are discussed in Sections 4.1.9 and 4.1.11, respectively.

The Applicant proposes to clear most vegetation from the proposed reservoir, but also has indicated that there are areas where vegetation could be left, generally the areas above EL 860.

The establishment and management of new and existing areas would apply to plantings around major nonreservoir project facilities, and to modification and management of habitat areas around the reservoir.

Plantings around major nonreservoir project facilities would be conducted primarily for soil stabilization and landscaping. These plantings would be conducted on most nonreservoir project sites both during and following construction, and would apply to such areas as temporary roads, spoil sites, borrow sites, equipment staging areas, and powerhouse sites. A mixture of grass and legume species would be used to stabilize these areas in an effort to expedite the development of seminatural vegetation.

Habitat modification and management would be conducted primarily in an effort to mitigate impacts to wildlife. These activities are discussed in Section 4.1.9.2.

As described in Section 4.1.1.2, the Applicant has proposed the installation of drainage works in agricultural lands impacted by higher groundwater levels.

4.1.8.3 Unavoidable Adverse Impacts

The construction of the proposed project facilities and the reservoir, excluding the transmission line, would require the permanent removal of about 719 acres of existing terrestrial vegetation, representing a variety of vegetation types. About 280 acres would be removed and displaced with project facilities, while the remaining 439 acres would be cleared to accommodate the reservoir.

4.1.9 Wildlife Resources

4.1.9.1 Beneficial and Adverse Impacts

The construction of the proposed project would result in the inundation of 439 acres of wildlife habitat, including 366 acres of forest, 37 acres of clearcut, and 36 acres of agricultural land. Resident and migratory species dependent upon the inundated areas would be forced to relocate to adjacent areas. Immobile species and life stages, or species with small home ranges, would be lost. Displaced wildlife would affect adjacent habitats, which are assumed to be at their carrying capacity, by increasing competiton for food and cover. Overcrowding and accompanying stress would cause the loss of the least fit individuals and habitat deterioration.

Lands inundated would include streambank and riparian habitats in the western third of the project area that are intensively used by wildlife. Riparian and aquatic species that forage, nest, and den in this area would be lost. Nineteen beaver dens (approximately 95 individuals) and an undetermined number of river otter, muskrat, and mink dens would be lost. One otter den (four individuals) would be lost in the construction area. The new shoreline should be suitable for beavers if sufficient riparian vegetation develops. Otters and mink may reestablish themselves if a suitable food supply develops in the reservoir area. The overall use of the project area by aquatic furbearers, however, may decrease because of increased human use. The reservoir level fluctuation of less than 1 foot should not adversely affect denning activities.

The quality of habitats within close proximity to the shoreline is believed to be the most critical factor limiting survival of deer and elk during severe winters. Elimination of this critical habitat would greatly reduce deer and elk numbers during severe winters, at least until suitable shoreline vegetation can be established. The magnitude of this impact would depend upon future winter weather conditions, and on the rate and degree of shoreline revegetation. Deer and elk would benefit from the increased shoreline length. The increased depth and width of the reservoir should not adversely affect deer or elk that normally cross the Cowlitz River, because these species would be capable of swimming across the reservoir, if necessary.

Upland forested habitats make up a majority of the inundated lands, but are less productive than areas closer to the shoreline. These areas, however, provide food and cover for wintering and resident deer and elk, ruffed grouse, and a wide variety of nongame species, all of which would be lost. Agricultural lands to be inundated support less diverse wildlife populations.

The inundation of the river channel would eliminate wildlife species that are closely associated with rapid and riffle habitats, such as the dipper and common merganser. The loss of gravel bars would limit the use of the project area by species such as the spotted sandpiper and killdeer. Waterfowl utilizing slow-moving water would vacate the area during construction, but would be expected to utilize the reservoir after construction. The reservoir would receive greater use as resting and feeding habitat by duck species, however.

Additional losses of wildlife habitat would include approximately 20 acres of red alder/Douglas fir forest that would be permanently impacted by construction of the dam and powerhouse. An additional 20 acres would be temporarily affected by construction yards and roads. The downstream channel excavation would affect a minimal amount of wildlife habitat. Increased groundwater levels could alter additional wildlife habitat, resulting in a change of numbers for some wildlife species and changing species composition.

Secondary impacts on wildlife would result from construction activities. Increased on- and off-road vehicular traffic, noise and dust, and human intrusion would adversely affect movement and natural activities of most wildlife species in the vicinity of the construction site. Some species, especially big game and raptors, would be forced to leave the area, and the exposure and vulnerability of deer and elk would probably increase during the construction period. Increased road kills and poaching would also be expected.

Development of recreational facilities and associated recreational use would ultimately result in the degradation of approximately 180 acres of red alder/Douglas fir forest, including some old growth forest. Wildlife use of these areas would be greatly reduced because of diminished habitat quality and increased human use. The impact would be most pronounced during the breeding season, when human use would be the highest and wildlife species are most sensitive to disturbance. Sizable populations of breeding ruffed grouse would be lost from this forested habitat, while deer and elk use would be reduced. New recreation facilities and improved access would also increase human intrusion into adjacent wildlife habitats, which would result in additional harassment of wildlife populations. Increased hunting and trapping pressure would also be expected.

The construction of the transmission line would necessitate the clearing of approximately 19 acres of forested wildlife habitat, thus precluding its use by squirrels, cavity-nesting species, and other forest dwelling species. An additional 14 acres of clearcut areas would be affected. The creation and maintenance of a forest opening would benefit species, such as deer and elk, that utilize early and mid-successional vegetation. Further, the creation of 6.7 miles of edge habitat would benefit species requiring both open and forest habitats.

4.1.9.2 Mitigative Measures Proposed

The Applicant's mitigation plan would seek to achieve the goal of no net loss in wildlife populations over the life of the project, by maintaining and enhancing existing habitats (Application, Exhibit S). WDG has conducted a study of the effects of the project on wildlife, and is working with the Applicant to determine measures needed to mitigate project impacts. Applicant has proposed to manage intensively 465 acres of land specifically for wildlife benefits, and to revegetate the new reservoir shoreline. Basic elements of the mitigation plan are discussed below. WDG's final wildlife study and mitigation recommendations were completed in November 1981, and are being reviewed by the Applicant. Based on the results of the study, the adequacy of Applicant's preliminary mitigation estimate would be assessed, and the extent and location of habitat management activities would be determined.

Lands managed for wildlife could be classified into five categories:

Shoreline/Riparian Habitat

The establishment of new shoreline/riparian habitat would offset the impacts of the loss of big leaf maple/red alder and big leaf maple vegetated areas. This would be accomplished by selectively clearing certain areas and by leaving large trees and snags, and would be followed by planting appropriate herb, shrub, and tree species. These activities would be conducted before completion of the project, so that the new shoreline/riparian vegetation is well established when the reservoir is flooded. The acceleration of the development of this habitat would reduce impacts on wildlife dependent on shoreline vegetation. In order to retain its wildlife value, domestic livestock would be excluded from the shoreline except in those areas which are currently pasture. The lower reaches of Kiona and Siler Creeks would be fenced to exclude livestock.

"Meadow" Habitat

Small "meadows" would be established to replace the loss of clearcut and meadow habitat. Selected areas would be cleared of all vegetation, including stumps, and planted with fescue, rye grass, and clover for wildlife forage. These areas would be cleared and replanted every 3 to 5 years to maintain high forage valu Deer and elk would benefit from increased forage production, and ruffed grouse broods would benefit from increased invertebrate populations.

Mixed Woodlands Habitat

The mixed woodlands habitat would be established in similar existing woodlands, and would be managed to maintain an early successional forest. This forest would be divided into five units, and one unit would be selectively cut every fifth year. This management technique would ultimately produce five early successional levels of the mixed woodland habitat. A variety of wildlife species would benefit from the increased habitat diversity.

Shrubland Habitat

A shrubland habitat is proposed for the transmission ROW following construction. Natural shrubs and forbs would occur, but some plantings are proposed to speed the development of browse species. Periodic removal of trees would be required to maintain this shrubland habitat.

Wetlands Habitat

The development of three separate wetland areas is proposed by the Applicant. These areas would represent an enhancement and not a replacement measure, since no wetland with emergent vegetation would be lost at the proposed project with the reservoir at EL 866. The Applicant's proposals call for the development of two impoundments by diking shallow arms of the reservoir at RM 92 on the south shore of the Cowlitz River, and at RM 92.7 on the north shore. A third wetland area would be developed at RM 1 on the west bank of the Cispus River. Following the establishment of dikes and appurtenant structures, these areas would be selectively cleared and planted with riparian and wetlands vegetation species to hasten development of a semi-natural wetland community. The permanent wetlands would provide quality habitat for many wildlife species, especially aquatic furbearers, waterfowl, wading birds, amphibians, and reptiles.

Additional mitigative measures include the retention of much of the vegetation and snags above EL 860. Many species of wildlife would benefit from increased perch sites, cavities, and improved aquatic food supply. All disturbed areas would be revegetated. The Applicant plans to have a professional wildlife biologist monitor construction activities, and conduct studies every 5 years to assess the success of the mitigation program.

4.1.9.3 Unavoidable Adverse Impacts

The project would result in the unavoidable loss or degradation of 719 acres of wildlife habitat. Species inhabiting these areas would be lost. The loss of critical deer and elk wintering habitat along the shoreline in the western part of the project area would result in an unavoidable short-term reduction in population numbers. The severity of the impact would be dependent upon winter weather conditions, and on the rate and success of shoreline revegetation. In the long-term, the development of an adequate mitigation plan would reduce these losses to a minimum.

Species which utilize the riffle areas and gravel bars would be lost, and aquatic mammals would experience a reduction in numbers. Increased human activity associated with construction, improved access, and recreational facilities would result in the unavoidable disturbance of wildlife inhabiting adjacent areas. The loss of wildlife and wildlife habitat is not expected to endanger the local ecosystem.

4.1.10 Threatened or Endangered Species

4.1.10.1 Beneficial and Adverse Impacts

The construction and operation of project facilities could potentially result in short- and long-term impacts on the small number of wintering bald eagles that forage in the project area. No roosting areas or nesting sites have been identified in the vicinity of the project.

The construction of the Cowlitz Falls Project, involving the presence of up to 200 construction workers, increased timber clearing activities, blasting, and increased human intrusion, would likely impact bald eagles that utilize the project area. Construction is scheduled to last through at least two winters.

Eagles tolerate a high level of activity where habitat is optimal. At less preferred sites, human activities are more disruptive to eagles and can cause a shift in habitat use patterns (Steenhof, 1976), or even dispersal from an area (Shea, 1973). Automobile traffic is one of the least disturbing human activities to eagles, which apparently become conditioned to cars (Stalmaster, 1976). Pedestrian traffic is more disturbing. Minor auditory disturbances alone do not necessarily seriously disturb eagles. Gunshots and chainsaw activity have been known to cause eagles to depart an area.

Since the project area is not considered prime eagle habitat, it is likely that eagles would avoid the area during the most disruptive portion of the construction period. Eagles would be expected to return after the completion of construction.

Food availability appears to be the factor limiting the number of wintering eagles in the project area. Wintering eagles are opportunistic feeders and choose the most readily available food supply. In the Pacific Northwest, eagles commonly feed on stranded, spawned-out salmon carcasses. Salmon may be an important food source for eagles downstream, but no migrating salmon reach the project area because they are blocked by downstream dams. The project area does not support a heavy concentration of waterfowl, which is also a preferred eagle prey.

No concentrated food source is available in the project area to attract and hold large numbers of eagles. Observations have indicated that carrion is the most important food source utilized by eagles in the project area (Wood et al., 1980). Close to the Cowlitz River, concentrations of as many as seven eagles have been observed feeding on cow and deer carcasses, much of which has been set out by local landowners. Deer carrion has been shown to affect eagle distribution (Stalmaster, 1976), especially when riverine food supplies are unavailable (Servheen, 1975). The construction of the project should not affect the food supply of the eagle. The project may, in fact, increase the food supply because carrion transported by the rivers would be trapped in the slack water of the proposed reservoir (Wood et al., 1981).

Proximity to a food supply is probably the most important factor influencing perch selection by eagles (Steenhof, 1976; Stalmaster, 1976). A good view of the surrounding area is

also an important criterion (Servheen, 1975; Stalmaster, 1976). Eagles prefer the highest available perch sites for improved visibility and accessibility. Favored eagle perch sites in Washington include dead trees, big leaf maple, and cottonwood (Stalmaster and Newman, 1979). Dead and deciduous trees lack leaves in winter and allow the greatest range of vision. Red alder receive less use because of their typical smaller size.

The availability of perch sites would be reduced following the clearing of the present shoreline. This is especially important because most of the remaining old growth in the project area is located near the present shoreline, and would be removed. This reduction in the number of large trees, however, should not be a limiting factor in continued eagle use of the project area. Alternate trees would be available above the impoundment area. In addition, Applicant has proposed leaving most vegetation above EL 860, which would retain some perch sites. Additional perch sites could be created by leaving selected trees in the impoundment area, by creating additional snags along the new shoreline by girdling or topping trees, and by building artifical perch sites.

Motorboats, drift boats, and shore fishing have been shown to disrupt eagle activity patterns in Washington (Stalmaster, 1976) and other areas (Steenhof, 1976; Ingram, 1965). Improved access to the Cowlitz and Cispus Rivers and shoreline areas would result from the development of various recreational facilities at the project. Little disturbance to the bald eagle should result because increased recreational use of the area during January to March is expected to be minimal, and the eagle food sources are located away from the rivers.

Transmission lines and towers can pose a possible electrocution hazard to bald eagles. Suitable designs are available to reduce these hazards.

In summary, the small number of bald eagles that utilize the project area would be displaced during construction of the project. The project would not affect the eagles' food supply, and any impacts from the loss of perch sites could be mitigated. No long-term impacts on the eagle should occur. Therefore, Staff concludes that construction and operation of the Cowlitz Falls Project would not jeopardize the continued existence of the bald eagle.

4.1.10.2 Mitigative Measures Proposed

The Applicant has not specifically proposed any mitigative measures for the conservation of the bald eagle.

4.1.10.3 Unavoidable Adverse Impacts

Perch sites for wintering bald eagles would be reduced in the vicinity of the project. With proper mitigation, the threatened bald eagle should not experience any unavoidable adverse impacts (see Section 5.2.1.8).

4.1.11 Visual Resources

4.1.11.1 Beneficial and Adverse Impacts

Adverse impacts to visual resources in the proposed project area would occur during the construction period. Because there would be limited public access to the proposed project area, and particularly to the proposed dam site, and since construction and staging areas would not be readily visible from well traveled roads, these impacts would be relatively minor and limited to the construction period. In addition, some adverse visual impact would occur along the project fill haul road where roadside vegetation would be covered with dust.

Visual impacts to the Big Bottom, or upper project viewshed, would be mimimal. The general visual character of the river channel and of the surrounding lands would remain almost unchanged. Possible changes in ground water levels could affect the amount and types of vegetation occurring in the low-lying lands, and could also reduce the amount of cultivated lands. These changes would alter the existing visual characteristics, but the alterations would not necessarily be adverse.

The visual impacts within the next viewshed would also be minor. Several riffles and rapids would be eliminated, and the river channel would be widened in several places. The shoreline adjacent to the proposed camping area, and in the vicinity of the proposed boat launch at Champion International's wooden bridge, would be developed to improve public access to the river upstream, and to the proposed reservoir downstream. These changes would allow the visual resources of this viewshed to be more readily experienced by potentially greater numbers of people, which could be considered a beneficial visual impact.

The next two viewsheds would be altered significantly. Both rivers would be inundated by the pondage created by the proposed dam. The rapids of the Cowlitz River and the confluence with the Cispus would be flooded, and Cowlitz Falls would be permanently lost from view. The Cispus River segments would become a slow moving pondage within the proposed project area. The reservoir, after stabilization of the bank vegetation and weathering of any rock blasted area (cuts), however, could provide aesthetically pleasing views to some individuals.

The proposed dam, powerhouse, and related project features would permanently intrude upon the Cowlitz Falls area. Since these facilities would be located on the side of a rounded hill, however, they would be screened from view points on the wider, middle sections of the reservoir. The proposed channelization downstream of the proposed dam would also drastically alter the existing visual characteristics of the Cowlitz River.

Considering that only a general location of the proposed transmission line ROW has been identified by the Applicant, the main visual impacts could include interference with views from several residences along the ROW and the addition of a highly visible cleared corridor on the northern slope of the saddle between Dog Mountain and Glenoma Peak, as seen from Meade Hill Road and U.S. Highway 12. It is expected that the Applicant would avoid these potential impacts in the final design and routing of the transmission lines so that visual impacts would be minimal. Although the existing visual resources of the project area, particularly those of the lower two viewsheds, will be altered, no significantly unusual or unique visual resources would be adversely impacted by the proposed project.

4.1.11.2 Mitigative Measures Proposed

The Applicant has identified its proposed measures to minimize and mitigate impacts on visual resources in Exhibit V of its application for license. The Applicant would utilize commonly practiced construction techniques to minimize adverse impacts to visual resources, and states that it has designed the project to minimize land form disturbances and contrasts with the surrounding environment. Where possible, the Applicant would restore natural contours, revegetate, mulch, reseed, place borrow areas in sites to be inundated, leave natural rock outcrops in cuts, and preserve a buffer zone around the entire project to help maintain scenic quality (Application, Exhibit W).

Although the final plans for the transmission line ROW have not been provided, the Applicant has identified its visual objectives to plan, design, and construct the transmission line in a manner that would be in harmony with, and subordinate to, the natural landscape. The Exhibit W lists specific design criteria that include generally accepted measures for minimization of impacts. Some of these measures are tapering vegetation, deflecting the ROW occasionally to prevent tunnel effects, providing natural screening, and locating structures to limit their visibility or silhouetting against the sky (Application, Exhibit W).

4.1.11.3 Unavoidable Adverse Impacts

Temporary adverse visual impacts associated with the construction of the project would be unavoidable. Some permanent adverse visual impacts would be incurred as a result of the location of the cleared transmission line ROW, and because of visual encroachment of project facilities on the natural environment. Any scenic qualities associated with the inundated portions of the Cowlitz and Cispus Rivers would also be permanently lost. Some secondary adverse visual impacts associated with commercial development adjacent to, or in the vicinity of, the proposed project may also be unavoidable.

4.1.12 Cultural Resources

4.1.12.1 Beneficial and Adverse Impacts

Proposed geotechnical work in the vicinity of the dam would directly affect portions of the Cowlitz Falls South Site. During project construction, work on the dam, diversion channel, cofferdam, and access road would take place at, or immediately adjacent to, the same archeological site. The Satanus (Indian) Homestead, which is thought to be located within the boundaries of Cowlitz Falls South, would be affected similarly by construction activities.

Three sites in the vicinity of Cowlitz Falls--Cowlitz Falls South, Cowlitz Falls North, and the Satanus Homestead--could also be affected by unauthorized relic collecting carried out by construction personnel. The presence of workers in the area over many months would increase the likelihood of deliberate or inadvertent damage to the sites; presently, the sites are relatively inaccessible, and the area is used only by occasional fishermen.

Filling of the reservoir would also impact a number of prehistoric and historic sites. The reservoir would inundate portions of the Cowlitz Falls South Site, the conterminous Satanus Homestead Site, the approaches to the Champion International wooden bridge, and the suspected location of the Tumwater Homestead. Testing has shown that deposits at the Cowlitz Falls South Site reach a depth of approximately 860 feet, and the bridge and homestead are situated at the same elevation. Higher water levels in the reservoir would also inundate some of the land associated with the Walter Koher Homestead.

4.1.12.2 Mitigative Measures Proposed

As proposed, the project would avoid impacts to most of the cultural resource sites identified in the project area. The Applicant, however, has advanced mitigation proposals for three sites that occur in the project vicinity--Cowlitz Falls South (and the Satanus Homestead), Cowlitz Falls North, and the Champion International wooden bridge.

At the Cowlitz Falls South Site, the Applicant proposes to conduct a scientific data recovery program to mitigate adverse effects. The program would seek to excavate a sample of each of the site's three components in order to investigate such research questions as the possible uses of the falls' microenvironment, changes in those uses over time, and trade and travel patterns in the area. A detailed data recovery plan is to be developed by the Applicant for submission to the Washington State Historic Preservation Officer, the Cowlitz Indian Tribe, and the Advisory Council on Historic Preservation.

Although the Applicant does not anticipate that the Cowlitz Falls North Site would be adversely affected by the project, it is proposing a monitoring program to assure that indirect effects do not occur at the site. If indirect effects are detected at the site, the Applicant would undertake additional testing work to reassess the site's eligibility for the National Register of Historic Places, and to aid in the formulation of specific mitigation measures.

For the Champion International wooden bridge, the Applicant proposes to raise the bridge and its approaches to compensate for higher water levels. No mitigative measures have been recommended for dealing with the construction of a boat launching ramp beside the bridge.

4.1.12.3 Unavoidable Adverse Impacts

The proposed project would have a number of unavoidable adverse impacts on the Cowlitz Falls South Site. The site would be disturbed by geotechnical work, by construction of project works, and by the filling of the reservoir. These actions would also affect the most recent site component that may relate to use of the site during the period of the Satanus Homestead. Even if a data recovery program were instituted at the site, as proposed by the Applicant, there would still be a loss of some scientific information. Data recovery is a form of site destruction, and only a portion of the site's available information would be saved by a sampling strategy.

At EL 866, the project would also inundate the Tumwater Homestead location, and a part of the property containing the Walter Koher Homestead. The only remaining physical evidence of the Tumwater Homestead site, however, is an orchard, and the higher water level at the Koher Homestead would not affect its structures.

4.1.13 Socioeconomic Factors - Construction

4.1.13.1 Beneficial and Adverse Impacts

Impacts on Employment

During the proposed project's 3-year construction period, the number of on-site personnel, including hourly and salaried employees of the construction contractor and subcontractors but excluding a 7-person supervisory engineering staff, would range from 15 to 195, averaging 130 workers (Table 4-2). In total, construction of the Cowlitz Falls Project would require 4,430 man-months (or approximately 370 man-years) of construction labor and 238 man-months of supervisory engineering, for which a total of $16.2 million (in 1982 dollars) plus fringe benefits, would be paid (Application, Exhibit W, Supplemental Information, Item 19).

Impacts on Population

Based on the magnitude of the proposed project and observations at comparable hydroelectric developments, FERC staff expects that existing residents of eastern Lewis County and daily commuters from outside Lewis County together would comprise about 70 to 75 percent of all on-site workers. Most of these persons would be residents of either the Centralia-Chehalis urban area, located approximately 1 hour by car from the project site, or the considerably larger Tacoma area, about a 75-minute drive from the project. Workers who currently reside more than 90 minutes from the construction site would comprise the balance of the required labor force. These persons would relocate in the project impact area. (See Section 3.1.9.) Consequently, the Cowlitz Falls Project would generate the in-migration of 50 workers, at most (Table 4-3).

Surveys of construction workers at comparable projects indicate that: (1) approximately 20 percent of all personnel who relocate for the Cowlitz Falls Project would be single, widowed, separated, or divorced; (2) only half of all married relocatees would be accompanied by one or more dependents; and (3) in-migrating families would have an average of 1.6 children, including 1 child of school age. Based on these figures, FERC staff calculated

Table 4-2. Average monthly number of on-site construction personnel who would be employed at the Cowlitz Falls Project. 1/

Month	Number of on-site construction personnel 2/		
	Year 1	Year 2	Year 3
January	--	175	140
February	--	180	140
March	15	175	140
April	35	175	140
May	35	195	115
June	80	195	115
July	130	195	115
August	130	170	105
September	130	160	105
October	150	150	85
November	150	140	85
December	155	140	85
Average for year	84	171	114

1/ Application, 1981, Exhibit W.

2/ Includes hourly and salaried workers.

Table 4-3. Projected population influx into the Mossyrock-Morton-Glenoma-Randle area of Lewis County resulting from the construction of the Cowlitz Falls Project. 1/

Project year	Average number of persons who would relocate				
	Construction personnel	Spouses	School-age children	Pre school-age children	Total
1	25	10	10	5	50
2	50	20	20	10	100
3	35	15	15	8	73

1/ FERC staff estimates.

the total population in-migration into the project impact area that would occur as a result of project construction (Table 4-3). Staff's analysis reveals that, during peak construction activity, the project would result in the influx of 100 persons.

Impacts on Housing

In-migrating families and individuals would require housing accommodations. Staff's analysis of housing availability in the project impact area (Section 3.1.9.3) indicates that there currently is sufficient vacant housing to accommodate the expected population influx. Whereas construction personnel who in-migrate with a family are likely to relocate with their own mobile home or move into a single-family house, workers who relocate without dependents are apt to rent an apartment, a room in one of the area's motels, or a space for their trailer.

Impacts on Local Trade and Service Establishments

The population in-migration, as well as the additional commutation into the project impact area that would result from construction of the Cowlitz Falls Project, would benefit the economy of eastern Lewis County. Spending by relocatees and commuters at mobile home and trailer parks, motels, and retail and personal service establishments (particularly at eating and drinking places, food stores, and automobile service stations) would expand the income levels of the area's proprietors, and could create some additional part-time employment opportunities there.

Impacts on Local Public Services

"Local public services" in this instance means all local government services except education (i.e., law enforcement, fire protection, road maintenance and repair, health services, and welfare programs). Impacts on public schools are discussed separately because public education in Washington State is provided by numerous independent school districts, and most of the costs of operating public schools are financed through a state/local fund.

Project-induced in-migration would increase the population of the project impact area by only 1.1 percent (100 divided by 8,815), and the new residents would occupy existing housing. Thus, relocatees associated with the proposed project should not have a significant impact on the demand for local public services in eastern Lewis County.

Applicant indicates that trucks carrying heavy equipment, sand, gravel, and other construction materials for the proposed project would use only very small segments of county-maintained roads. Instead, project-related trucks primarily would use state-maintained U.S. Highway 12 to Glenoma, and then private logging roads to the project site. The private road that would be most heavily utilized by trucks runs along the eastern shore of Riffe Lake, crosses the Cowlitz River, and follows the river to the dam site. This road, which was constructed by Tacoma City Light as part of the Mossyrock Dam Project, is controlled and maintained by the Champion International Corporation. The proposed project, therefore, should not require a significant amount of additional county expenditures for road maintenance and repair.

Impacts on Local Tax Revenues

Washington State and all of its counties and incorporated places levy a combined state and local sales/use tax. The state and local tax rates are, respectively, 4.5 percent and 0.5 percent. In addition to charging the combined 5.0 percent rate, communities that become special transporation districts may impose an additional 0.3 percent transit tax. The local sales/use tax in Lewis County is 0.5 percent.

Whereas the sales/use tax utilized by most states is levied primarily on retail sales, Washington States's tax is levied on: (1) sales of retail establishments except food for home consumption and prescription medicine; (2) sales of business establishments that provide personal, maintenance, or business services; and (3) sales of services pertaining to the construction, repair, or improvement of a new or existing building or other structure located on real property owned by the purchaser. Consequently, the Cowlitz Falls Project would produce local sales tax revenues equivalent to 0.5 percent of the project's total construction contract price, including labor.

Under Washington State's existing tax laws, the project's prime contractor would be responsible for the monthly collection of sales tax from the Applicant and for its remittance to the Washington State Department of Revenue. During the projected 3-year construction period, the Applicant estimates that it would pay state and local sales taxes totaling $3,744,000 (Application, Exhibit N).

After deducting 1.5 percent from local sales tax revenues for its collection expenses, the Department of Revenue would distribute the remainder. Because the Cowlitz Falls Project would be situated within an unincorporated area, Lewis County's general fund would receive all of the disbursed amount, $368,784 ($3,744,000 x .10 x .985).

Lewis County also would receive additional sales tax revenue as a result of project-related commuters and relocatees purchasing taxable goods and services in Lewis County. Staff estimates that, during the construction period, these expenditures would generate local sales taxes totaling approximately $5,500.

Because the Applicant is a municipal corporation of Washington State, it is exempt from paying local property tax. Thus, the Applicant would not pay taxes on the value of its in-place project facilities. The contractors' construction machinery and equipment (exclusive of licensed vehicles) that are in Lewis County on January 1, however, would be taxed by Lewis County as personal property.

The Applicant has estimated that the depreciated value of all on-site construction equipment on January 1 would be as follows: nothing for the first year; $4.6 million for the second year; and $3.5 million for the third year. After the Lewis County Tax Assessor certifies the reported values, the Lewis County Treasurer would compute the taxes owed to the seven affected local government entities. Based on these values and the tax rates in effect as of October 1981, FERC staff calculated the property tax revenues that would be received by each of these entities (Table 4-4).

As discussed above, some of the relocating construction personnel would move with mobile homes or trailers. (Mobile homes are defined as mobile living units that are greater than 40 feet in length or 8 feet in width, whereas trailers are defined as mobile living units that do not exceed 40 feet in length or 8 feet in width.) Currently, local government entities in Washington State are permitted to tax mobile homes as personal property. Trailers, on the other hand, are not subject to the local personal property tax, but rather to Washington State's vehicle excise tax. Revenues from this tax accrue to the state's general fund, not to the counties.

Government officials in Washington State indicate that most construction personnel on the proposed project who in-migrate to Lewis County with mobile living units would have trailer rather than mobile homes. Consequently, these persons would not have a significant impact on Lewis County's personal property tax revenues.

During the 3-year construction period, Lewis County and the special government districts that serve eastern Lewis County (exclusive of public school districts and the school fund) would receive additional tax revenue from the proposed project totaling $420,650. This amount includes approximately $374,300 of additional local sales taxes, and $46,365 of additional personal property taxes. By contrast, the project's incremental local public service costs would be minimal. Staff concludes, therefore, that, during construction, the proposed project would have a substantial positive fiscal impact on the affected local governments.

Table 4-4. Local personal property tax revenues that would be produced by on-site construction equipment and machinery. 1/

Taxing entity	Current tax rate 2/	Estimated property tax revenues 3/ Year 2	Year 3	Total
School fund	$3.4926	$16,066	$12,224	$28,290
County general fund	1.3770	8,722	6,636	15,358
County road fund	1.8960	6,334	4,820	11,154
White Pass School District	2.6880	12,365	9,408	21,773
Fire District No. 14 (located in Randle)	1.3480	6,201	4,718	10,919
Cemetery District	0.1050	483	368	851
Library District	0.4128	1,899	1,445	3,344
Hospital District No. 1	0.5850	2,691	2,048	4,739
Total	$11.9044	$54,761	$41,667	$96,428

1/ Data provided in letter of October 22, 1981, from Applicant to James Haimes of FERC staff.

2/ Tax per $1,000 of assessed value.

3/ Based on on-site equipment having a total assessed value of $4.6 million in year 2 and $3.5 million in year 3.

Impacts on Local School Districts

During the scoping meeting for the Cowlitz Falls Project, held in Chehalis, Washington, on September 30, 1981, a number of superintendents from school districts in eastern Lewis County stated that the proposed project could adversely impact their schools, and the superintendents asked therefore, that the Applicant should be required to negotiate an agreement to provide financial assistance to their districts. FERC Staff's estimates of the numbers of school-age children who would accompany relocating construction personnel indicate, however, that these local school districts probably would experience only negligible enrollment increases (Table 4-5). Considering that these additional students would vary in age, the enrollment gains in any one grade should not exceed 2. Consequently, the incremental expenditures necessitated by project induced enrollment should be limited to the cost of purchasing additional desks, textbooks, and school supplies, or a few hundred dollars per year for each additional student.

Under Washington State's current method of financing public education, each of the impacted school districts--White Pass, Morton, and Mossyrock--automatically would receive, respectively, $1,794, $2,217, and $1,945 per year of additional state funds for each additional student (unpublished data provided by Robert C. Munson, Supervisor of Research and Development, Financial Services, Superintendent of Public Instruction, Olympia, Washington, October 1981, personal communication). The proposed project, therefore, would be a financial benefit to the affected school districts, particularly to the White Pass School District. In addition to the additional state funds, it would receive approximately $21,800 of additional personal property tax revenues (Table 4-4).

4.1.13.2 Mitigative Measures Proposed

Since the proposed project's impacts would be beneficial to the economy and fiscal status of Lewis County, the Applicant has not proposed any mitigative measures for socioeconomics.

4.1.13.3 Unavoidable Adverse Impacts

Construction of the proposed project would result in the temporary in-migration of approximately 100 persons to eastern Lewis County. This influx could exert some upward pressure on housing rents in that area. In addition, construction-related traffic could cause periodic minor delays on U.S. Highway 12.

Table 4-5. Impacts of in-migrating construction workers on school districts in eastern Lewis County. 1/

Project year	Number of additional students		
	White Pass School District	Morton School District	Mossyrock School District
1	5	3	2
2	10	6	4
3	8	4	3

1/ FERC staff analysis.

4.1.14 Socioeconomic Factors - Operation

4.1.14.1 Beneficial and Adverse Impacts

Impacts to Employment, Population, and Local Government Services

After the project is completed construction personnel and their dependents who have relocated in the project impact area would out-migrate. Before reservoir filling, farms and lumber companies may have to relocate equipment that is situated on land to be inundated. The proposed project would not require the displacement of any occupied residences, farm buildings, or business establishments, however.

Operation and maintenance of the proposed project would necessitate the employment of about 15 personnel. The Applicant anticipates that almost all these persons would be existing residents of Lewis County. Consequently, project operation would not have any significant impacts on local employment, population, or government services.

Impacts to Commercial Timberland

The Applicant proposes to acquire a total of 750 acres of commercial timberland, including 315 acres that would be inundated by the proposed reservoir, and approximately 400 acres that would be managed for wildlife or reserved for future recreation. Champion International, owner of 465 of the 750 acres, appears to be actively logging in the area. Consequently, this land probably would be almost all clearcut at the time of acquisition by the Applicant. Clearcut commercial timberland in the project area has an average market value of about $600 per acre (Cynthia Nelson, Forestry Consultant with R.W. Beck and Associates, October 1981, personal communication). Therefore, after clearcutting, the 750 acres of commercial timberland required for the Cowlitz Falls Project would be worth approximately $450,000.

Although the proposed project would utilize 750 acres of commercial timberland, only the 315 acres required for the project reservoir would be permanently lost for timber production. The land held for future recreational use or managed for wildlife could continue to produce commercial timber, although it would yield fewer board-feet per year than land managed primarily for timber production.

Impacts to Local Tax Revenues

Because the Applicant is a municipal corporation of Washington State, it is exempt from paying local real estate taxes on the property it acquires and the facilities it constructs. The Applicant proposes to acquire approximately 1,830 acres of land for the proposed project, including 1,150 acres of privately owned land that currently generates local property tax revenues, and 680 acres of publically owned land that is currently exempt from local taxation (Application, Exhibit F, Table F-2).

The private lands that would be purchased for the proposed project, and therefore removed from the local tax rolls, include 750 acres of commercial timberland, 250 acres of agricultural land, and 150 acres of undeveloped rural land. Because Washington State has passed laws to limit the property tax burden on certain commercial timberlands and farmland, the total assessed value of the 1,150 acres of private land to be acquired for the project is a fairly modest amount--$285,000 (Application Exhibit W, Table 8-5). Based on 1981 tax rates, the proposed project could result in the loss of local property taxes totaling almost $4,000 per year (Table 4-6).

The tax revenue loss would be completely outweighed by the incremental public utility district privilege taxes that would be produced by the proposed project. This tax, which is collected by the Washington State Department of Revenue, currently is fixed at 5 percent of the first 4 mills per kilowatt hour from the sale of self-generated energy. Based on the proposed project's average annual generation (267,200,000 kWh), the project would produce PUD privilege tax revenues that average $53,440 per year (.05 x $.004 x 267,200,000). This amount would be distributed by the Department of Revenue as follows: $2,138 would be allocated to the state general fund; $17,956 would be credited to Lewis County's state/local public school fund; and $33,346 would be paid to Lewis County (Donn Smallwood, Washington State Department of Revenue, September 1981, personal communication).

Lewis County Commissioners would be able to allocate some portion of the $33,346 amount to the county's junior taxing districts. Therefore, the White Pass School District, Fire District No. 14, and other special districts that would lose annual real estate tax revenues as a result of the proposed project could be completely compensated by the redistribution of PUD privilege tax revenues.

Table 4-6. Potential loss in annual real estate tax revenues resulting from the Cowlitz Falls Project. 1/

Taxing entity	1981 tax rate 2/	Annual tax loss 3/
Public school fund	$3.4926	$995
Lewis County	1.8960	540
County road fund	1.3770	392
White Pass School District	2.6880	766
Fire District No. 14	1.3480	384
Cemetary District	0.1050	30
Library District	0.4128	118
Hospital District No. 1	0.5850	167
Total	$11.9044	$3,392

1/ FERC staff analysis.

2/ Tax per $1,000 of assessed value.

3/ Based on the September 1980 assessed value of all private property that would be acquired by Applicant.

Impacts to Farms in the Randle Area

The Applicant proposes to acquire 250 acres of agricultural land for the proposed project, including about 200 acres that would be used as a buffer strip along the upper portions of the reservoir, 30 acres located in Section 20 that would be managed for wildlife, and 21 acres that would be inundated by the proposed reservoir. Cultivated farmland that would be impacted by the project is currently used to graze beef and dairy cattle, or to grow alfalfa, timothy, and other feed for local livestock.

In addition to those agricultural lands that would be included within the project boundary, approximately 170 acres of farmland, including 130 acres that are currently used to produce hay and silage, would be adversely affected by reservoir-induced seasonal rises in groundwater levels (Application, Exhibit W, page 9-16).

The Applicant indicates (Application, Exhibit W, page 8-16) that: "the lost annual productivity of the agricultural lands within the project boundary and groundwater impact area could amount to $100,000 per year if all buffer zone lands were cultivated. Actual annual lost production is estimated to be about $35,000 since most buffer zone agricultural lands are covered with brush and are not being cultivated."

The project's groundwater effects also could adversely impact a few wells or septic systems used by adjacent farms.

4.1.14.2 Mitigative Measures Proposed

The Applicant proposes to monitor existing and postproject groundwater levels to determine the impacts on agricultural land, wells, and septic systems. If the proposed reservoir adversely affects adjacent farms, the Applicant either would purchase the land or would install drainage works on it. If any wells are affected by altered groundwater levels, the Applicant either would seal them or would drill new ones. Moreover, if any septic systems are affected by high groundwater levels, the Applicant either would modify or would relocate them (Application, Exhibit W, pages 5-52, 9-19, and 9-20). The Applicant, however, has not yet proposed a definitive plan to implement these proposed mitigation measures.

4.1.14.3 Unavoidable Adverse Impacts

The proposed project would result in the inundation and permanent loss of 21 acres of farmland and 315 acres of commercial timber land. In addition, the value of yearly timber growth would be diminished on approximately 400 acres of existing commercial timber lands that the Applicant would acquire for wildlife management or future recreation.

4.1.15 Transportation Facilities - Construction

4.1.15.1 Beneficial and Adverse Impacts

The proposed project would produce three types of construction traffic, including: (1) delivery of construction equipment and material; (2) commuting by construction workers; and (3) trips by earthmoving vehicles between the construction site and spoil areas. Traffic volumes that would result from each of these sources are discussed below.

The Applicant anticipates that, during peak construction activity, approximately 200 vehicle trips per week would be required for the delivery of equipment and material to the project site. Based on a five-day work week, this implies an average of 40 deliveries each day. All of this traffic would travel over U.S. Highway 12 (SR-12) and the private road that runs along the eastern shore of Riffe Lake.

A maximum of 195 persons would be employed at the construction site. Staff anticipates that, because many workers would travel in carpools, approximately 100 vehicles would be driven to the construction site. Most commuters also would use SR-12 and the east Riffe Lake road.

The Applicant indicates that, during the first nine months of construction activity, the project would generate 1,800 spoil disposal trips per week. None of these trips would involve SR-12; 1,450 would use a road segment that is currently impassable; and 350 trips would affect a Champion International logging road and a small segment of county maintained Falls Road.

4.1.15.2 Mitigative Measures Proposed

The Applicant proposes to negotiate agreements with Lewis County, the State of Washington, and owners of private roads that would be used by project-related vehicles. These agreements would establish (1) measures for the regulation of traffic during project construction and (2) the amounts of monetary compensation that would be paid by the Applicant for road maintenance and repair, and for delays and rerouting imposed on logging trucks.

4.1.15.3 Unavoidable Adverse Impacts

Construction-related traffic could cause some minor traffic delays on privately-owned roads that serve the project area and at the intersection of SR-12 and the east Riffe Lake road.

4.2 ALTERNATIVE DESIGNS OF THE PROPOSED ACTION

This section discusses only those differences in impacts, mitigation, and unavoidable adverse impacts from the Applicant's proposed project.

4.2.1 Geology and Soils

EL 862

A reservoir at EL 862 would inundate less land than the proposed reservoir. Inundation would only occur in the lower portion of the reservoir. Groundwater levels would not raise as much as for the proposed project, and less agricultural land in the Big Bottom area would be severely affected. Prime Agricultural Lands in the Bottom areas, those with Siler Soils, would probably not be adversely affected. Only minimal impacts would be expected on the effectiveness of existing drainage systems in areas with Schooley Soils. The most likely soils to be adversely affected would be some of the lower-lying Siler and Schooley Soils on the south side of the river just upstream from the moraine, where installation of new drainage systems might be required.

Unless suitable drainage systems are installed, new swampy areas could develop in the Ancestral Valley, and unstable slope conditions could develop in the saddle area of the right bank of the river, downstream from the dam.

EL 872

A reservoir at EL 872 would severely affect agricultural land in the Big Bottom area. Nearly all of the Schooley Soils and some of the prime Siler Soils would be inundated. Most of the rest of the Big Bottom areas not inundated, consisting of Prime Agricultural Lands with Siler Soils, would experience rises of groundwater levels to within a few feet of the surface that would severely reduce or preclude their utility as prime farmland. The Big Bottom area effectively could be eliminated as an agricultural area. For a project at EL 872, proposals for drainage of Big Bottom area farmlands would probably include the possibility of constructing artificial earth dikes to prevent the inundation of productive areas and the possibility of using pumps as part of proposed drainage systems.

Using either EL 862 or EL 872 could produce new swamps in the Ancestral Valley and unstable slope conditions in the saddle area on the right bank of the river, unless proper drainage systems are installed. Additionally, the loss of some of the usable agricultural soils in the Big Bottom area may be unavoidable at EL 872 because of an underlying, permeable pumice layer that may preclude the design and construction of effective drainage systems.

Eastern Alternative Corridor

There might be less erosion at individual tower sites on the eastern part of the ridge than on the proposed corridor because of less severe terrain. The eastern corridor would probably require minimal access road construction. Because the east corridor would be longer than the proposed corridor, its potential for erosion may be greater.

Western Alternative Corridor

More erosion might occur at individual tower sites on the west end of the ridge than on the proposed corridor over the ridge because of the steeper terrain to the west end of the ridge. The western corridor would probably require less new access road construction. The total potential erosion would be greater than for the proposed corridor because the western corridor is longer.

4.2.2 Land Use

EL 862

If operated at EL 862, the proposed project would be reduced to about 565 acres in area. The Applicant has estimated that about 10 acres of general agricultural land would be impacted by inundation or raised groundwater levels, and about 190 acres of commercial timberlands would be inundated. At EL 862, the approach to the Champion International wooden bridge would not be flooded (Application, Exhibit W).

With the reservoir at EL 862, the unavoidable adverse impacts on land use would be: the preclusion of existing and any other potential land uses for the estimated 565 acres of land that would be included within the proposed project boundary; the permanent inundation of 290 acres of commercial land; and the temporary preclusion of existing land use at the proposed staging area. A small amount of general agricultural land might be adversely impacted by raised groundwater levels.

EL 872

Operation at EL 872 would increase the size of the reservoir to about 3,300 acres, and would preclude any existing land uses. The Applicant has estimated that about 1,070 acres of cultivated land and about 1,400 acres of general agricultural land would be adversely impacted, either by flooding or raised groundwater levels. In addition, the Applicant has estimated that about 470 acres of commercial timberland would be inundated. For this alternative, the Applicant has not specified how many additional acres and types of land would be included within the project boundary for the buffer zone and for wildlife mitigation. The Applicant did estimate that 1,949 acres of wetland habitat would be created (Application, Exhibit W).

The unavoidable adverse impacts on land use would include: the preclusion of any existing land uses for the estimated 3,300 acres of land that would be included within the proposed project boundary; the permanent inundation of, or raised groundwater impacts on, an estimated 1,070 acres of cultivated land; the permanent inundation of, or raised groundwater impacts on, an additional 1,400 acres of general agricultural land; and the permanent inundation of about 470 acres of commercial timberland.

Eastern and Western Alternative Corridors

The two alternative routes are both slightly longer than the Applicant's proposed ROW. Use of either transmission line alternative would prevent the existing land uses within the respective corridors. These would be unavoidable adverse impacts.

4.2.3 Recreation

EL 862 and EL 872

The EL 862 alternative would inundate fewer popular recreational camping, hunting, and fishing sites than the proposed action, and the EL 872 alternative would inundate more.

The inundation of locally popular recreational camping, hunting, and fishing sites, particularly along the shorelines of the Cowlitz and Cispus Rivers, near their confluence, would be a permanent adverse impact for both alternatives.

4.2.4 Air Quality and Climate

EL 862 and EL 872

The amount of fog that would result from operation of the proposed reservoir at either EL 862 or EL 872 would differ from that which would occur at EL 866. The surface area of the reservoir would affect the amount of fog that would occur, and ultimately the amount of land area encompassed by fog. The surface area of the reservoir at EL 862 would be approximately 765 acres; the surface area at EL 872 would be 3,700 acres. Based upon the comparison of the surface areas of the reservoirs at the proposed alternative elevations, it is unlikely that there would be a significant difference in the fog generated at EL 866 and EL 862. It is possible that at EL 872 there would be a greater amount of fog generated than at EL 866, since the surface area is approximately four times larger, but the increase in the frequency and amount of fog would not be as great as that which occurred upon the filling of Riffe Lake.

4.2.5 Water Quality and Quantity

Water Quality

EL 862 and EL 872

Operation of the project at EL 872 would create expansive shallow backwaters in the areas on Kiona, Schooley, and Siler Creeks. As a consequence of the limited amount of exchange that would occur between the main channel and these areas, it is expected that the water temperature would be increased above that characteristic of the Cowlitz River. Increased water temperatures could result in a corresponding decrease in the oxygen concentration. The decrease in oxygen levels could be significant in the backwater areas of the reservoir during initial operation of the facility, as a result of the biodegradation of organic matter associated with the soils.

Construction and initial operation of the proposed facility at EL 862 and EL 872 would result in the temporary degradation of water quality. Prolonged operation of the facility would have a minimal impact on the overall water quality of the Cowlitz River; during the summer months, shallow areas of the Kiona, Siler, and Schooley Creeks that would result from EL 872 would have temperatures higher that those characteristic of the river.

Groundwater

EL 862

The elevations of the water table caused by EL 862 would impact land uses on the periphery of the reservoir, but would not

restrict any land uses in the Big Bottom area. Possible adverse impacts to domestic wells and septic systems would be reduced under EL 862 because the land that would be affected by increases in the water table is sparsely populated.

EL 872

The adverse impacts from increases in the groundwater levels at EL 872 would be more extensive than for EL 866. As shown in Figure 4-4, areas of significant groundwater impacts exist along the periphery of the reservoir and into the bottomlands of Kiona, Siler, and Schooley Creeks; these areas could extend beyond the boundaries indicated in Figure 4-4. The impacted areas would be much larger for EL 872 than for EL 866, and the number of domestic wells and septic systems that would be adversely impacted would be greater. The Applicant estimates that six domestic wells and nine septic systems would be adversely impacted.

The Applicant proposed to modify or relocate domestic wells or septic systems that would be adversely impacted by operation of the reservoir at EL 872.

An unavoidable adverse impact associated with EL 872 would be the raising of the water table to a level that would restrict the usage of the land surface in parts of the Big Bottom area. EL 872 would also adversely impact a greater number of domestic wells and sewage drain fields. Seepage of water through the permeable deposits of the Ancestral Valley could result under either EL 872 or EL 862.

Sedimentation

EL 862 and EL 872

There would be minor differences in the volume of sediment deposited in the main body of the reservoir for EL 862 and EL 872, compared to that for EL 866, because of the differences in reservoir volumes and sediment trap efficiencies.

Operation of the project at EL 872 would significantly reduce the velocity of the Cowlitz River in the Randle area thereby resulting in the deposition of sediment in flood-sensitive areas. The depth to which sediment would be deposited in the river channel is expected to exceed that which would occur if the reservoir was maintained at EL 866. As a result, impacts of the project operated at EL 872 on flooding would be equal to or more severe than the proposed project.

The impacts associated with operation of the project at EL 862 on the flood levels of the Randle area are greatly reduced. The sediment deposition for this operating level is confined to the area below Randle and the velocities of the river during high flow periods more closely approximate the preproject conditions, causing less sediment deposition than EL 866.

4.2.6 Fishery Resources

EL 862

At EL 862, less riverine habitat would be inundated. About

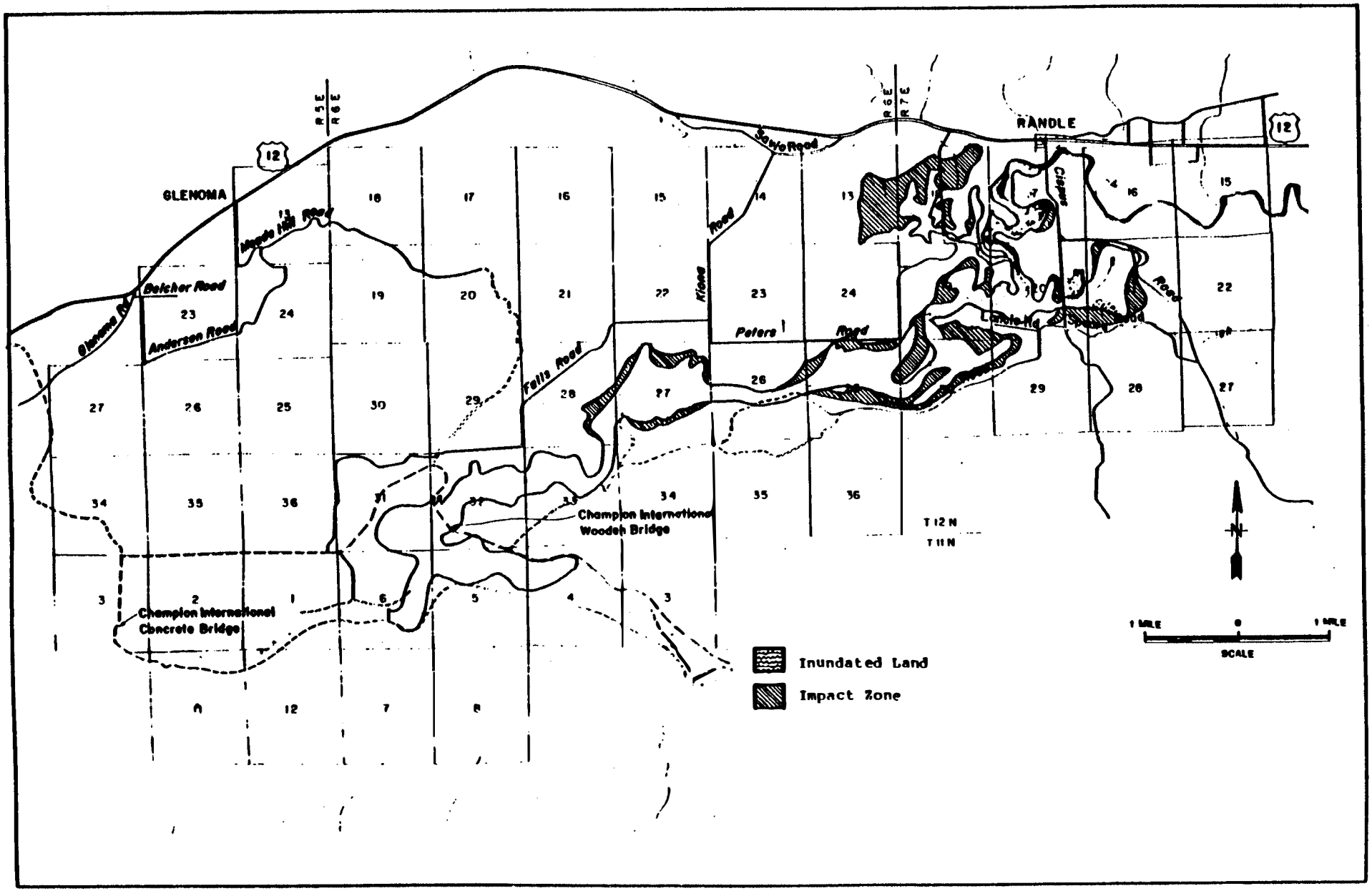


Figure 4-4. Portions of the Big Bottom area where land use would be affected by water tables raised by reservoir alternative EL 872 (Source: Application, Exhibit W).

compared to 14 miles at EL 866. EL 862 would thus have slightly less impact on trout and other resident riverine fishes, although it would decrease the size of the diked, shallow impoundments that the Applicant has proposed as mitigation for the proposed action. The popular fishing and camping area at the confluence of the Cispus River would still be flooded, although upriver tributaries would not be flooded.

EL 872

Use of EL 872 would inundate about 2 additional miles of the Cowlitz and Cispus Rivers and several more miles of tributary streams. The additional flooding would eliminate more stream habitat, and would probably have a greater negative impact on resident trout and other stream fishes than EL 866. A major impact of EL 872, not present with the other alternatives, would be the flooding of about 1,400 acres of low-lying farmland, causing the formation of large areas of shallow lake and wetland habitat. These areas, although of little benefit to trout, could provide ideal habitat for warmwater fishes such as largemouth bass and sunfishes, and could produce sizable increases in the populations of these fishes.

Since the amount of shallow impoundment habitat would be greater at EL 872, it might not be necessary for the Applicant to construct this habitat as previously proposed. Sections of tributary streams that had been proposed for installation of habitat improvement structures would be flooded; this would require the selection of other stream reaches for these structures.

4.2.7 Vegetation

EL 862

EL 862 would require the removal of about 339 acres of terrestrial vegetation for the reservoir, which would be 100 acres (23 percent) less than for EL 866. The same vegetation types would be affected, generally in the same proportion as for EL 866.

EL 862 would cause impacts to vegetation and agricultural crops from an increase in groundwater, but the acreage involved would be less than for EL 866. EL 862 would cause a seasonal rise in groundwater levels of about 1 foot, to within 5 feet of the ground surface, in approximately a 100-foot strip bordering the channel. No permanent groundwater impacts would be caused by EL 862 in the agricultural area (R. W. Beck and Associates, 1980b).

Seepage from EL 862 could affect vegetation in the Ancestral Valley, but the impact would probably be less severe than from EL 866 because EL 862 would have less head pressure.

There would be additional riparian vegetation beyond present conditions with a reservoir at either EL 862 or EL 866, although the EL 866 reservoir would provide more of this type of habitat.

EL 872

Building a reservoir at EL 872 would require the removal of approximately 1,457 acres of terrestrial vegetation. This impact would represent about 1,000 acres (230 percent) more impact on vegetation than would a reservoir at EL 866, and approximately 1,110 acres (320 percent) more vegetation impact than a reservoir at EL 862.

All vegetation types would be affected by construction of a reservoir at EL 872. The primary area of impact would be with agricultural land: about 600 acres (40 percent) of the entire inundated area would occur in the grass/hay/pasture type, followed by 250 acres (17 percent) in the lowland forest big leaf maple/red alder type. EL 872 would also inundate about 68 acres of the wetland/riparian land feature; EL 862 and EL 866 would not inundate such areas. Other vegetational areas impacted by flooding would be upland and lowland land features. Acreage removals for each vegetative type are shown in Table 4-1.

About 730 additional acres (380 acres permanent and 350 acres seasonal) of agricultural land will be impacted by the higher groundwater levels produced under EL 872 (R. W. Beck and Associates, 1980b). Higher groundwater, in combination with inundation effects, would severely affect several farms along the river.

The potential impact of seepage on vegetation in the Ancestral Valley, would be greater with EL 872 than with either EL 862 or EL 866. A higher hydraulic head at EL 872 would account for this greater potential.

Eastern and Western Alternative Corridors

Alternative transmission line A would affect about 42 acres of red alder/Douglas fir forest (21 acres) and clearcut land (21 acres). It would require about 18 acres more than alternative transmission line C, which would impact about 24 acres of red alder/Douglas fir forest (15 acres) and clearcut land (9 acres).

4.2.8 Wildlife Resources

EL 862

EL 862 would inundate 339 acres of wildlife habitat, including 271 acres of forest, 37 acres of clearcut, and 31 acres of agricultural habitats. The impacts on wildlife would be similar in nature, but less severe than under EL 866 because reduced amounts of forested habitat would be affected. Wintering deer and

elk would be significantly affected, but the impact would be less severe than under EL 866, because less critical shoreline habitat would be disturbed. Based on pellet-group count data collected during the severe winter of 1979-80, habitats that would be inundated by this reservoir level alternative supported 25 percent less deer and elk, compared to the habitats that would be inundated at EL 866 (Wood et al., 1980).

EL 872

Use of EL 872 would inundate 1,457 acres of wildlife habitat, including 713 acres of forest, 68 acres of clearcut, and 608 acres of agricultural/meadow habitats. The impacts to wildlife would be similar in nature, but more severe than under EL 866, because a greater amount of habitat would be affected, especially forested habitat. The majority of additional shoreline habitat affected would be located in the upstream parts of the project area, and is of lesser value to wildlife than the downstream shoreline habitats. Judging from pellet-group counts from the winter of 1979-80, habitats that would be inundated by this reservoir alternative supported 23 percent more deer and 9 percent more elk than the habitats that would be inundated by EL 866 (Wood et al., 1980). The agricultural land affected has less wildlife value than forested habitat. Gibbs Lake (3 acres), which provides habitat for a variety of waterfowl and shorebirds, would be inundated. The creation of extensive wetlands and shallow areas would benefit many wildlife species.

Eastern and Western Alternative Corridors

Transmission line A would adversely affect 21 acres of forested wildlife habitat. The creation and maintenance of 43 acres of mid-successional vegetation and 10.2 miles of edge habitat would benefit many species. Transmission line C would adversely affect 15 acres of forested wildlife habitat, but would result in the creation and maintenance of 29 acres of mid-successional vegetation and 4.5 miles of edge habitat.

4.2.9 Threatened or Endangered Species

EL 862 and 872

El 862 would affect fewer eagle perch sites than the proposed project.

A reservoir at EL 872 would affect more perch sites. Mitigative measures are available to reduce the impacts on eagles of a reservoir at EL 872. The effect of this alternative on the supplemental feeding of eagles by landowners is unknown.

Neither alternative would jeopardize the continued existence of the bald eagle.

4.2.10 Visual Resources

EL 862 and EL 872

Since less land would be inundated at EL 862, the amount of overall change in the visual resources of the project area would be reduced.

The size of the reservoir at EL 872 would be significantly larger, and would cover more of the Big Bottom area within the uppermost viewshed. Some of the meanders of the Cowlitz River through agricultural land would disappear from view. Portions of the reservoir at EL 872 also would be viewable from the town of Randle and from the Cispus Road south of Randle.

No particularly diverse or unique visual resources would be expected to be adversely impacted by either of these proposed project alternatives.

Eastern and Western Alternative Corridors

The eastern alternative ROW would be viewable from more residential dwellings. The western alternative ROW would be seen from Riffe Lake by boaters, campers, and hang gliding enthusiasts using the Dog Mountain site. The presence of the transmission line would tend to degrade the natural setting of the area, and would have an adverse impact on visual enjoyment.

4.2.11 Cultural Resources

EL 872

At EL 872, only one additional historic property would be affected. A portion of the Siler Homestead lands would be under water at EL 872, but there would be no direct impacts to the structures located on the property. The setting of the Siler Homestead would be altered by higher water levels if the project were to be operated at EL 872.

4.2.12 Socioeconomic Factors

EL 872

The EL 872 alternative would result in the loss of 1,070 acres of cultivated farmland in the Randle area through inundation or permanent increase in groundwater levels. Consequently, Applicant expected that this alternative would displace 10 farm operations (Application, Exhibit W, pages 13-29). This alternative also would remove considerably more privately owned land from the local property tax rolls than the proposed project.

4.3 WOOD-FIRED STEAM-ELECTRIC PROJECT

4.3.1 Geology and Soils

Construction activities that would disturb soils, alter natural slopes and drainage, or remove protective vegetative cover and supportive root systems could result in minor short-term soil erosion. Minor erosion could occur during project operation if slopes and drainage are not properly designed. Depending upon the site chosen, either 30 or 50 acres of Prime Agricultural Land would be preempted from use as farmland. The 50-acre site may no longer qualify as Prime Agricultural Land because of its present use as a log storage area.

It would be expected that the Applicant would propose appropriate criteria for project design, construction scheduling, and construction, operation, and maintenance procedures, so that soil erosion would be precluded or minimized.

Some minor soil erosion would be unavoidable during project construction, before protective measures could be implemented, and in areas where constant construction activity would preclude the effectiveness of mitigative measures. The loss of Prime Agricultural Land would be unavoidable.

4.3.2 Land Use

A wood-fired electric generation plant developed at either of the two sites discussed in Section 3.3.1 would not be incompatible with the existing industrial land use in those vicinities; constructing a wood-fired plant would, of course, preclude the use of 30 acres of land the plant would occupy. Building a wood-fired plant near the existing wood veneer plant in the Big Bottom area could adversely impact potential agricultural land. The ash from a wood-fired generation plant could be utilized, however, to improve the nutrients in nearby farming lands (Office of Technology Assessment, 1980).

4.3.3 Meteorology

Construction of the woodwaste facility would cause temporary and localized increases in noise and particulates near the plant site. The operation of construction equipment would increase the levels of such air pollutants as carbon monoxide, hydrocarbon, and nitrous oxides.

A woodwaste plant would emit sulfur oxides, particulates, and organic compounds. Sulfur oxides originate from the oxidation of sulfur compounds contained in the woodwaste. The amount of sulfur oxide emitted from the plant is dependent upon the concentration of sulfur in the woodwaste and upon the temperature of the boiler, which determine the degree to which the sulfur compounds of the wood are oxidized. Sulfur concentrations for woodwaste vary from 0 to 0.1 percent by dry weight. Particulates emitted from a woodwaste plant are composed of unburned carbon and inorganic ash, made up of such substances as sodium, potassium, and silica. The amount of particulates originating from the plant is dependent, in part, upon the ash content of the fuel, which ranges from 0.7 to 5.2 percent by dry weight. A variety of organic compounds is generated during the combustion of woodwastes, some of which are potentially hazardous to human health. Current information indicates that organic compounds such as polychlorinated hydrocarbons are emitted from wood-burning facilities, but the concentrations of these compounds are believed to be very low. EPA has established standards for sulfur oxides and particulates, and is currently in the process of establishing standards for the types of organic compounds discussed above.

Construction of a woodwaste plant would require the issuance of a new source emission permit. The low sulfur content of the fuel would result in the emission of a comparatively low amount of sulfur dioxide; thus, it is unlikely that the plant would be required to use scrubbers or similar desulfurizing equipment, although it is probable that the operators of the plant would be required to reduce particulate emissions by using electrostatic precipitators.

4.3.4 Noise Levels

Construction of the proposed facility would result in temporary and localized increases in noise levels at the plant site. In addition, transportation of woodwaste by trucks to the plant site would increase noise above ambient levels during operation of the plant.

It is expected that the construction equipment and trucks would conform to noise standards prescribed by Federal and state statutes, and that this should minimize the amount of noise emitted from the plant during operation.

4.3.5 Water Quality and Quantity

During construction of the proposed woodwaste plant, water would be required for sanitation and construction use. Water would be obtained from the nearby Cowlitz River. The consumption of water from the Cowlitz River would not significantly impact the river.

Wastewater streams originating from the woodwaste plant consist of: sanitary effluent, cooling tower blowdown, powerhouse effluent, and runoff from the woodwaste storage area. The sanitary waste would be processed in a packaged treatment plant, and the effluent from the plant would be drained into a leach field system; this process should have minimal impact on the water resources of the area. Cooling tower blowdown is characterized as having high mineral content and as containing algicides. Powerhouse effluent would contain high concentrations of silica, various salts, phosphate, oil, and grease. These wastes, along with the cooling tower blowdown, would be disposed of by means of an underground injection system. The injection of these wastes into geologic formations would be required to meet the statutory requirements of the EPA's Underground Injection Control Program, Part C of Public Law 93-523, as amended by Public Law 95-190 on November 15, 1977. Adherence to these requirements would insure that the injection of waste would not adversely impact potable groundwater supplies.

Runoff from woodwaste storage piles characteristically has high concentrations of tannins and other organic compounds. The high concentration of organic compounds would exert a significant oxygen demand on waters receiving such waste. A possible treatment for these wastes would be the collection of runoff in a settling pond, followed by chemical and biological treatment.

4.3.6 Fishery Resources

Operation of a woodwaste generation facility could result in the degradation of water quality by the leaching of toxic organic compounds from stockpiled woodwaste, and the discharge of heated water into streams, with negative effects on local fish populations. Since none of the woodwaste sites under consideration in Lewis County would be located on or near a stream with significant fisheries, however, the impacts of such a facility would be minor.

4.3.7 Vegetation

Development of a woodwaste facility at Site A would require the removal of some of the forested area. A minimum of 30 acres is needed for such a facility. It is anticipated that all of the 20-acre wood storage area would be utilized. The additional 10 acres would come from the adjacent forest and field areas.

The development of the woodwaste facility on Site B would require development of the entire 30-acre site. A loss of agricultural land and small fringe areas of forest land would occur.

The operation of a woodwaste facility could impact the supply of feedstock and the disposal of ash. Should the supply of woodwaste diminish, a supplement of whole-tree wood chips may be required. The harvest of trees specifically for supplying feedstock for a woodwaste plant could produce such substantial impacts on forest lands as: increased erosion and consequent degradation of water quality; loss of aesthetic and recreational values; possible long-term drop in forest productivity; and reduction of forest ecosystem diversity and loss of valued ecosystems and their wildlife.

The disposal of ash from operation of the facility may require that a new landfill site be developed. Development of such a site would require the removal of additional vegetation.

At least 30 acres of forest could be lost with the development of either Site A or B. More forest land would be lost with Site A, and therefore, more impact to vegetation would occur on Site A than Site B.

4.3.8 Wildlife Resources

Construction of a wood-fired generating plant would require 30 acres of habitat for construction of the plant and fuel storage. Construction at Site A would have no impact on wildlife. Construction at Site B would affect rural and agricultural areas with marginal wildlife value. If forest residues are required, an unknown effect on forest wildlife would result. Forest residues provide shelter and food to small mammals, and provide a temporary food supply for deer and elk. In the long term, removal of forest residues would promote new vegetation, benefiting many wildlife species.

4.3.9 Threatened or Endangered Species

The wood-fired generating plant would not adversely affect any threatened or endangered species.

4.3.10 Visual Resources

Development of a wood-fired electric generation plant at either of the two proposed sites would not have a significant adverse impact on any unique visual resources. Since both proposed sites are adjacent to existing wood processing plants, the use of either site would increase the visual presence of industrial operations to passerbys to a minor extent. A wood-fired plant would produce a smoke plume, but the adverse visual impact of the plume could be kept to a minimum by the use of air quality control equipment and proper stack design. By comparison, the adverse effects from the burning of timber slash in Lewis County, a common practice, are less capable of being minimized, and are greater in impact.

4.3.11 Cultural Resources

The nature and extent of impacts to archeological and historic sites as a result of the construction and operation of the wood-fired steam electric plant are unknown. A cultural resource survey of the proposed plant locations has not been conducted. Based upon a very limited amount of previous work in the area, it could be expected that some sites in areas not disturbed by past and present land-use practices would be affected.

4.3.12 Socioeconomic Factors

Socioeconomic impacts resulting from the construction of a woodwaste electric generating plant would be similar to those of the proposed project. (See Section 4.1.14.)

By purchasing logging residues, mill-yard and log handling residues, and hardwoods from mills in the Morton-Randle-Packwood area, the woodwaste alternative would increase those mills' employment and income levels. This alternative also could expand Lewis County's PUD privilege tax revenues.

While the proposed project would remove 1,150 acres of privately owned land from the local property tax rolls, this alternative would eliminate only 30 acres.

4.4 COAL-FIRED STEAM-ELECTRIC PROJECT

4.4.1 Geology and Soils

Project construction activities that would disturb soils, alter natural slopes and drainage, or remove protective vegetative cover and supportive root systems could result in soil erosion. Landsliding, slumping, or other types of soil mass movement could also occur, depending upon the siting of facilities and the angle of excavated slopes.

The Applicant would be expected to propose appropriate criteria regarding project siting, design, construction scheduling, and construction, operation, and maintenance procedures, by which soil erosion and soil mass movement would be precluded or minimized.

Some minor soil erosion would be unavoidable during construction, before protective measures could be implemented, and in areas where constant construction activity would preclude the effectiveness of mitigative measures.

4.4.2 Land Use

Staff can only discuss the impacts of building a coal-fired electric generation plant in general because the specific configuration and site of such a plant are not known. The description of the coal-fired alternative in Section 2.4.1 identifies the amount of land that would be required. Regardless of where such a plant would be sited, it would preclude any existing and near-future alternate land uses for the site. In addition, if such a plant is located in an urban or suburban setting, the plant could have an adverse impact on nearby residential and commercial development. The requirements for rail access, for a sufficient nearby water supply, and for approximately 2,000 acres for a solid-waste disposal site would all contribute to adverse land-use impacts. Adverse land-use impacts would also be associated with the mining of the coal; whether or not these impacts would be new or significant would depend on whether the proposed source would be a new mining operation or an existing one.

4.4.3 Air Quality

Short-term adverse effects on local air quality would occur during project construction because of exhaust emissions, smoke and dust particles from vehicles and equipment using internal combustion engines, and blasting and soil and rock excavation.

Sulfur oxides, nitrogen oxides, and particulates are the major pollutants that are emitted from coal-fired steam-electric plants during operation. The amount of these pollutants discharged into the atmosphere is a function of the chemical composition of coal, the type of combustion unit used, the amount of coal used, and the effectiveness of the pollution control equipment (U.S. Environmental Protection Agency, 1979). Sulfur oxides (SOx) are produced from the oxidation of approximately 95 percent of the available sulfur that is contained in coal. The nitrogen oxides (NOx) are produced from the oxidation of atmospheric nitrogen that is injected into the combustion unit and from the oxidation of nitrogen compounds contained in coal. Particulate emissions, composed primarily of carbon, alumina, and iron oxide, are derived from the ash fraction of coal. Nonmethane hydrocarbons and carbon monoxides are also released during the combustion of coal; the quantity of these pollutants released is dependent upon the efficiency of the combustion unit (U.S. Environmental Protection Agency 1977). EPA has established regulations governing the rate of discharge of these pollutants into the atmosphere.

According to the Clean Air Act of 1970, as amended in 1977, plans for a plant that would represent any new major pollutant source to be located in a clean air area must be submitted to a review process, in order to obtain a permit for prevention of significant deterioration. The coal-fired plant would be defined as a new major source under the requirements of Section 169 of the Act. As a part of the review process, the Applicant would be required to submit up to 1 year of preconstruction air quality monitoring data, and would be required to conduct an air quality analysis to demonstrate that emissions from the plant would not significantly increase local pollution levels (U.S. Environmental Protection Agency, 1980).

Air quality standards established by Federal and state regulatory agencies are meant to protect the local air quality, but these standards do not insure that emissions from coal-fired plants would not adversely affect the quality of the human environment. The long-range transportation of pollutants, for example, is not addressed in the regulations. According to a report published by the National Commission on Air Quality, large quantities of pollutants can be released without violating local ambient standards, and these emissions can cause serious acid deposition problems in downwind regions. In addition, local ambient standards address such pollutants as sulfur and nitrogen oxides, but only indirectly are concerned with such pollutants as sulfates and nitrates that are integrally involved in acid deposition (National Commission on Air Quality, 1981). Acid deposition has been implicated in such adverse environmental impacts as decreased forest productivity, elimination of fish populations from lakes, increased suspectibility of plants to disease, degradation of water quality, and decreased soil fertility.

Pollutants emitted from coal-fired plants that are not currently regulated by the EPA include such biologically hazardous compounds as benzene soluble organics, particulate polycyclic organic matter, benzo pyrene, and polyhalogenated biphenols. Information concerning the quality of these substances emitted from the coal-fired plants, as well as their origin during the combustion process, is limited. Bumb et al. (1980) indicated that chlorinated dioxins (polyhalogenated biphenols) are intimately associated with airborne particulate matter that originates from the combustion of fossil fuels. It is unlikely that a significant amount of these substances is collected by electrostatic precipitators and scrubbers. EPA is currently conducting studies that will establish standards for these compounds.

4.4.4 Noise Levels

During project construction, short-term local increases in noise levels would occur from the use of air compression and heavy equipment. Operation of the plant would result in a long-term increase in the noise levels in the vicinity of the project. It is probable that the increases in noise levels would be within limits established by Federal and state agencies as acceptable.

Staff expects that control measures would be proposed to keep noise levels within Federal and state standards.

4.4.5 Water Quality and Quantity

Construction of the coal-fired plant would require water for sanitation purposes and for use in various construction activities. Operation of the plant would require 11,000 gallons per minute (gpm) of water; 4,000 and 7,000 gpm would be required for cooling tower blowdown and as makeup for evaporative losses, respectively.

Operation of the coal-fired plant would generate such waste streams as cooling tower blowdown sewage from plant facilities, liquor from the flue-gas scrubbers, sluice water from ash disposal, and runoff from the coal storage pile and the plant site. Cooling tower blowdown characteristically contains high concentrations of dissolved solids; the sluice water would contain high levels of suspended solids. The chemical characteristics of the scrubber liquor, coal pile runoff, leachate from the ash disposal, and the sluice water are determined by the chemical composition of the coal, which in turn is dependent upon the type of coal used, and upon the preparation of the coal. These waste streams can vary from a highly acidic effluent, containing various trace amounts of potentially toxic substances, to a nontoxic alkaline effluent. The kinds of treatment used to minimize the adverse impacts of these wastes on the water resources of the project areas is dependent upon the toxicity of the wastes. In general, toxic waste streams would be collected in a basin that would be lined with an impermeable material, or disposed of in an area where a groundwater monitoring system would allow for early detection of groundwater contamination. Discharge to surface waters would be required to meet Federal and state water quality standards so as to minimize the impacts on aquatic resources.

4.4.6 Fishery Resources

Adverse effects associated with the operation of a large coal-fired project on fishes would include impingement and entrainment mortality of larval, young, and adult fishes, and mortality and other effects of a heated discharge on fishes. Many of these impacts can be mitigated by proper facility design and the use of closed-cycle cooling systems. Since a specific site for a coal-fired project has not been selected, specific impacts cannot be predicted.

4.4.7 Wildlife Resources

The construction of a coal-fired generating plant would result in the clearing of 2,500 acres of wildlife habitat. Ingestion of ash pond water and degraded water quality would pose a hazard to some wildlife species; mitigative measures could reduce these impacts to acceptable levels. Tall structures could cause increases in bird mortality.

4.4.8 Threatened or Endangered Species

Impacts on threatened or endangered species cannot be determined until a specific site is selected.

4.4.9 Visual Resources

Depending on the site chosen, the construction and operation of a coal-fired electric-generating plant could have significant adverse impacts on visual resources. Adverse visual impacts from the construction activities and the design and operation of plants are often unavoidable because of the high visibilty of the smoke stacks, the typical smoke plumes, and the visual degradation associated with potential temperature inversion effects.

4.4.10 Cultural Resources

No cultural resource assessment has been conducted in conjunction with the proposed coal-fired steam-electric plant, so the impact to cultural resources is unknown. Given the number or acres that would be required for the coal-fired facility, it is probable that cultural resource sites would be affected by construction and operation of the project.

4.5 NO ACTION

The no-action alternative would allow the natural, biotic, and human resources in the proposed project area to develop according to current patterns, and would preserve the area's visual and cultural resources. Existing recreational uses of the project area would continue, and portions of the Cowlitz and Cispus Rivers would remain as potential candidates for inclusion in the National Wild and Scenic River System. All of the adverse impacts of the proposed project and its alternatives, as discussed earlier in this section, would be avoided if no action is taken, but Lewis County would not receive the economic benefits associated with the construction and operation of energy facilities. The Applicant also could be expected to take other steps to secure electric power for customers in its service area.

4.6 COMPARISON OF ALTERNATIVES

Available information on selected project characteristics and on areas of environmental impact for the proposed Cowlitz Falls Project and its alternatives is summarized in Table 4-7. The table includes a comparison of the major impacts expected to occur to specific resources, even if the mitigative measures proposed by the Applicant, or required by Federal and state laws and regulations, are implemented. This impact summary does not reflect additional mitigation measures that may be recommended by various agencies or by the FERC staff. Section 5-2 discusses the mitigative measures recommended by the agencies and the Staff.

4.7 RELATIONSHIP TO LAND USE LAWS, PLANS, AND POLICIES

The development of the proposed project or either of the design alternatives would require the Applicant to obtain a conditional permit from Lewis County under the state-mandated, county-implemented Shoreline Master Program. Under this program, rivers with average flows greater than 1,000 cfs are designated as rivers of statewide significance by the Shoreline Management Act of the 1979 Revised Code of the State of Washington.

The relationship of the proposed project to the Wild and Scenic Rivers Act of 1968 is discussed in Section 3.1.2.2.

There are no zoning laws or other land-use plans or policies that would be affected by the proposed project's development.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

A variety of natural resources, including land, water and minerals, together with a number of human resources such as entrepreneurial skill, capital, labor, and building supplies, would be used in the construction and operation of the proposed hydroelectric project or its alternatives. The commitment of some of these resources to an energy-producing facility would be irreversible and irretrievable. Other resources and land uses would be unavailable during the life of a particular alternative, but would not be irreversibly committed, and could be employed for other purposes following the removal of an energy facility. The opportunity to use these resources or to choose alternative land uses, however, would be lost during the operation of the proposed project or its alternatives, and these lost opportunities would be irretrievable.

4.8.1 Cowlitz Falls Project - Applicant's Proposal

Materials and human labor required for construction of the dam, powerhouse, intake, tailrace, switching station, and transmission line for the proposed hydroelectric project would be irreversibly and irretrievably committed. Construction and operation of the project would also eliminate some fish, wildlife, and benthic organisms, and would result in the loss of some timber resources. Information at archeological sites that would be excavated would also be lost.

Table 4-7. Comparisons of alternatives, based on a summary of selected engineering and environmental impacts associated with the proposed project and alternatives (Source: Staff).

	Cowlitz Falls Project	Alternative reservoir levels (862)	(872)	Transmission line alternative rights-of-way (A)	(C)	Woodwaste plant	Coal-fired plant
Upstream area affected by dams	650 acres	300 acres	2,940 acres	NA	NA	NA	NA
Consumptive fuel use	None	None	None	NA	NA		
Trans. line length (miles)	5.2	5.2	5.2	8.7	8.6	Up to 2	Unknown
Cost ($1,000)				936	809		
Air quality	Minor increase in exhaust emissions and smoke during construction; some increases in fog.	Same as for proposed project.	Same as for proposed project.	Same as for proposed project.	Same as for proposed project.	Increases in particulate and sulfur oxide concentrations above ambient levels.	Increase in suspended particulates at coal mine; increased pollutant levels from combustion process; possible emission of potentially hazardous nonregulated pollutants with long-range effects.

Table 4-7. continued.

	Cowlitz Falls Project	Alternative reservoir levels (862)	(872)	Transmission line alternative rights-of-way (A)	(C)	Woodwaste plant	Coal-fired plant
Noise levels	Increases above background levels during construction.	Same as for proposed project.	Same as for proposed project.	Same as for proposed project.	Same as for proposed project.	Increases above background levels during construction; increases during operation.	Increases above background levels during construction, increases during operation.
Geologic resources	Reservoir-induced shallow groundwater conditions in some agricultural soils.	Same as for proposed project.	Inundation of some Prime Agr. Lands in addition to groundwater impacts.	None	None	Preempted use of Prime Agr. Lands.	Unknown
Geologic hazards	Erosion during construction; erosion and sloughing during oper.; potential seepage causing swampy or shallow groundwater in An. Valley or problems in saddle area.	Same as for proposed project.	Same as for proposed project.	More erosion potential.	Less erosion potential.	None	Unknown

Table 4-7. continued

	Cowlitz Falls Project	Alternative reservoir levels (862)	(872)	Transmission line alternative rights-of-way (A)	(C)	Woodwaste plant	Coal-fired plant
Water quality	Temporary increases in turbidity during construction; temporary degradation of water quality resulting from inundation of soils; increases in turbidity when floodgates opened during high flows.	Same as for proposed project.	Same as for proposed project; increased water temperatures and decreased oxygen concentrations in the backwater areas.	NA	NA	Possible introduction of pollutants into surface waters from failure of treatment facilities.	Potential for surface and groundwater contamination from improperly constructed holding ponds.
Water quantity	Aggravation of flooding from sedimentation of backwater areas.	Less aggravation of flooding than with proposed project.	Greater aggravation of flooding than with proposed project.	NA	NA	Consumption of water for cooling tower loss.	Consumption of water for cooling tower loss.
Vegetation	Disturbance or removal of 752 acres (including transmission line).	Removal of 619 acres (without trans. line).	Removal of 1,737 acres (without trans. line).	Disturbance or removal of 42 acres.	Disturbance or removal of 24 acres.	Clearance of vegetation on 30 acres.	Unknown

Table 4-7. continued.

	Cowlitz Falls Project	Alternative reservoir levels (862)	(872)	Transmission line alternative rights-of-way (A)	(C)	Woodwaste plant	Coal-fired plant
Wildlife resources	Loss or degradation of 719 acres of habitat; short-term impacts on deer and elk.	Loss or degradation of 619 acres; less severe impacts on deer and elk.	Loss or degradation of 1,737 acres; more severe impacts on deer and elk.	Minor alterations of habitat.	Minor alterations of habitat.	Loss of 30 acres of habitat with minimal value.	Unknown
Endangered species	Short-term disturbance to bald eagles and loss of perch sites.	Same as for proposed project.	Same as for proposed project.	None	None	None	Unknown
Existing fishery	Blockage of upriver fish migration; inundation of 14 miles of riverine habitat; dam-associated mortality of downstream migrants; alteration of habitat downstream.	Same as for proposed project, but with less inundation.	Same as for proposed project, but with more inundation.	None	None	Minor impacts from discharge of heated water and leaching of organic compounds.	Impingement and entrainment mortality; effects of warmwater discharge.

Table 4-7. continued.

	Cowlitz Falls Project	Alternative reservoir levels (862)	(872)	Transmission line alternative rights-of-way (A)	(C)	Woodwaste plant	Coal-fired plant
Future anadromous fishery	Dam with downstream migrant facilities would allow collection and transport of emigrating smolt to downstream areas.	Same as for proposed project.	Same as for proposed project.	None	None	Minor impact; no specific site.	Potential serious impact; no specific site.
Existing recreation	Loss of popular kayaking, camping, hunting, and fishing sites; eligibility for Wild and Scenic River System could be affected.	Same as for proposed project.	Same as for proposed project.	Possible safety hazard for existing hang glider site.	None	NA	NA
Proposed recreation	Increased availability of day-use and overnight facilities; county would gain needed offsite multipurpose athletic field.	Same as for proposed project.	Same as for proposed project.	None	None	NA	NA

Table 4-7. continued.

	Cowlitz Falls Project	Alternative reservoir levels (862)	(872)	Transmission line alternative rights-of-way (A)	(C)	Woodwaste plant	Coal-fired plant
Peak labor force	200 workers	200 workers	200 workers	NA	NA	Unknown	Unknown
Construction payroll ($ mil)	16.2	16.2	16.2	Unknown	Unknown	Unknown	Unknown
Housing units displaced	None	None	Some	None	None	None	Unknown
Fiscal impact	Additional yearly PUD privilege tax revenues to Lewis County--$33,350.	Favorable	Unfavorable	NA	NA	Favorable	Unknown
Visual resources	Minor impacts from construction and intrusion of man-made facilities; loss of Cowlitz Falls areas; transmission line within site of dwellings.	Same as for proposed project.	Same as for proposed project.	Possible adverse effects near Riffe Lake and on recreational experience.	Visible from more residences than proposed ROW and western ROW.	Unknown	Unknown
Cultural resources	Inundation of at least one site potentially eligible for the National Register.	Same as for proposed project.	Loss of land surrounding one additional site.	Unknown	Unknown	Unknown	Unknown

4.8.2 Design and Operating Alternatives

The resources required for construction of hydroelectric projects at EL 862 or EL 872 would be similar to those consumed in the construction of the civil works for the proposed project. A reservoir at EL 862 would require the commitment of fewer natural resources; more natural resources would be committed for a reservoir with an operation level at EL 862, and more productive farmland would be lost.

The alternative transmission line ROWs are longer than the proposed alignment. Therefore, the alternative alignments would potentially require the commitment of more material, human, and natural resources, some of which would be irretrievable.

4.8.3 Woodwaste Facility

Materials and human labor required for the construction of a wood-fired facility would be irreversibly and irretrievably committed. The woodwaste itself and the fuel required for its transportation would also be irretrievably lost. Construction and operation of the facility would be expected to eliminate some wildlife and vegetation, and the disposal of waste products could irreversibly affect potential land uses of the areas affected. There would also be an irreversible and irretrievable commitment of prime agricultural soils at either location selected for the wood-fired alternative.

4.8.4 Coal-fired Facility

Materials and human labor required for the construction of a coal-burning powerplant would be irreversibly and irretrievably committed. Since it is a nonrenewable resource, the coal used at the plant would also be irreversibly and irretrievably committed, as would the fuel used in the transportation of the coal from the mine to the powerplant. Depending on its location, the coal-fired facility would also be expected to eliminate some wildlife and vegetation resources. Some fish could also be lost through impingement and entrainment, and plant discharges could eliminate certain fish and benthic resources.

4.8.5 No Action

No direct irreversible or irretrievable commitments of resources would be associated with the no-action alternative. Without the construction of the proposed alternative energy facility, however, there would be an irretrievable loss of power generation for an unknown period of time until other forms of power could be made available in the Applicant's service area.

4.9 RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

Short-term uses of the environment, for both the proposed project and its alternatives,are considered those that would occur during the normal hydroelectric licensing period of 50 years. The long-term productivity of affected environmental resources is discussed in terms of meeting future energy requirements in the Applicant's service area, and of responsibly managing the environment for succeeding generations.

4.1.9 Cowlitz Falls Project - Applicant's Proposal

The proposed project would provide 70 MW of electric power to help meet projected deficits within the Applicant's service area. The proposed project would utilize the kinetic energy in falling water, and would generate 267 GWh of electrical energy annually under average streamflow conditions. By using a renewable resource, the proposed project would also help to reduce the Nation's dependence on imported and nonrenewable energy resources.

If the proposed project is constructed, the existing resources in the project vicinity could not be used for rafting and kayaking, for river bank fishing, and for certain land uses. In addition, maintenance of vegetation and its use for wildlife habitat would not continue in areas needed for project facilities. A different type of fishery probably would develop in the project reservoir, and changes in the basic character of certain reaches of the Cowlitz and Cispus Rivers would affect their consideration for inclusion in the Wild and Scenic River System. The implementation of mitigative measures proposed by the Applicant, and the adoption of additional measures recommended by government agencies and the FERC Staff, would reduce the impacts of the proposed project on some of the area's environmental resources.

Although the proposed project would provide a new source of renewable energy, it would also contribute to some reduction in the quality and diversity of environmental resources and values now found in reaches of the Cowlitz and Cispus Rivers upstream of Cowlitz Falls.

4.9.2 Alternative Design of the Proposed Project

The relationships between short-term use and long-term productivity for the proposed design alternatives are generally the same as those discussed for the proposed project. One important difference would occur if the hydroelectric project were to be operated at EL 872; far greater amounts of prime or quality farmland would be removed from production, with additional human and economic consequences.

4.9.3 Wood-fired Steam-electric Project

The wood-fired plant would provide about 25 MW of dependable capacity to help meet projected energy deficits. This alternative would utilize a renewable resource, and would also help to lessen dependence on imported energy resources.

Construction of the wood-fired project would affect Prime Agriculture Lands at either of the proposed project sites, and it is unlikely that these lands could ever be returned to the same level of productivity. Project facilities, however, would be compatible with the existing wood-products industry in Lewis County. Vegetation and wildlife habitat would be modified, at least during the life of the project, and it is probable that new or better-adapted species would develop on lands needed for project purposes.

Specific mitigative measures have not been proposed for the wood-fired alternative, but it can be assumed that available techniques would help to reduce adverse impacts to the resources and values of the project vicinity.

4.9.4 Coal-fired Steam-electric Project

A coal-fired plant would provide enough dependable capacity to allow the Applicant, in conjunction with other entities, to purchase electric energy to help meet projected deficits. For its operating life, the coal-fired facility would make the Nation less dependent on imported energy resources, but it would require the consumption of a nonrenewable resource.

4.9.5 No Action

If no action is taken with respect to the Applicant's proposal or its alternatives, there would be no change in the relationship between the current uses of resources and their long-term productivity.

5. STAFF CONCLUSIONS

5.1 SIGNIFICANT ENVIRONMENTAL IMPACTS

5.1.1 Cowlitz Falls Project--Proposed Action

The construction and operation of the proposed Cowlitz Falls Project would result in the following significant environmental impacts:

- aggravation of flooding in the Randle area.
- increased erosion and bank sloughing along the shoreline of the reservoir.
- the potential for seepage through permeable deposits in the Ancestral Valley, causing swampy, shallow groundwater soil conditions in the valley, and potentially hazardous bank-slope conditions in the saddle area downstream from the dam.
- the creation of reservoir-induced, shallow groundwater conditions in some of the agricultural soils in the Big Bottom.
- the preclusion of alternative land uses on, and the loss of productivity from, timber and agricultural lands within project boundaries.
- the sedimentation of the headwaters of the reservoir, causing aggravated flooding in the Randle area.
- the diversion of 2,000 feet of the Cowlitz River during the construction phase.
- the excavation of about 1 mile of the Cowlitz River to form a straight, uniform-depth tailrace channel.
- the inundation of 14 miles of the Cowlitz and Cispus Rivers, and of 1.5 miles of tributary streams.
- the blockage of upstream fish migration from Riffe Lake.
- the loss of sport fishing for salmon upstream of the dam.

- the loss of existing white water recreational activities, such as rafting and kayaking.
- the loss of potential eligibility of project reaches of the Cowlitz and Cispus Rivers for inclusion in the National Wild and Scenic Rivers System.
- the loss or alteration of approximately 719 acres of vegetation, including 501 acres of uplands, 182 acres of lowlands, and 36 acres of agrarian/meadow, of which 439 acres would be inundated.
- the inundation of 439 acres of wildlife habitat, the loss or degradation of 280 acres of this habitat, and the increased disturbance of adjacent wildlife populations.
- the inundation of 315 acres of commercial timberland, and a rise in groundwater levels under approximately 130 acres of cultivated agricultural land.
- the in-migration of approximately 100 persons to the Randle area, with resulting benefits for the area's retail trade and service establishments.
- the generation of $375,000 in additional sales tax revenues for Lewis County and approximately $100,000 in additional local property taxes.
- the generation of an average of $53,440 per year in incremental PUD privilege tax revenues, of which approximately $33,350 would be paid to Lewis County.
- the loss of archeological resources at the Cowlitz Falls South Site.

5.1.2 Alternative Designs of the Proposed Action

5.1.2.1 EL 862

The construction and operation of a hydroelectric project at Cowlitz Falls at EL 862 would have significant environmental impacts similar to the proposed project, with the following exceptions:

- a reduction of flood aggravation in the Randle area as compared to maintenance of a reservoir at EL 866.
- a reduction in the amount of agricultural land that would be directly affected by inundation or potentially increased groundwater levels.
- a lack of significant increases in groundwater levels so that present land uses would not be affected.
- the inundation of 10.9 miles of the Cowlitz and Cispus Rivers.
- the inundation of 100 less acres of vegetation, including 37 acres of uplands, 58 acres of lowlands, and 5 acres of agrarian/meadow.
- the loss of 100 acres less wildlife habitat.

5.1.2.2 EL 872

The construction and operation of a hydroelectric project at Cowlitz Falls at EL 872 would have significant environmental impacts similar to the proposed project with the following exceptions:

- aggravation of flooding in the Randle area.
- the inundation of Prime Agricultural Lands and other productive soils, and the creation of reservoir-induced shallow groundwater conditions in Prime Agricultural Land soils in the Big Bottom area.
- the inundation of significantly greater numbers of acres of timber and agricultural lands.
- the loss of land bases at local farms, with the potential to undermine the economic feasibility of 11 farming operations.
- the inundation of 16 miles of the Cowlitz and Cispus Rivers, and of several miles of tributary streams.
- the loss of approximately 1,018 acres of additional vegetation, including 149 acres of uplands, 229 acres of lowlands, 68 acres of wetlands/riparian, and 572 acres of agrarian/meadow.

- the loss of approximately 1,018 acres of additional wildlife habitat.
- the loss of 1,070 acres of cultivated farmland in the Randle area.
- the removal of considerably more privately owned land from the local property tax rolls.

5.1.2.3 Transmission Line Corridors

The construction and operation of alternative transmission lines would have significant environmental impacts similar to the proposed project's selected corridor with the following exceptions:

- increased erosion associated with construction of access roads and transmission towers.
- for the western corridor, interference with hang gliding activities in the project vicinity, and intrusion into existing recreational uses and visual characteristics of the Riffe Lake area.

5.1.3 Woodwaste Plant

The construction and operation of a woodwaste plant as an alternative to the proposed Cowlitz Falls Project would result in the following significant environmental impacts:

- the preemption of agricultural use of Prime Agricultural Land.
- the preclusion of alternative land uses on about 30 acres at the plant site and on an undefined amount of land needed for the disposal of fuel byproducts.
- an increase in income and employment in the area's lumber and plywood mills.
- the production of incremental PUD privilege tax revenues.

5.1.4 Coal-fired Plant

The construction and operation of a coal-fired plant as an alternative to the proposed Cowlitz Falls Project would result in the following significant environmental impacts:

- the preclusion of alternative land uses at the plant site and at the site of the initial mining operation.
- potentially intrusive visual effects, depending upon the choice of a plant site.
- the potential degradation of air quality as a result of plant emissions.
- the loss of fishery resources through entrainment and impingement, and as a result of the discharge of heated water.
- the decline of fish populations in the immediate vicinity of construction as a result of increased turbidity levels or waste runoff.
- the potential for the loss of vegetation resources at the plant site and at the mining source.
- the loss of 2,500 acres of wildlife habitat and the increased disturbance of adjacent wildlife populations.
- the potential that the siting of the plant could make the immediate area less desirable for tourism and second-home development.
- an increase in the number of workers required to operate a coal-fired facility.
- the production of incremental PUD privilege tax revenues.
- the potential loss of cultural resource sites at the plant site and mining operation.

5.2 MITIGATIVE MEASURES RECOMMENDED BY AGENCIES AND STAFF

5.2.1 Cowlitz Falls Project--Applicant's Proposal

5.2.1.1 Geology and Soils

EPA strongly recommended the construction of additional test wells to better determine the potential for seepage through the Ancestral Valley deposits, and to aid in

assessing the slope-stability threat from springs that might develop on the right bank of the river, in the saddle area downstream from the dam (Application, Exhibit W, Appendix A). Staff concurs with EPA, and believes that several additional wells would be needed before the presence, or absence, of potentially significant seepage channels within the valley deposits could safely be determined. Staff further recommends that the additional wells should be constructed as soon as possible, rather than waiting until the final design stage, as proposed by the Applicant. Immediate construction of the wells would allow a longer time for monitoring, and would provide a more reliable data base for determining the existence of subsurface flows from the river and for predicting subsurface flows that may occur from a reservoir.

The EPA commented that the Applicant should provide a specific implementation plan and mitigative measures for the impacts on agricultural soils that would result from reservoir-induced higher groundwater levels (U.S. Environmental Protection Agency, 1981; C. Smith, Environmental Sanitary Engineer, EPA, Region 10, Seattle, Washington, December 9, 1981, personal communication). Staff concurs, and recommends that the Applicant should prepare such a plan in cooperation with the U.S. Soil Conservation Service. Staff further recommends that the plan should include a means for evaluating the impacts on the value of the affected lands, and that it should include consideration of the potential use of dikes and pumps as part of possible drainage systems.

General measures have been proposed, but no specific plans have yet been advanced, for mitigating project-induced erosion, sedimentation, and sliding and other soil mass movement. Staff therefore recommends that prior to the commencement of construction, and following consultation with state and Federal agencies, the Applicant prepare an erosion, dust, sedimentation, and slope stability control plan.

5.2.1.2 Land Use

The Applicant's proposal to purchase adequate buffer zone land in fee would be consistent with the Commission's policy established in Commission Opinion No. 91 (Federal Energy Regulatory Commission, 1980). Because of potential conflicts associated with the use and management of the proposed buffer zone lands for wildlife mitigation, recreation, or use by adjacent landowners, the Staff recommends that the Applicant prepare a detailed management plan for the proposed buffer zone lands, in consultation with the appropriate agencies. The plan should include a proposed permit system, identifying potential uses the Applicant would allow, and specifying conditions for use by adjacent land owners. The Staff further recommends that any uses allowed should be in accordance with a permit or final agreement, based on a case-by-case analysis of conflicts with other established uses, particularly public recreational use and access.

Champion International Corporation suggested that Applicant acquire easements rather than purchase lands in fee. The Staff believes that the Applicant has assessed the Commission's policy as stated in Opinion No. 91, and has elected to purchase buffer-zone lands in fee, rather than acquiring easements that would be required to meet the specifications in Opinion No. 91.

The WDG suggested at the scoping meeting on September 30, 1981, that the Staff should address the potential impacts of recreational or residential development along the proposed reservoir shoreline. Although the Staff does not feel that there would be great pressures for development, Staff also believes that an adequate fee-owned buffer zone and permit-management system would minimize development pressures and any potential adverse impacts.

5.2.1.3 Recreation

The Applicant's proposed Recreation Plan, as commented on by the agencies and as reviewed by Staff, appears to mitigate adequately for the loss of existing recreational resources and opportunities, but does not mitigate in kind for the loss of previously identified existing recreational opportunties.

5.2.1.4 Water Quality and Quantity

Debris

During the scoping sessions held on September 30, 1981, personnel from the Washington Department of Ecology and members of the Cowlitz Falls Dam Prevention Committee indicated that the debris transported by the Cowlitz River during high flow could be of sufficient size to block the spillway of the proposed dam, and, as a result, could aggravate flooding in the Randle area. Staff believes that the spillway, as designed, may not allow passage of larger debris that is transported by the Cowlitz River and that some aggravation of flooding could result. To mitigate for this impact, Staff recommends that the Applicant prepare a detailed debris collection and removal plan, to be submitted to the Commission for approval, along with comments from relevant resource agencies, prior to the start of construction. The plan should include: a description of collection methods; a schedule for the debris removal operations; methods of removal; a description of the criteria that would be used to select debris to be removed; and the identification of those areas where the operations would be performed.

Sedimentation

Staff's analysis of the project indicates that operation of the project would result in the deposition of sediment in the headwaters of the project reservoir, thereby aggravating flooding in the Randle area. Increases in the frequency of overbank flooding and the amount of land that would be inundated as a result are primarily dependent upon the amount and location of sediment that would accumulate in the headwaters of the reservoir. Staff recommend that the Applicant develop a program to monitor sediment accumulation in the headwaters of the project reservoir and to determine measures necessary to remove significant accumulation of sediment within the river channel in flood-sensitive areas. This program should be developed in conjunction with relevant resource agencies and should be submitted to the Commission for approval prior to construction of the proposed project.

5.2.1.5 Fisheries

The Applicant has adopted many, but not all, of the mitigative measures recommended by the agencies and others who commented on the application. Both WDF and WDG have discussed the installation of upstream fish passage facilities as a way to mitigate the blockage of upstream fish migrations from Riffe Lake, although the Applicant has not proposed such facilities.

WDG proposed additional mitigative and compensation measures in its final report on studies associated with the project (Wood et al., 1981). Measures recommended but not yet adopted by the Applicant include: construction of the bypass channel around the dam site so that water velocities would not exceed 4 feet per second; maintenance of a larger (50,000 rainbow trout per year) trout stocking program in the proposed reservoir; stocking of largemouth bass and black crappie in the warm-water subimpoundments; and habitat improvement and preservation along an additional 3.6 miles of Siler and Kiona Creeks. The WDG did not recommend habitat improvements on Goat, Tumwater, or Crystal Creeks, but discussed improvements on 52.8 miles of other streams in the area as an alternative to the program of stocking 50,000 fish per year. Other agencies (FWS, WDF, and EPA) indicated that their final recommendations on mitigation would be withheld until WDG completed its final report. Additional recommendations from the other agencies have not yet been received by staff.

The Applicant has not indicated whether it would support the mitigation and compensation measures proposed by WDG, but stated that negotiations with WDG on a final mitigation plan would occur in the near future. Staff also reserves its final recommendations pending the outcome of these negotiations, and receipt of the agency recommendations.

5.2.1.6 Vegetation

There were no measures recommended by the agencies for mitigation of vegetation impacts, except for those presented in the WDG's and Applicant's wildlife mitigation plan (Section 5.2.1.7).

The impacts to agricultural lands resulting from higher water tables could be mitigated by planting different crops. Two groups of forage crops, tall fescue (Festuca sp.) and trefoil (Lotus spp.), presently grown by some farmers in the project area, can tolerate a water table of about 1 to 1.5 feet. Forage crops and corn, both of which are also grown in the area, generally will tolerate a water table 3 to 4 feet deep. One drawback to growing tall fescue or trefoil in the potential impacted area is that these species are low in nutritive value for dairy cattle (Malcolm McPhail, December 1, 1981, personal communication).

5.2.1.7 Wildlife

WDG has developed wildlife mitigation recommendations (Wood et al., 1981) that include many components similar to those proposed by the Applicant, but contain much greater detail. WDG has identified sites that could be managed for wildlife, and has developed specific management objectives for each site. Major unresolved differences are discussed below.

WDG has recommended that a 200-foot-wide buffer zone be preserved on both sides of the transmission line ROW to maintain the wildlife habitat value of the ROW. The Applicant has not proposed to purchase these lands. Purchase of any additional commercial timber lands would increase the adverse impacts to the timber industry. WDG also recommended that livestock be excluded from general access to the shoreline. Applicant has stated that this would further impact agriculture in the area, and has proposed to allow present grazing to continue in that zone. WDG also proposed that streambank enhancement for the benefit of wildlife be extended an additional 3.6 miles farther upstream on Kiona and Siler Creeks.

Staff recommends that the Applicant and WDG negotiate a mutually acceptable mitigation plan, either by agreement, before issuance of a license, or as a condition of the license. Staff reserves its judgment on the mitigation plan until a final plan has been advanced by the Applicant.

5.2.1.8 Threatened or Endangered Species

FWS commented that with adequate mitigative measures to protect and develop bald eagle perch sites, no adverse impacts to the eagle would occur. Therefore, Staff is recommending a license article that would require the Licensee, in cooperation with the FWS and WDG, to determine measures necessary to prevent or mitigate the loss of bald eagle perch sites along the proposed reservoir shoreline and to implement these measures prior to the commencement of project construction.

5.2.1.9 Visual Resources

There were no measures recommended by the agencies for mitigation of visual resources impacts. The Staff recommends that the Applicant's proposed mitigative measures (Application, Exhibit V) be included as a condition of any license that might be issued for the proposed project.

5.2.1.10 Cultural Resources

The Applicant should refine its general mitigation proposals to develop specific measures for the avoidance or mitigation of adverse effects to the Cowlitz Falls South Archeological site.

5.2.2 Alternative Design of the Proposed Project

The mitigation measures discussed previously for the proposed project are generally applicable to a project at EL 862 and 872, and to the alternative transmission line corridors. Staff would recommend the following additional mitigative measure:

- expanded development of shoreline/riparian habitat, "meadow" habitat, mixed woodland habitat, and wetlands habitat for a reservoir at EL 872.

5.2.3 Alternative Energy Facilities

The agencies have not suggested any mitigative measures for the woodwaste and coal-fired alternatives. Specific mitigative measures would depend upon the locations selected for those energy facilities, and upon the resources encountered at those locations.

5.3 UNMITIGATED ENVIRONMENTAL IMPACTS

5.3.1 Cowlitz Falls Project--Applicant's Proposal

The proposed project's unmitigated environmental impacts would include:

- the loss of approximately 870 acres of existing river bed, agricultural land, and timberland.
- the loss of recreational opportunities for stream bank fishing, rafting, and kayaking in existing reaches of the Cowlitz and Cispus Rivers.
- the possible disqualification of sections of the Cowlitz and Cispus Rivers for inclusion in the National Wild and Scenic Rivers System.
- the loss of 15.5 miles of free-flowing rivers and streams, and the associated loss of habitat for fish and benthic organisms.
- the permanent transformation of a diverse reach of the Cowlitz River into a straight, uniform-depth tailrace channel.
- the blockage of upstream fish migrations from Riffe Lake.
- the loss of wildlife through habitat clearing or alteration, and as a result of displacement.

5.3.2 Alternative Design of the Proposed Project

The unmitigated environmental impacts associated with the proposed project's alternative design schemes are generally similar to those for the proposed Cowlitz Falls Project, with the following exceptions:

EL 862

- the loss of fewer acres of existing river bed and timberland.
- the loss of 10.9 miles of free-flowing rivers and streams.

EL 872

- the loss of additional acres of river bed and timberland, and the inundation of more acres of farmland.
- the loss of more than 20 miles of free-flowing rivers and streams.

5.3.3 Alternative Energy Facilities

An identification of specific unmitigated environmental effects associated with the proposed alternative energy facilities is not possible because specific locations have not been selected for several of the alternatives. For both the proposed woodwaste and coal-fired alternatives, there probably would be some level of pollutants emitted, regardless of efforts to adhere to EPA standards; also there probably would be impacts associated with the long-term transportation of such pollutants as acid rain.

5.4 STAFF CONCLUSIONS

This statement has examined the environmental consequences of the proposed Cowlitz Falls Hydroelectric Project, the possible design alternatives to the proposed project, a woodwaste plant alternative, a coal-fired plant alternative, and the no-action alternative. Staff's analysis indicates that the proposed Cowlitz Falls Project is the least costly alternative, but that it would not necessarily be the most desirable, from an environmental standpoint, for meeting the electrical power needs of the Applicant's service area. Staff analysis shows that a woodwaste project could offer comparable energy benefits with fewer adverse environmental impacts, although at a greater cost per kilowatt (125.1 mills vs. 67.3 mills).

Staff's analysis of the hydroelectric alternatives at Cowlitz Falls shows that operation of the project at EL 862 is environmentally preferable. A reservoir constructed and operated at EL 862 would have significantly fewer adverse impacts than a reservoir at EL 866 or EL 872, particularly for such resources as productive farmland, vegetation, and wildlife, and for local land uses. Maintenance of the project reservoir at EL 866 or EL 872 could result in the aggravation of flooding in the Randle area which would necessitate the acquisition of flood easements. The differences in the cost of energy for a project at EL 862 versus the proposed project would not be significant--66.9 mills/kWh for 862 and 65.2 mills/kWh for 866. The loss of energy production associated with maintenance of the reservoir at EL 862 compared to the proposed project would be 11.2 GWh.

On the basis of available information, Staff agrees that the Applicant's proposed transmission line ROW is the preferred alternative.

While acknowledging that considerably more information is available on the potential adverse effects of the Applicant's proposed project, the Staff concludes that a woodwaste plant could represent an environmentally superior alternative. A woodwaste plant would affect only a limited amount of land and few significant resources. Assuming that a woodwaste facility could be constructed at either of the sites identified in this statement, the woodwaste plant would have a negligible effect on geology and soils, land use, vegetation, wildlife, fisheries, and visual resources. The woodwaste plant would have an impact on the area's air quality, but this impact could be mitigated, and it might not represent an additional adverse impact when compared to existing wood-burning activities in the region. In addition, the use of a locally available resource would be compatible with the area's economy, would increase revenue to existing logging operations, and would produce generation tax revenues for Lewis County.

A woodwaste facility would have a shorter operating life than a hydroelectric project. Initially, a woodwaste plant would generate power at a cost comparable to the proposed project; over the life of the project, however, the increases in wood fuel costs caused by rises in transportation and processing costs would push the operating cost of the woodwaste facility beyond the cost of the hydroelectric project. Staff's analysis shows that operating the woodwaste facility over a 50-year period would be about twice as costly as operating the proposed project.

Staff's evaluation of a coal-fired alternative indicates that it would have the potential to affect a wide variety of environmental resources and values. Since no specific location has been identified for the coal-fired alternative, the Staff is unable to compare the relative impacts of a coal-fired project and the proposed action. A coal-fired facility, however, would occupy over 2,500 acres, and could be expected to have significant impacts at both the plant site and at the location selected for mining operations. Moreover, a coal-fired electric plant would use a nonrenewable resource, and would have a shorter useful operating life than the Applicant's proposed project.

Finally, the no-action alternative would not change the existing environmental relationships in the project area, but it also would not provide for projected energy needs. The no-action alternative would require that the Applicant either obtain needed power from other sources or accelerate the development of other generation facilities. Both of these developments could result in increased energy costs.

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7. LIST OF PREPARERS

The following staff members of the Federal Energy Regulatory Commission were responsible for preparation of the FEIS:

LON CROW (B.A., Biology, 48 semester hours for M.S. in Biology). Five years experience in aquatic ecology and impact assessment.

JAMES FARGO (B.S., M.S., Civil Engineering). More than nine years experience in civil engineering in nuclear and hydroelectric design and analysis.

JAMES FEENEY--EIS Coordinator (B.A., M.A., History). More than four years experience in cultural resource impact assessment.

PETER FOOTE (B.S., Wildlife Biology, M.S. Fisheries Biology). Eleven years experience in the fields of fisheries biology and impact assessment.

JAMES HAIMES (B.A., Economics, 60 semester hours for Ph.D.). Eight years experience in private economic consulting, seven years experience as government economist.

PETER LEITZKE (B.S., Geology, M.A., Geological Science). Nine years experience in the geotechnical consulting field, and in geology, soils, and geological hazard assessment.

ALAN MITCHNICK (B.S., Biology and Environmental Studies, M.S., Wildlife Biology). Four years experience in the fields of impact assessment and terrestrial ecology.

PATRICK MURPHY (B.S., M.S., Wildlife Management). Nine years experience in the fields of terrestrial ecology and impact assessment.

PETER NYGARD (B.S., Electrical Engineering). Sixteen years experience with the FERC as an electrical engineer.

STEVE SINGAL (B.S., M.S., Civil Engineering). Five years experience as an environment engineer, and six years experience as a civil engineer.

8. LIST OF RECIPIENTS

The agencies, organizations, and individuals listed below received copies of the Draft and Final Environmental Impact Statements. Those that provided comments on the Draft Environmental Impact Statement are indicated with an asterisk, and their letters of comment and staff responses are found in Appendix B.

Federal

Advisory Council on Historic Preservation
Department of Agriculture, U.S. Forest Service
Department of Commerce
* Department of Defense, U.S. Army Corps of Engineers
* Department of the Interior
Department of Transportation
* Environmental Protection Agency
Federal Emergency Management Agency
National Marine Fisheries Service
U.S. Department of Energy, Bonneville Power Administration

State

Attorney General, State of Washington
Department of Agriculture
* Department of Ecology
Department of Fisheries
Department of Natural Resources
Governor, State of Washington
* State Parks and Recreation Commission
* Department of Game
State Historic Preservation Officer
Utilities and Transportation Commission

Native American Organizations

Olympic Peninsula Agency
Point No Point Treaty Council
Spokane Agency
Superintendent, Colville Agency
Superintendent, Puget Sound Agency
Superintendent, Yakima Agency

Intervenors

* City of Tacoma, Department of Public Utilities
Cowlitz Indian Tribe
Ms Fran Brady
Mr. John F. Forsberg
Ms Ethal Eastman
Mr. K.A. Heimbigner
Mr. Thomas Lackey, Champion International Corporation
Mr. Norman McMahan
Mr. William R. McMahan
Ms Geneva Mead
Mr. Wallace Mead
Ms Eleanor Music
Mr. Jennings Music
Mr. Loren D. Prescott
Mr. James M. Quigley, Esq., Champion International Corporation
Ms Catherine Sadler
Mr. Norman Sadler, Cowlitz Falls Dam Prevention Committee
Mr. Henry A. Young

Applicant

Lewis County, Public Utility District No. 1

Others

Patrick Andreotti
Native American Project

APPENDIX A. Form L-4: Terms and Conditions of License for Unconstructed Major Project Affecting Navigable Waters of the United States

FEDERAL POWER COMMISSION

TERMS AND CONDITIONS OF LICENSE FOR UNCONSTRUCTED MAJOR PROJECT AFFECTING NAVIGABLE WATERS OF THE UNITED STATES

Article 1. The entire project, as described in this order of the Commission, shall be subject to all of the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: Provided, however, That if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval a revised, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. The project works shall be constructed in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, there shall not be made without prior approval of the Commission any substantial alteration or addition not in conformity with the approved plans to any dam or other project works under the license or any substantial use of project lands and waters not authorized herein; and any emergency alteration, addition, or use so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in project works, or in uses of project lands and waters, or divergence from such approved exhibits may be made if such changes will not result in a decrease in efficiency, in a material increase in cost, in an adverse environmental impact, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct.

Upon the completion of the project, or at such other time as the Commission may direct, the Licensee shall submit to the Commission for approval revised exhibits insofar as necessary to show any divergence from or variations in the project area and project boundary as finally located or in the project works as actually constructed when compared with the area and boundary shown and the works described in the license or in the exhibits approved by the Commission, together with a statement in writing setting forth the reasons which in the opinion of the Licensee necessitated or justified variation in or divergence from the approved exhibits. Such revised exhibits shall, if and when approved by the Commission, be made a part of the license under the provisions of Article 2 hereof.

Article 4. The construction, operation, and maintenance of the project and any work incidental to additions or alterations shall be subject to the inspection and supervision of the Regional Engineer, Federal Power Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of the project and for any subsequent alterations to the project. Construction of the project works or any feature or alteration thereof shall not be initiated until the program of inspection for the project works or any such feature thereof has been approved by said representative. The Licensee shall also furnish to said representative such further information as he may require concerning the construction, operation, and maintenance of the project, and of any alteration thereof, and shall notify him of the date upon which work will begin, as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall allow said representative and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may prescribe from time to time for the protection of life, health, or property.

Article 5. The Licensee, within five years from the date of issuance of the license, shall acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for the construction, maintenance, and operation of the project. The Licensee or its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights of occupancy and use; and none of such properties shall be voluntarily sold, leased, transferred, abandoned, or otherwise disposed of without the prior written approval of the Commission, except that the Licensee may lease or otherwise dispose of interests in project lands or property without specific written approval of the Commission pursuant to the then current regulations of the Commission. The provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear; and mortgage or trust deeds or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article.

Article 6. In the event the project is taken over by the United States upon the termination of the license as provided in Section 14 of the Federal Power Act, or is transferred to a new licensee or to a non-power licensee under the provisions of Section 15 of said Act, the Licensee, its successors and assigns shall be responsible for, and shall make good any defect of title to, or of right of occupancy and use in, any of such project property that is necessary or appropriate or valuable and serviceable in the maintenance and operation of the project, and shall pay and discharge, or shall assume responsibility for payment and discharge of, all liens or encumbrances upon the project or project property created by the Licensee or created or incurred after the issuance of the license: Provided, That the provisions of this article are not intended to require the Licensee, for the purpose of transferring the project to the United States or to a new licensee, to acquire any different title to, or right of occupancy and use in, any of such project property than was necessary to acquire for its own purposes as the Licensee.

Article 7. The actual legitimate original cost of the project, and of any addition thereto or betterment thereof, shall be determined by the Commission in accordance with the Federal Power Act and the Commission's Rules and Regulations thereunder.

Article 8. The Licensee shall install and thereafter maintain gages and stream-gaging stations for the purpose of determining the stage and flow of the stream or streams on which the project is located, the amount of water held in and withdrawn from storage, and the effective head on the turbines; shall provide for the required reading of such gages and for the adequate rating of such stations; and shall install and maintain standard meters adequate for the determination of the amount of electric energy generated by the project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission or its authorized representative. The Commission reserves the right, after notice and opportunity for hearing, to require such alterations in the number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, as are necessary to secure adequate determinations. The installation of gages, the rating of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of the project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision, or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient records of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 9. The Licensee shall, after notice and opportunity for hearing, install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so.

Article 10. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other projects or power systems and in such manner as the Commission may direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 11. Whenever the Licensee is directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement, the Licensee shall reimburse the owner of the headwater improvement for such part of the annual charges for interest, maintenance, and depreciation thereof as the Commission shall determine to be equitable, and shall pay to the United States the cost of making such determination as fixed by the Commission. For benefits provided by a storage reservoir or other headwater improvement of the United States, the Licensee shall pay to the Commission the amounts for which it is billed from time to time for such headwater benefits and for the cost of making the determinations pursuant to the then current regulations of the Commission under the Federal Power Act.

Article 12. The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as the Commission may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes, and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

Article 13. On the application of any person, association, corporation, Federal agency, State or municipality, the Licensee shall permit such reasonable use of its reservoir or other project properties, including works, lands and water rights, or parts thereof, as may be ordered by the Commission, after notice and opportunity for hearing, in the interests of comprehensive development of the waterway or waterways involved and the conservation and utilization of the water resources of the region for water supply or for the purposes of steam-electric, irrigation, industrial, municipal or similar uses. The Licensee shall receive reasonable compensation for use of its reservoir or other project properties or parts thereof for such purposes, to include at least full reimbursement for any damages or expenses which the joint use causes the Licensee to incur. Any such compensation shall be fixed by the Commission either by approval of an agreement between the Licensee and the party or parties benefiting or after notice and opportunity for hearing. Applications shall contain information in sufficient detail to afford a full understanding of the proposed use, including satisfactory evidence that the applicant possesses necessary water rights pursuant to applicable State law, or a showing of cause why such evidence cannot concurrently be submitted, and a statement as to the relationship of the proposed use to any State or municipal plans or orders which may have been adopted with respect to the use of such waters.

Article 14. In the construction or maintenance of the project works, the Licensee shall place and maintain suitable structures and devices to reduce to a reasonable degree the liability of contact between its transmission lines and telegraph, telephone and other signal wires or power transmission lines constructed prior to its transmission lines and not owned by the Licensee, and shall also place and maintain suitable structures and devices to reduce to a reasonable degree the liability of any structures or wires falling or obstructing traffic or endangering life. None of the provisions of this article are intended to relieve the Licensee from any responsibility or requirement which may be imposed by any other lawful authority for avoiding or eliminating inductive interference.

Article 15. The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.

Article 16. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of the Licensee's lands and interests in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be reasonably prescribed by the Commission in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 17. The Licensee shall construct, maintain, and operate, or shall arrange for the construction, maintenance, and operation of such reasonable recreational facilities, including modifications thereto, such as access roads, wharves, launching ramps, beaches, picnic and camping areas, sanitary facilities, and utilities, giving consideration to the needs of the physically handicapped, and shall comply with such reasonable modifications of the project, as may be prescribed hereafter by the Commission during the term of this license upon its own motion or upon the recommendation of the Secretary of the Interior or other interested Federal or State agencies, after notice and opportunity for hearing.

Article 18. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and for outdoor recreational purposes, including fishing and hunting: Provided, That the Licensee may reserve from public access such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property.

Article 19. In the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing.

Article 20. The Licensee shall consult with the appropriate State and Federal agencies and, within one year of the date of issuance of this license, shall submit for Commission approval a plan for clearing the reservoir area. Further, the Licensee shall clear and keep clear to an adequate width lands along open conduits and shall dispose of all temporary structures, unused timber, brush, refuse, or other material unnecessary for the purposes of the project which results from the clearing of lands or from the maintenance or alteration of the project works. In addition, all trees along the periphery of project reservoirs which may die during operations of the project shall be removed. Upon approval of the clearing plan all clearing of the lands and disposal of the unnecessary material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission and in accordance with appropriate Federal, State, and local statutes and regulations.

Article 21. Material may be dredged or excavated from, or placed as fill in, project lands and/or waters only in the prosecution of work specifically authorized under the license; in the maintenance of the project; or after obtaining Commission approval, as appropriate. Any such material shall be removed and/or deposited in such manner

as to reasonably preserve the environmental values of the project and so as not to interfere with traffic on land or water. Dredging and filling in a navigable water of the United States shall also be done to the satisfaction of the District Engineer, Department of the Army, in charge of the locality.

Article 22. Whenever the United States shall desire to construct, complete, or improve navigation facilities in connection with the project, the Licensee shall convey to the United States, free of cost, such of its lands and rights-of-way and such rights of passage through its dams or other structures, and shall permit such control of its pools, as may be required to complete and maintain such navigation facilities.

Article 23. The operation of any navigation facilities which may be constructed as a part of, or in connection with, any dam or diversion structure constituting a part of the project works shall at all times be controlled by such reasonable rules and regulations in the interest of navigation, including control of the level of the pool caused by such dam or diversion structure, as may be made from time to time by the Secretary of the Army.

Article 24. The Licensee shall furnish power free of cost to the United States for the operation and maintenance of navigation facilities in the vicinity of the project at the voltage and frequency required by such facilities and at a point adjacent thereto, whether said facilities are constructed by the Licensee or by the United States.

Article 25. The Licensee shall construct, maintain, and operate at its own expense such lights and other signals for the protection of navigation as may be directed by the Secretary of the Department in which the Coast Guard is operating.

Article 26. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without adequate replacement, or shall abandon or discontinue good faith operation of the project or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address of the Licensee

or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license. The Commission, after notice and opportunity for hearing, may require the Licensee to remove any or all structures, equipment and power lines within the project boundary and to take any such other action necessary to restore the project waters, lands, and facilities remaining within the project boundary to a condition satisfactory to the United States agency having jurisdiction over its lands or the Commission's authorized representative, as appropriate, or to provide for the continued operation and maintenance of nonpower facilities and fulfill such other obligations under the license as the Commission may prescribe. In addition, the Commission in its discretion, after notice and opportunity for hearing, may also agree to the surrender of the license when the Commission, for the reasons recited herein, deems it to be the intent of the Licensee to surrender the license.

Article 27. The right of the Licensee and of its successors and assigns to use or occupy waters over which the United States has jurisdiction, or lands of the United States under the license, for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless the Licensee has obtained a new license pursuant to the then existing laws and regulations, or an annual license under the terms and conditions of this license.

Article 28. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.

Appendix B. Letters of Comment on the Draft Environmental Impact Statement and Staff Responses

OFFICE OF THE COMMISSIONERS
LEWIS COUNTY, WASHINGTON
CHEHALIS, WASHINGTON
98532
P.O. BOX 798
(206) 748-9121

GARY ELY
FIRST DISTRICT
ROBERT I. VENEMON
SECOND DISTRICT
HAROLD COOPER
THIRD DISTRICT

July 2, 1982

OFFICIAL FILE COPY

Mr. James P. Feeney
Federal Regulatory Commission
Office of Electric Power Regulation
825 N. Capitol Street
Washington, D.C. 20426

Gentlemen:

Concerning the Final Environmental Statement on the proposed Cowlitz Falls Project #2833, we offer the following comments in addition to those presented in the past.

The tax table on Page 4-43 is in error. The County General Fund and the County Road Fund figures should be reversed, as the General Fund levy is 1.3770 and the Road Fund is 1.8960.

See revised table.

We disagree with the Washington Department of Game concept of requesting a 200 feet buffer for wildlife management on each side of the proposed power line right of way. We also oppose their position regarding livestock watering use on the proposed reservoir as a taking of rights with no concern for prior historical use.

Your comment is noted.

We oppose the purchasing or condemnation of any additional farm or timberland for game mitigation except voluntary sales of wetlands if proven that wetland areas have been lost in the project area.

Your comment is noted.

Sincerely,

BOARD OF COUNTY COMMISSIONERS
LEWIS COUNTY WASHINGTON

Harold Cooper
Robert I. Venemon
Gary Ely

HC:cll

FERC - DOCKETED
JUL 9 1982

B-2

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

OFFICIAL FILE COPY

ER-82/665

JUN 3

TO	INIT.	DATE
982		
CENTRAL FILES		

Mr. Kenneth F. Plumb, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, D.C. 20426

Dear Mr. Plumb:

We have reviewed the draft environmental statement for the Cowlitz Falls Project, FERC No. 2833, Lewis County, Washington, and have the following comments.

Section 2.1.2.6 - Recreation land acquisition and development are legitimate components of an Exhibit R (Recreation Plan), thus all recreation land should be a part of the project (18 CFR 2.7(a)). The project boundary, therefore, should be revised to include the one proposed recreation site which is currently outside the boundary.

In addition, plans for the recreation facilities should include a discussion of the source of water supply. If ground water is to be used, the agency approving the well location, construction, and certifying the water supply for public use should be identified.

Page 2-3 - Figure 2-2 indicates that the stream gage operated by the U.S. Geological Survey at River Mile 69.2 will be inundated. Consideration should be given to measures to ensure continued operation of the gage.

Section 4.1.2.2 - It is noted that, "The applicant proposes to mitigate land use impacts by minimizing, to the extent allowable, the width of the buffer zone . . . and locating proposed recreational areas primarily on publicly-owned land." We recommend that all recreation areas, even those held for future development, be acquired by the applicant and included in the project with such costs considered as a part of the project(18 CFR 2.7).

In this same section, we disagree that provisions of a buffer zone (shown in Table 2-2 as wildlife mitigation) fulfills the mitigation requirement for the loss of riverine resources. The same land cannot be used to concurrently mitigate the loss of wildlife resources and provide for active recreation pursuits. Furthermore, this section states that the buffer zone would limit direct access to the proposed reservoir; and, as such, would not be a mitigative measure that would compensate for the loss of river segments identified in the Nationwide Rivers Inventory.

As stated in our earlier reviews of this project, we recommend that the applicant be required, as a license condition, to acquire conservation easements and/or other measures to compensate for the loss of riverine resources of the Cowlitz and Cispus Rivers. Failure of the applicant to set forth acceptable mitigation proposals should not deter FERC from addressing mitigation measures in the final environmental impact statement.

PUBLIC - DOCKETED
JUN 7 1982

The day use park has been proposed by the Applicant and concurred in by the Lewis County Parks and Recreation Commission, as a form of off-site mitigation (although not in-kind) for the loss of existing recreational activities which would be impacted by the proposed project. The inclusion of the proposal to develop the park in the Exhibit R, and subsequently in any license issued, if it is approved, would assure its development and continued operation. Since, however, the site is not contiguous with the project and is not directly related to the project recreational development, Staff does not believe it need be included within the project boundary.

Detailed plans for the recreational areas were not included in the Exhibit R at the time of the DEIS. The Applicant has stated that it would obtain the necessary permits and approvals from the appropriate agencies in regard to matters such as public water supply.

Article 8 of the license, which is presented in Appendix A, would require the Applicant to install and maintain stream-gaging stations for the purpose of determining the stage and flow of the stream on which the project is located.

The statement "locating proposed recreational areas primarily on publicly-owned land" refers to the preproject ownership of the land. The two proposed project recreational areas to be located on the reservoir shoreline would be purchased in fee or leased from the DNR by the Applicant and are shown to be within the proposed project boundary. See revised text at Section 4.1.2.2.

Staff has recommended (at Section 5.2.1.2) that the Applicant prepare a detailed management plan for the proposed buffer zone lands in consultation with the appropriate agencies, and further, that a case-by-case analysis precede the issuance of any use permits for the buffer zone lands to identify and ameliorate any potential conflicts, particularly with regard to public recreational access.

Your recommendation has been considered in Section 4.1.2.2.

B-13

DIVISIONS
Light
Water
Belt Line

City of Tacoma
WASHINGTON

DEPARTMENT OF PUBLIC UTILITIES
Paul S. Nolan, Director

Please address reply to
City of Tacoma
Department of Public Utilities
P. O. Box 11007
Tacoma, Washington 98411
(206) 383-2611

Attention

May 28, 1982

The Honorable Kenneth Plumb, Secretary
Federal Energy Regulatory Commission
Office of Electric Power Regulation
825 N. Capitol St., N.E.
Washington, D.C. 20426

ATTENTION: Mr. James P. Feeney

Dear Sir:

The City of Tacoma, Department of Public Utilities, acknowledges receipt of the FERC's Draft Environmental Impact Statement for Cowlitz Falls Project No. 2833, Washington and submits the following comments:

OPERATIONS

From an operational view, the Draft EIS does not address the project's potential impact on the existing downstream hydroelectric facilities owned by the City of Tacoma. Even with the project's limited reservoir capacity, some consideration should be given to flow regulation, excessive spill (planned or accidental) and energy lost to Tacoma during the original reservoir fill.

See new Section 2.1.9.

WILDLIFE

1. Section 4.1.9.1 refers to pool inundation. This paragraph states "displaced wildlife would effect adjacent habitats, which are assumed to be at their carrying capacities, by increasing competition for food and cover. Overcrowding and accompanying stress would cause the loss of the least fit individuals and habitat deterioration".

Comment: The adverse effects of lateral animal displacements could be greatly reduced if the surrounding lands above the pool were enhanced before the pool is inundated. The appropriate above-pool areas could be cleared and replanted with more suitable vegetation to accommodate the sudden increase in population per unit area.

Staff agrees.

B-5

2. Page 4-27 mentions the destruction/degradation of 180 acres of red alder/douglas fir forest, including some old growth forest - for recreational facilities and associated uses.

Comment: Due to the increased scarcity of true old growth, the trees themselves have a recreational and aesthetic value all their own. Their destruction would be very counterproductive and a great loss to future generations. A modest planning realignment will save the trees.

3. Section 4.1.9.3. Unavoidable Adverse Impacts states: "The loss of critical deer and elk wintering habitat along the shoreline would result in an unavoidable short-term reduction in population numbers".

Comment: The statement fails to consider the "heat sink effect" of the reservoir itself. Large bodies of water tend to modify the microclimate of the area, lessening the severity of the winters as well as cooling the summers.

In addition, pre-flooding habitat enhancement may increase the thermal cover along the proposed shoreline, lessening further the harsh winter climate.

GENERAL COMMENTS - WILDLIFE MITIGATION

It is essential that a clear, final mitigation solution be reached before the project gets its final approval. Avoid the "numbers game" on animal populations. Enhancing the habitat to maximize the carrying capacity for targeted key species is in keeping with the spirit of the mitigation efforts nationwide.

Animal population counts are all too often heavily influenced by activities off projects, over which the requesting agency has no control. For example, clear cutting, recreational developments, a change in farming or forest practices, etc., can and will have a great influence on the absolute numbers of deer, elk, bear and other non-migrating species.

FISHERIES

1. Reference: Paragraph 1 - Page 3-20 states that the Washington Department of Game periodically plants hatchery reared rainbow trout in the upper Cowlitz and its tributaries.

The Cowlitz Falls campground site, which would include the old-growth Douglas fir stand in question, would be obtained by the Applicant in fee or leases from the Washington Department of Natural Resources (DNR). The DNR, however, would retain the timber rights. Details of the recreation plan would be developed during final project design in consultation with the Lewis County Parks and Recreation Commission and the DNR. The initial development of the campground probably would require moving some of the old-growth timber on site. The campground would also be designed to be compatible with a future timber management plan that the DNR would develop in conjunction with the Applicant and the Lewis County Parks and Recreation Commission.

Staff will recommend that the Applicant be required to amend its Exhibit R by filing for Commission approval a detailed site plan for the Cowlitz Falls campground.

Staff believes that any benefit to deer and elk from modification of the microclimate would be insufficient to offset the short-term loss of shoreline/riparian habitat.

Staff agrees.

Staff agrees.

Staff agrees.

Comment: Significant numbers (up to 80,000 pounds) of legal size rainbow and cutthroat trout are annually planted in the Cowlitz River and its tributaries upstream of Mayfield and Mossyrock Dams. These fish originate from the Cowlitz River Trout Hatchery at Blue Creek (Tacoma owned) and are released each year as part of Tacoma's Cowlitz mitigation obligation for maintaining a fishery for resident trout affected by the project upstream of Mayfield & Mossyrock Dams.

2. Reference: Paragraph 3 - Page 3-20 and Table 3-5 page 3-21 present numbers of salmon passing Mayfield Dam fish facilities from 1961 through 1968.

Comment: Table 3-5 should designate both jacks and adults, and the text on page 3-20 paragraph 3 should mention that salmon counts include jacks. Jacks, in some years, are as numerous as adults. When mitigating for salmon, only adults are considered as compensation. The impact of the proposed dam upon upstream and downstream movements of salmon and trout should be understood and discussed more fully.

See revised Section 3.1.4.2.

3. Reference: Paragraph 1, page 3-22, last sentence.

Comment: Washington Department of Fisheries and Washington Department of Game estimate that the Cowlitz River Watershed upstream of the proposed dam site could support total adult production (catch plus escapement) 55,555 spring chinook, 63,818 fall chinook, 202,262 coho and 12,900 steelhead. These numbers approximate the present annual production of both Tacoma's hatcheries. If the Departments' estimates are correct, a significant reduction of Tacoma's hatchery obligations would occur if the upper watershed were returned to natural production. Our Agreement with the Department of Fisheries states that our mitigation obligation can consist of natural production above the hatchery site plus hatchery production and that hatchery production can be reduced by the amount of natural production. Tacoma is, therefore, keenly aware that this production benefit exists, but also that it is dependent upon the successful capture, enumeration, and transportation of smolts at the proposed dam site; plus the prevention of losses of smolts that may pass through turbines and over the spillway. Trapping facilities and turbine bypasses, however, are not being installed, but provisions are made for retrofitting a trapping system. Adults captured at the salmon hatchery resulting from these wild smolts must be identifiable to maintain genetic integrity.

See revised text of section 3.1.4.2. Table 3-5 appropriately identifies which counts include jacks. The impacts of the proposed dam on fish migration are described in Section 4.1.7.1.

4. Reference: Paragraph 3 page 3-8. The Washington Department of Game discusses the planting of 50,000 rainbow trout in the proposed reservoir plus stocking largemouth bass and crappie in the warm-water sub-impoundments.

Your opinion has been noted.

CITY OF TACOMA
DEPARTMENT OF PUBLIC UTILITIES

Comment: Tacoma believes the addition of these species to the upper watershed is counterproductive to the potential of this area for rearing of wild steelhead and salmon juveniles. Tacoma believes reestablishing salmon and steelhead populations in this section of the Cowlitz the highest and best biological use.

Your opinion has been noted.

The City appreciates this opportunity to comment on the draft EIS for Cowlitz Falls Project 2833.

Yours very truly,

Paul J. Nolan
Director of Utilities

Morton School District 214

David E. Woodruff, Superintendent

MORTON, WA 98356

May 27, 1982

Department of Electric Power Regulation
825 North Capitol Street N. E.
Washington, DC 20426

Dear Commission Members:

In testimony given at the hearing for the Cowlitz Falls Project 1-7811 - Washington, the Lewis County Superintendent of Schools Organization went on record requesting that the Lewis County PUD #1 provide the schools with a contract similar to that used for the Satsop nuclear construction impact. A review of the draft environmental statement for the Cowlitz Falls project indicates that this has not been taken into account.

We repeat our request.

Thank you.

Sincerely,

David E. Woodruff
Superintendent

DEW:cjb

This issue was discussed on page 4-44 of the DEIS. See Section 4.1.13 of the FEIS.

B-9

JOHN SPELLMAN
Governor

DONALD W. MOOS
Director

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504 • (206) 459-6000

May 27, 1982

Mr. James P. Feeney
Federal Energy Regulatory Commission
Office of Electric Power Regulation
825 North Capitol Street, N.E.
Washington, D.C. 20426

Dear Mr. Feeney:

The following is the consolidated State of Washington response to your National Environmental Policy Act (NEPA) draft environmental impact statement (EIS) for the proposed Cowlitz Falls Hydroelectric Project (FERC No. 2833):

General:

1. This is an excellent EIS. It is terse, incisive, substantially complete, well written, and very informative. The FERC Environmental Analysis Staff has done an outstanding job of implementing the Council on Environmental Quality (CEQ) regulations.

   No response required.

2. We would like to believe that the close involvement of the state in the license application process through direct involvement and the State Environmental Policy Act (SEPA) EIS procedure contributed substantially, not only to the quality of your document, but also to the quality of the project which was submitted to you. Indeed, the dominant theme of the scoping meeting you conducted in Chehalis was that, although all involved parties did not agree on the desirability of the project, most felt their concerns had been successfully aired during the SEPA process. In this spirit, you should consider the final SEPA EIS, including comments as a part of the NEPA process and the following specific comments as supplemental.

Specific:

1. (Section 2.1.8) New, unpublished data compiled by the University of Washington shows considerable moderate earthquake activity within five to ten miles of the project site. It is probable that higher design accelerations than the 0.1g proposed will be required.

   Your opinion has been noted. The last paragraph of the section states that the Licensee would be required to do a thorough seismological investigation for the final design.

2. (Section 3.1.1.2) You state that volcano-related mudflows would not be expected to affect the site. We disagree and feel that such mudflows would affect the project site.

Your opinion has been noted.

3. (Section 4.7) It is our opinion that coastal zone certification would be required for this project. It would be granted if the Shoreline Management Act conditional use permit and the water quality certification were issued.

Your opinion has been noted.

4. (Page 3-22, paragraph 1, last sentence) Mr. Easterbrooks of the Washington Department of Fisheries (WDF) notes that the numbers refer to the estimated maximum for salmon. He is not sure if the steelhead and sea-run cutthroat figures should be similarly qualified. WDF also draws specific attention to their December 22, 1980 letter of comment on the SEPA EIS and their August 31, 1981 letter to FERC on the license application.

See revised Section 3.1.4.2. The comments and opinions of the Washington Department of Fisheries expressed in previous letters have been noted.

5. The Washington Department of Game notes that they agree with your EIS but continue to have differences with the PUD. They continue to work with the PUD on these matters. Their letter is attached.

No response required.

6. The Washington State Parks and Recreation Commission notes that the project will have no effect on properties under its management or control. Their letter is attached.

No response required.

7. The Washington State Department of Transportation (WDOT) feels that the EIS should address the impact on transportation facilities. They are particularly concerned about intersections with SR-12. They would like to see an analysis of construction impacts (employee traffic, construction vehicles, etc.) and recreational use after construction. They feel that the applicant should pay for necessary improvements. WDOT's memo is enclosed.

An analysis of road impacts that would result from construction activities has been added to the FEIS. See Section 4.1.15. Road impacts that would be produced by the public's use of the proposed recreational facilities are discussed in Section 4.1.3 of the FEIS.

Thank you for the opportunity to comment. If you wish to further discuss these matters as you prepare your final EIS, please call either your agency contacts directly or Mr. Tom Elwell of WDOE at (206) 459-6019.

Sincerely,

Donald M. Moos
Director

DMM:mg

Enclosure

NSPELLMAN
Governor

FRANK LOCKARD
Director

STATE OF WASHINGTON
DEPARTMENT OF GAME
600 North Capitol Way, GH-11 • Olympia, Washington 98504 • (206) 753-5700

May 26, 1982

James Feeney
Office of Electric Power & Regulation
825 North Capitol Street N.E.
Washington, D. C. 20426

DRAFT ENVIRONMENTAL IMPACT STATEMENT:
Cowlitz Falls Project

Dear Mr. Feeney:

Your document was reviewed by our staff as requested; comments follow.

With very limited exception, we are in agreement with the description of our position contained in the DEIS. For example, we do not feel that the 8,000-pound, 50,000-fish, rainbow trout plant should be considered a maximum level. Rather, we believe these should be starting figures, with adjustments to be made in either direction to maintain the quality fishery. However, we must emphasize that most of the statements of our position on mitigation issues and the differences between our stand and that of Lewis County PUD are correct.

No response required.

For purposes of final resolution of a mitigation package, we intend to continue meeting with representatives of the PUD. We believe that differences can be resolved in this manner. Gary Fenton of our Olympia office (206-754-2608) will coordinate this effort.

No response required.

Thank you for giving us the opportunity to respond to your document.

Sincerely,

THE DEPARTMENT OF GAME

John Carleton, Applied Ecologist
Environmental Affairs Program
Habitat Management Division

JC:cv
cc: Agencies
Region

B-12

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
P.O. BOX 2870
PORTLAND, OREGON 97208

JUN 1 1 03 PM '82
FEDERAL ENERGY REGULATORY COMMISSION

NPDPL-ER

OFFICIAL FILE COPY

TO	RMT.	DATE
[illegible]	May	982

CENTRAL FILES

Mr. Jesse P. Feeney
Federal Energy Regulatory Commission
Office of Electric Power Regulation
825 North Capitol Street, NE
Washington, D. C. 20426

Dear Mr. Feeney:

We have reviewed the draft environmental impact statement for Cowlitz Falls Project, FERC No. 2833, Washington, with respect to the U. S. Army Corps of Engineers areas of responsibilities for flood control, navigation, hydropower and regulatory functions.

In the discussion of the coal-fired power facility there appears to be some inconsistent information concerning plant factors. For instance, in paragraph 1.4.2 on page 1-21, the plant factor is listed as 75% while in paragraph 2.4.3 on page 2-19 it is shown as 65%. We suggest this conflict be clarified.

A plant factor of 75% is correct.

The DEIS contains considerable information on existing water quality but only minimal discussion on water quality impacts from the proposed action. We are concerned with the failure of the statement to adequately address those environmental matters that we must consider in our regulatory responsibilities of Section 404 of the Clean Water Act. The applicant, Public Utility District No. 1 of Lewis County, prior to initiation of construction of the proposed hydropower facility, must obtain the necessary Section 404 documentation from the Corps of Engineers and as part of that action must provide sufficient data to complete a Section 404(b)(1) evaluation as outlined in 40 CFR 230 (December 1980). If the subject statement fulfills the requirements of the referenced codified regulation, this would allow the Corps of Engineers to adopt the FERC Statement as part of the Section 404 requirements and would assist in processing the applicant's Sec. 404 permit in a timely manner.

Staff believes that the impacts associated with the construction and operation of the proposed Cowlitz Falls Project on the water quality of the Cowlitz River have been adequately addressed.

Thank you for the opportunity to review and comment on the DEIS.

Sincerely,

ROBERT L. CROSBY
Colonel, Corps of Engineers
Deputy Division Engineer

RECEIVED
JUN 1 1982

JOHN SPELLMAN
Governor

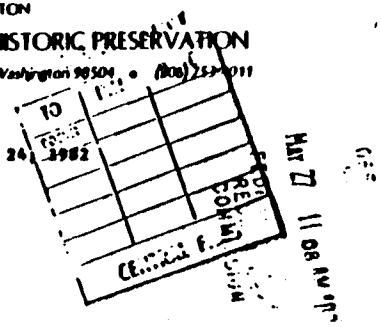
JACOB THOMAS
Director

STATE OF WASHINGTON

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION

111 West Twenty-First Avenue, KL-11 • Olympia, Washington 98504 • (206) 753-4011

COMMENTS



May 24, 1982

Mr. James P. Feeney
Federal Energy Regulatory Commission
Office of Electric Power Regulation
825 North Capitol Street, N.E.
Washington, DC 20426

Re: Cowlitz Falls Project
FERC Project No. 2833
Lewis County, Washington

Dear Mr. Feeney:

A staff review has been completed of the draft environmental impact statement for the project referenced above. The document adequately considers known and anticipated cultural resources and the potential for impact to these. We concur with measures proposed to identify cultural resources and mitigate anticipated impacts to such resources as may be present.

Thank you for this opportunity to comment.

Sincerely

Robert G. Whitlam, Ph.D.
Archaeologist

cc: Public Utility Dist. #1 of Lewis County

FEDERAL ENERGY REGULATORY COMMISSION
DOCKETED
MAY 28 1982
DOCUMENT ACTION

Your comments have been noted.

B-14

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

MAY 2 1 1982

Kenneth F. Plumb, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, D.C. 20426

ATTN: Mr. James P. Feeney, OEPR

RE: Cowlitz Falls Hydroelectric Project Draft EIS
FERC No. 2833-Washington

OFFICIAL FILE COPY

TO	INIT.	DATE
SECRET		
CENTRAL FILES		

FEDERAL ENERGY REGULATORY COMMISSION

MAY 27 10 52 AM '82

OFFICE OF THE SECRETARY

Dear Mr. Feeney:

The Environmental Protection Agency (EPA) has completed reviewing the Draft Environmental Impact Statement (DEIS) for the proposed Cowlitz Falls Hydroelectric Project of P.U.D. #1 of Lewis County (Washington). The DEIS presents a generally thorough discussion of the potential environmental consequences of the proposed projects and the alternatives to it which have been considered by FERC during this NEPA environmental review.

No response required.

The DEIS notes, in its discussion of environmental mitigation measures, that:

1. Additional test wells are necessary to assess the slope stability threat from springs that might develop on the right bank of the river, downstream of the dam.

No response required.

2. Specific mitigation measures and an implementation plan are necessary to minimize the impacts of reservoir-induced groundwater level changes on agricultural soils.

No response required.

3. A debris collection and removal plan for the area upstream of the reservoir is needed for both water quality and flood prevention purposes.

Staff agrees and would recommend that the Commission condition the license to provide for the implementation of an effective debris collection and removal plan.

4. Further analysis of erosional and depositional processes in backwater areas is needed to insure that dam/reservoir induced sediment problems are minimized.

Staff agrees and recommends that the Commission condition the license to require the Applicant to perform additional studies to accurately assess the impacts associated with sedimentation of the proposed reservoir. In addition, Staff would recommend that the license conditions provide the Commission with the authority to modify the operation of the project in the event that the additional studies indicate that such modifications are necessary.

EPA concurs with these findings and we recommend that those mitigation steps which cannot be completed while the licensing process is under way be addressed through license stipulations, if a license is granted for the project by FERC.

FEDERAL ENERGY REGULATORY COMMISSION
DOCKETED
MAY 27 1982
DOCUMENT SECTION

No response required.

EPA also agrees with the FERC staff conclusion that the proposed project, with a reservoir operating level of 866' MSL (mean sea level), is the hydroelectric alternative with the least severe adverse environmental consequences. Based on our review of the DEIS we have rated the proposed action and DEIS LO-1 [LO: lack of objections, 1: adequate information].

We appreciate the opportunity to review this EIS. Should you need to discuss EPA's comments you may contact Dick Thiel, our Environmental Evaluation Branch Chief, at (FTS) 399-1728 or (206) 442-1728.

Sincerely,

for John A. Spencer
Regional Administrator

cc: Idaho Operations Office

Your comment has been noted.

DOT. [illegible]

DEPARTMENT OF TRANSPORTATION
INTRA-DEPARTMENTAL COMMUNICATION

DATE: 20 May 1982

FROM: Ed W. Ferguson/C.L. [illegible]
PHONE: 476-6626 SUBJECT: Cowlitz Falls Project Draft EIS

To Department of Ecology
PV-11
Olympia

Attention Barbara Ritchie
NEPA Coordinator

We have reviewed the draft environmental impact statement and have the following comments.

The document does not address the impact the project is expected to have on transportation facilities in the area. We are specifically interested in the intersections of the access roads with SR-12. We would like to see an analysis of the impact both during construction, i.e., construction employment related traffic, haul, etc., and the impact by increased recreational usage after the reservoir is filled.

The WSDOT recommends that, should this analysis show intersection improvements to be necessary, the developer will be liable for the cost of the necessary improvements.

For our records, please send a copy of your decision on this matter to D.R. Peach, P.O. Box 1709, Vancouver, WA 98668.

If further information or clarification is desired, please contact this office at 476-6606 in Vancouver.

EWF:ls
CLE:BJ

Road impacts that would be generated by project construction are discussed in Section 4.1.15 of the FEIS. Traffic that would result from recreational use of project facilities is analyzed in Section 4.1.3.

As discussed in Section 4.1.15.2, the Applicant intends to negotiate agreements that would establish the amounts of monetary compensation that it would provide WSDOT, Lewis County, and private road owners.

JOHN SPELLMAN
Governor

STATE OF WASHINGTON
WASHINGTON STATE PARKS AND RECREATION COMMISSION
7150 Cleanwater Lane, KY-11 • Olympia, Washington 98504 • (206) 753-5755

IAN EVEREN
Director

May 11, 1982

35-2650-1820
DEIS - Cowlitz Falls
FERC Project #2833 -
Washington
(E-2351)

Barbara Ritchie
NEPA Coordinator
Department of Ecology
PV-11

Dear Ms. Ritchie:

The staff of the Washington State Parks and Recreation Commission has reviewed the above-noted document and finds that it will have no effect on properties under the management or control of the Washington State Parks and Recreation Commission.

No response required.

Thank you for the opportunity to review and comment.

Sincerely,

David W. Heiser, E.P., Chief
Environmental Coordination

sh

cc: Bill Bush, Chief, Research & Long Range Planning

P&R R-90FL(7/81)

B-18

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Area Office
2625 Parkmont Lane, S.W.,
Olympia, WA 98501

May 10, 1982

Mr. Kenneth F. Plumb, Secretary,
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, D.C. 20426

Re: FERC #2833 - Cowlitz Falls Project - Endangered Species Comments

Refer to: 1-3-82-I-422
Cross ref: 1-3-82-SP-73

Dear Mr. Plumb:

This is in response to your letter of April 23, 1982, requesting our comments on your biological assessment of project related impacts to the federally threatened bald eagle (Haliaeetus leucocephalus). Your Draft Environmental Impact Statement (DEIS) for the subject project (FERC #2833) contained the biological assessment and was forwarded with your letter. The subject project is on the Cowlitz River, Lewis County, Washington.

Section 7 of the Endangered Species Act of 1973, 16 U.S.C. 1531, et seq. (ESA) requires all Federal Agencies to consult with the Fish and Wildlife Service if their actions would affect any listed species. Your assessment, which adequately addressed the overall status of the bald eagle in the project area, indicated that adverse impacts are likely to occur should the project be implemented as presently designed (Section 4.1.10.1). These impacts are associated with the loss of per h sites (trees) along the existing riverbank due to clearing and inundation and clearing of the perimeter of the proposed reservoir. In the same section on page 432, you listed several mitigative measures that could effectively eliminate this impact including retaining and improving potential perches and adding perching platforms. However, Section 4.1.10.2 on that page states that the applicant has not proposed any mitigative measures for the conservation of the bald eagle.

No response required.

These mitigative measures should be required of the applicant before issuance of a license and wording to that effect included in the final EIS. Without such provisions, there will be an "effect" as defined in Section 7(a)(2) of the ESA, and formal consultation with this office would be required before issuance of a license.

See revised Section 5.2.1.8.

Specific location of perch sites can be coordinated with the Washington Department of Game. As an aid in planning and the development of perch sites, we have included two FWS publications related to this topic. If you should have any further questions relating to this project and over input, please contact Mr. Jim Bottorff of my Endangered Species staff (FTS 434-9444 or 206-753-9444). He has been informally consulting with Ms. Stephanie Storey of your staff on this project.

We appreciate your concern for endangered and threatened species and look forward to continued coordination with your agency in meeting our joint responsibilities to the ESA.

Sincerely,

Margaret J. Kolar

for Joseph R. Blum
Area Manager

cc: RO, AFA-SE
ES-Olympia
WDG-Non Game Program-TESC
WDG-Vancouver,
Attn: Bob Everitt
Lewis County PUD #1

No response required.

1

EVERGREEN LEGAL SERVICES
NATIVE AMERICAN PROJECT
[illegible] SMITH TOWER, 506 SECOND AVENUE
SEATTLE, WASHINGTON 98104
[illegible]

ANTHONY R. DALLAIRE
DIRECTOR

May 20, 1982

Mr. James P. Feeney
Federal Energy Regulatory Commission
Office of Electric Power Regulation
825 North Capitol Street, N.E.
Washington, D.C. 20426

Re: Cowlitz Falls Project, FERC No. 2833 - Comments on Draft Environmental Impact Statement

Dear Mr. Feeney:

The Cowlitz Tribe has the following comments after studying the above cited document and the previous material submitted on the Cowlitz Falls project and after consulting our experts on this matter.

First, the E.I.S. does not addres the need to monitor the construction phase of the proposed power transmission corridor from the dam site at Cowlitz Falls northerly to Rainy Creek. This is in direct contradiction to the recommendations of the Fugro (Ertec) survey crew's findings dated February 23, 1981. The survey recommended ..."Although no sites were discovered during present survey, because of the presence of isolated artifacts and the sensitive nature of the area, we recommend that an archaeologist monitor initial ground disturbance activities in the area." (Fugro, 1981, p.10). Since this transmission route crosses the ancestral valley of the Cowlitz River, a knowledgeable representative of the Cowlitz Tribe should be on hand to monitor the construction activities of this transmission avenue.

The Applicant has agreed to have an archeologist monitor construction work in all sensitive areas traversed by the proposed transmission line. Staff would recommend that any license issued for the project contain such a protective provision.

Second, the E.I.S. assumes that the project reservoir will be at EL 872 ft. (p.3-69), and that "[b]ank sloughing would continue to occur along the new reservoir shoreline." (p.4-1) The E.I.S. further cites that the average monthly flow of the river in the area is 5,744 cfs. However, the 1977 flow record was 90,000 in one month, raising the Randle area creeks an average of 15 feet above normal (p.3-10). The downstream water level in the vicinity of the constricted proposed dam site was not presented in the E.I.S. Even so, the North Falls site (EL 890 ft.), and particularly the Manasha site (EL 880 ft.), could be severely under cut approximately every 5 years according to the

The project would not be operated at EL 872, but a a lower elevation. Proposed operating procedures should ensure that, even in the event of a major flood event, the Manasha and North Cowlitz Falls sites would not be affected. The Washington SHPO has agreed that a determination of eligibility for the National Register is not necessary for the sites given the proposed operating regime of the project.

B-21

study (p.3-18). Thus, continual reassessments of the conditions of the sites will have to be made, and funds reserved for the eventual recovery of the data. Before then, test surveys must be made to ascertain their eligibility for the National Registry, since this may be impossible to accomplish once they have been partially or totally destroyed.

Finally, the tribe is concerned that adequate time will not be allocated to fully mitigate damage to the South Falls site. The E.I.S. acknowledges that the District is behind schedule, but still has several options for an accelerated time schedule that could still result in a commercial operation date of January 1986 (2-9). But the conclusions from the test excavations (Ertec 1981) were that approximately 6 months would be necessary to complete mitigation of the South Falls site (p.46). Thus there is a serious question of whether the applicant will provide sufficient time to excavate the site. There is danger here of a quick but inadequate job.

Moreover, this six month estimate is based on ambiguous east-west boundaries. The site is larger than the map on p.8 of Ertec's excavation report, because the report did not address the artifacts found in the excavation of the 1 X 1 test pits started along the east and west peripheries of the site (p.4). Thus, we do not know where the site ends. In all of the pits on the western border, cultural material was found, and on the eastern border a human mandible was recovered (E.I.S. p.3-35). This could in fact have been from the aboriginal/early historical cemetery believed to be located on the Jim Santanus Indian homesite, which was never located (E.I.S. 3-38).

Indeed, the eastern boundary of the site may extend a considerably distance towards the Cispus River, for the ethnographic descriptions of the area by Jacobs (1934) and Meade and Siler (1980) recount Indian habitation sites at the mouth of the Cispus River and the general vicinity of the Tumwater Indian Homestead, respectively. Naturally, if the archaeological site(s) is larger than anticipated, the overall time schedule will be affected by the prescribed mitigation procedures. Any "acceleration" plan that the Lewis County P.U.D. may be developing must adequately address the mitigation alternatives. The 6-month time frame that is allocated may not be long enough.

If necessary, the tribe will insist that construction be delayed rather then allow the artifacts of its ancestors be lost without adequate recovery. We are hopeful, however, that sufficient time and resources will be made available for mitigation voluntarily by the applicant.

The Applicant is preparing a detailed mitigation plan for the Cowlitz Falls South site, and following review of the plan, the staff will seek the comments of the Advisory Council on Historic Preservation. Staff would recommend that any license issued for the project contain a provision requiring that the Applicant carry out its mitigation work at the Cowlitz Falls South site prior to the commencement of any construction that would affect the site.

Sincerely,

JEFFREY S. SCHUSTER
Attorney for Cowlitz Indian Tribe

JSS:ns

cc Gary M. Kalich, Manager
Lewis County P.U.D.

A. Richard Griffith
R.W. Beck & Associates

Gail Thompson
EATEC

Mary Cloquet, Business Manager
Cowlitz Indian Tribe

Leo J. Meaney