

## 4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the project's use of the water resources of the Columbia River to generate power, estimate the economic benefits of the project, and estimate the cost of various environmental measures and the effects of these measures on project operations. Chelan PUD does not propose any modifications to the project generation facilities, but it does propose several environmental and recreational enhancements that would affect project costs.

### 4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Consistent with the Commission's approach to economic analysis, we base the value of the project power benefits on current cost of replacement power using alternative resources. Our analysis is based on current costs, with no assumptions concerning future escalation or inflation of the various cost components included in the cost of project power or alternative power.<sup>32</sup> For the Rocky Reach Project, we assume the value of generation is similar to the cost of purchasing the equivalent generation from BPA at its new resource rate for firm power.<sup>33</sup> Using the average of the monthly high and low load hourly energy rates for BPA customers buying power for all 5 years of the 5-year rate period, we calculate an average energy value of 34.4 mills/kWh. We use BPA's new resource capacity demand rate schedule to value the project's 1,225,000 kW of dependable capacity at \$24 per kW per year (kW-yr). Using the average energy value of 34.4 mills/kWh and capacity demand of \$24/kW-yr, the result is a power value of 39.27 mills/kWh.

The current cost economic analysis is not entirely a first-year analysis in that certain costs, such as major capital investments, would not be expended in a single year. The maximum period we use to annualize such costs is 30 years. Also, some future expenses, such as taxes and depreciation, are known and measurable and are, therefore, incorporated in our cost analysis.

For our economic analysis of the alternatives, we used the assumptions, values, and parameters shown in table 17.

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<sup>32</sup> Mead Corporation, Publishing Paper Division, 72 FERC 61,027 (July 13, 1995).

<sup>33</sup> Bonneville Power Administration, 2002 Wholesale Power Rate Schedules (Revised December 2001).

Table 17. Summary of key parameters for economic analysis of the Rocky Reach Project. (Source: Chelan PUD, 2004a, as modified by staff).

<b>Assumption</b>	<b>Value</b>	<b>Source</b>
Power value <sup>a</sup>	39.27 mills/kWh	Chelan PUD/staff
Overall cost of money	7 percent	Chelan PUD
Discount rate	7 percent	Staff
Insurance rate	0.25 percent of new net investment	Staff
Term of financing <sup>b</sup>	20 years	Staff
Period of analysis <sup>c</sup>	30 years	Staff
Escalation rate after 2006 <sup>d</sup>	0 percent	Staff
Net investment (2006\$) <sup>e</sup>	\$532,815,460	Chelan PUD/staff
O&M costs (2006\$) <sup>f</sup>	\$35,420,039	Chelan PUD/staff
No-action average annual generation (MWh) <sup>g</sup>	6,030,900	Chelan PUD/staff
No-action dependable capacity (kW)	1,225,000	Staff

<sup>a</sup> Based on Chelan PUD (2004a) energy value of 34.4 mills/kWh and dependable capacity value of \$24/kW-yr.

<sup>b</sup> Staff uses 20 years as the standard term of financing.

<sup>c</sup> Chelan PUD submitted a 50-year analysis in its license application (Chelan PUD, 2004a). However, staff uses 30 years as the standard period of analysis. Costs that would be incurred by Chelan PUD beyond 2035, including major costs for acoustic studies in 2036 and 2046 and juvenile bypass system R&M in 2047, are not included in this analysis.

<sup>d</sup> Chelan PUD assumed a 3.5 percent escalation rate in its license application (Chelan PUD, 2004a). Our analysis assumes no escalation.

<sup>e</sup> Net plant investment from Chelan PUD (2004a, table 18), adjusted through straight line depreciation to 2006. Additional costs added by staff include installation of the Commission-approved micro-turbine (\$2,202,010) (Chelan PUD, letter dated December 27, 2004) and relicensing costs (\$16,200,000) and existing costs (\$119,672,600) (Chelan PUD, 2004a, table 20), all expressed in 2006\$.

<sup>f</sup> O&M from Chelan PUD (2004a, tables 19 and 20), including existing annual O&M (\$28,373,000); local, state, and federal taxes (\$1,147,000), existing O&M

(\$2,932,659), and costs associated with the Bull Trout Management Plan that would be incurred prior to issuance of a new license (\$432,800). Additional costs added by staff include micro-turbine O&M (\$6,099) beginning in 2010. All costs were escalated to 2006\$.

- <sup>g</sup> Average annual generation (5,806,000 MWh) from Chelan PUD (2004a) plus increased efficiency gains due to turbine rehabilitation (231,700 MWh) and installation of approved micro-turbine (6,100 MWh), less effects of environmental measures incurred prior to relicensing (-12,900 MWh) (Chelan PUD, letter dated December 27, 2004).

## 4.2 COMPARISON OF ALTERNATIVES

Table 18 provides a summary of the annual cost, power benefits, and annual net benefits for the three alternatives: Chelan PUD’s proposal, Chelan PUD’s proposal with staff-recommended measures (staff alternative), and the no-action alternative.

Table 18. Summary of the annual cost, power benefits, and annual net benefits for three alternatives.

	No Action	Chelan PUD’s Proposal	Staff Alternative
Installed capacity (MW) <sup>a</sup>	865.76	865.76	865.76
Annual generation (MWh) <sup>b</sup>	6,030,900	6,030,900	6,030,900
Annual power value (\$/MWh and mills/kWh)	\$236,862,960 39.27	\$236,862,960 39.27	\$236,862,960 39.27
Annual cost (\$/MWh and mills/kWh)	\$79,689,759 13.21	\$96,809,053 16.05	\$96,419,289 15.99
Annual net benefit (\$/MWh and mills/kWh)	\$157,173,201 26.06	\$140,053,907 23.22	\$140,443,671 23.29

<sup>a</sup> Includes approved micro-turbine scheduled to be on line in 2010. Turbine is not associated with relicensing, and is therefore considered part of “No Action.”

<sup>b</sup> Includes increased efficiency due to rehabilitation of turbines and installation of approved micro-turbine.

### 4.2.1 No-Action Alternative

Under the no-action alternative, the project would continue to operate as it was operating when the Commission issued its REA notice on January 12, 2005. The planned turbine rehabilitation and micro-turbine installation approved by the Commission would occur, but Chelan PUD would not proceed further with HCP implementation and would not make other changes or enhancements to the environmental conditions of the project. Following the noted turbine changes, installed capacity would be 865.76 MW and generation would equal 6,030,900 MWh of electricity annually. Based on our estimate of the current cost of replacing this amount of power with no consideration of inflation over

the 30-year period of our analysis, the average annual power value of the project under the no-action alternative would be \$236.9 million (about \$39/MWh) and the average annual cost would be \$79.7 million (about \$13/MWh), resulting in an average annual net benefit of \$157.2 million (about \$26/MWh).

#### **4.2.2 Chelan PUD's Proposal**

Under Chelan PUD's proposal, the PUD would implement the environmental measures identified on table 19 as being recommended by Chelan PUD. Chelan PUD's proposal includes a number of substantial investments related to continuing implementation of the HCP, including \$130.0 million for eventual restoration and maintenance of the fish bypass and \$4.0 million for hatchery improvements. Chelan PUD's proposal also includes about \$16.7 million in recreational facility improvements. The measures included in this alternative would not change the project's installed or dependable capacity or its average annual generation. With the same average annual power value as the no-action alternative and with an average annual cost of \$96.8 million (about \$16/MWh), the average annual net benefit of Chelan PUD's proposal would be \$140.1 million (about \$23/MWh).

#### **4.2.3 Chelan PUD's Proposal with Staff-Recommended Measures**

Under Chelan PUD's proposal with staff-recommended modifications, the project would have the same power benefit as for Chelan PUD's proposal and the no-action alternative. With an average annual cost of \$96.4 million (about \$16/MWh), the average annual net benefit of the staff alternative would be \$140.4 million (about \$23/MWh). The staff alternative includes most, but not all, the measures proposed by Chelan PUD as well as several additional measures. We discuss the reasons for the staff modifications in section 5.1, *Comprehensive Development and Recommended Alternative*.

### **4.3 COST OF ENVIRONMENTAL MEASURES**

Certain measures proposed by Chelan PUD and other parties would affect project economics because they can increase the production cost by requiring new capital expenditures or additional annual costs for O&M. None of the measures would affect the project's power production capability or average annual generation. Table 19 summarizes the costs of environmental measures considered in this DEIS.

Table 19. Costs of proposed and recommended environmental measures for the Rocky Reach Hydroelectric Project.  
(Source: Chelan PUD, 2004a, modified by staff)

<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>	
<b>Shoreline Erosion Management Plan and Measures</b>					
1	Erosion control demonstration projects	Chelan, Staff	\$200,000	\$0	\$16,620
2	Distribution of erosion control information	Chelan, Staff	\$0	\$500	\$500
3	Shoreline erosion monitoring	Chelan, Staff	\$0	\$3,600	\$3,600
4	Erosion control work for BLM site	Chelan, Interior, Staff	\$200,000	\$0	\$16,620
<b>Water Quality Plan and Measures</b>					
5	Continued spill management to minimize TDG while meeting fish survival goals and continued monitoring of water temperatures in the project <sup>c</sup>	Chelan, Interior, Umatilla Tribes, Yakama Nation, Staff	\$0	\$0	\$0
6	Continued implementation and revision of SPCC plan <sup>c</sup>	Chelan, Interior, Umatilla Tribes, Yakama Nation, Staff	\$0	\$0	\$0
7	Continued implementation of Hourly Coordination Agreement and Hanford Reach Agreement <sup>c</sup>	Chelan, CRITFC, WDFW, Umatilla Tribes, Yakama Nation, Staff	\$0	\$0	\$0

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
8	Water Quality Plan implementation, including water quality and water temperature monitoring and stilling basin investigations <sup>d</sup> (assumes structural modifications not required)	Chelan, Interior, Staff	\$0	\$100,000	\$100,000
9	Water temperature monitoring from August through October (years 1–3)	Staff	\$0	\$1,060	\$1,060
10	Management to meet Washington state water quality standards <sup>e</sup>	WDOE, Interior, Umatilla Tribes, Yakama Nation, American Rivers, Staff	\$0	\$0	\$0
11	Water Quality Committee <sup>d</sup>	Umatilla Tribes, Yakama Nation	\$0	\$5,000	\$5,000
12	Update of current Water Quality Plan for TDG (years 1–10) <sup>d</sup>	Staff	\$0	\$2,830	\$2,830
<b>Anadromous Fish Measures under the HCP</b>					
13	Energy loss (spill) <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
14	Studies, including 2003 FPE, 2004 acoustic and PIT studies, and 2005 acoustic and PIT studies <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0
15	2006 acoustic study	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$1,720,000	\$0	\$142,910
16	2006 PIT study	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$1,678,300	\$0	\$139,440
17	2016 & 2026 acoustic study <sup>f</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$3,440,000	\$0	\$285,820
18	Research & development under the HCP (years 1–10)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$566,010	\$566,010
19	Pumping energy <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
20	Continued existing predator control program <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0
21	Increased predator control program	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$100,000	\$100,000
22	Continued existing fish ladder O&M <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0
23	Continued existing fish counting <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0
24	Juvenile bypass system construction <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0
25	Bypass system flow <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
26	Bypass construction R&M (year 2017) <sup>g</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$65,000,000	\$0	\$5,400,620
27	Bypass construction R&M (year 2032) <sup>g</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$65,000,000	\$0	\$5,400,620
28	Incremental bypass system O&M (years 1–5)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$234,770	\$234,770
29	Incremental bypass system O&M (years 6–30)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$479,430	\$479,430
30	Ongoing bypass system O&M (years 1–30)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	0	\$489,490	\$489,490
31	Hatchery capital improvements	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$4,000,000	\$0	\$332,350

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
32	Continued existing hatchery O&M <sup>c</sup>	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$0	\$0
33	Hatchery O&M (incremental)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$558,300	\$558,300
34	Hatchery management committees (years 1–10)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$141,500	\$141,500
35	Hatchery management consultants (years 1–10)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$56,600	\$56,600
36	Hatchery management committees (years 11–30)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$85,373	\$85,373
37	Tributary Conservation Fund (habitat mitigation)	Chelan, Interior, NOAA Fisheries, WDFW, WDOE, Yakama Nation, Staff	\$0	\$249,000	\$249,000

<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>	
<b>Alternatives or Additions to the HCP</b>					
38	Established juvenile salmonid mortality and FPE goal achievement (2013 and 2020)	Umatilla Tribes	\$0	Unknown	Unknown
39	Adult upstream salmonid passage goal achievement	Umatilla Tribes	\$0	Unknown	Unknown
40	Funding for regional evaluation of salmon stock	Umatilla Tribes	\$0	Unknown	Unknown
<b>White Sturgeon Management Plan and Measures</b>					
41	White sturgeon population supplementation program (includes hatchery construction) <sup>h</sup>	Chelan, Umatilla Tribes, Yakama Nation, WDFW, Interior, Staff	\$768,000	\$100,000	\$163,810
42	Monitoring and evaluation program to evaluate plan effectiveness of the augmentation program and to adjust population targets (years 1–30)	Chelan, Umatilla Tribes, Yakama Nation, WDFW, Interior, Staff	\$0	\$42,020	\$42,020
43	Coordination with other relevant entities involved in sturgeon research or management (cost included in item 42)	WDFW	\$0	\$0	\$0

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
44	4-tier sturgeon studies	Umatilla Tribes, Yakama Nation	Unknown	Unknown	Unknown
45	Funding for 0.5 FTE sturgeon biologist <sup>i</sup>	WDFW	\$0	\$30,000	\$30,000
<b>Pacific Lamprey Management Plan and Measures</b>					
46	Adult radio telemetry studies to identify upstream fishway success and upstream passage success of Pacific lamprey (completed in 2004–2005) <sup>c</sup>	Chelan, WDFW, Interior	\$0	\$0	\$0
47	Pacific lamprey monitoring (years 2–10)	Chelan, Interior, Staff	\$0	\$4,910	\$4,910
48	Investigation of fishway modifications for improving passage of Pacific lamprey, implementation of feasible measures and operational changes, and continued monitoring of fishway effectiveness <sup>d,j</sup>	Chelan, Interior, WDFW, Umatilla Tribes, Yakama Nation, Staff	\$100,000	\$0	\$8,310
49a	Upstream lamprey passage activities (annual passage counts, fishway modifications, and radiotelemetry program once every 10 years) <sup>d,k</sup>	WDFW, Staff	\$300,000	\$10,000	\$34,930

<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
49b Upstream lamprey passage activities (annual passage counts, fishway modifications, and radiotelemetry program at unspecified intervals)	Interior, Umatilla Tribes, Yakama Nation	Unknown	Unknown	Unknown
50 Downstream lamprey passage measures	WDFW, Interior, Umatilla Tribes, Yakama Nation, Staff	Unknown	Unknown	Unknown
51 Coordination with other relevant entities involved in Pacific lamprey research and management (cost included in other WDFW recommended measures)	WDFW	\$0	\$0	\$0
52 Juvenile lamprey habitat assessments (measure abundance, evaluate impacts)	WDFW, Interior, Umatilla Tribes, Yakama Nation	Unknown	Unknown	Unknown
53 Funding for 0.5 FTE Pacific lamprey biologist <sup>i</sup>	WDFW	\$0	\$30,000	\$30,000
54 Pacific lamprey regional research and information sharing <sup>d</sup>	WDFW, Interior, Umatilla Tribes, Yakama Nation	\$0	\$80,000	\$80,000
55 Meeting specified lamprey passage goals	Umatilla Tribes, Yakama Nation	\$0	Unknown	Unknown

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
56	Lamprey monitoring beyond project boundaries	Umatilla Tribes, Yakama Nation	Unknown	Unknown	Unknown
<b>Resident Fish Management Plan and Measures</b>					
57	Continued fish stocking for recreational fishing <sup>c</sup>	Chelan, Interior, WDFW, Staff	\$0	\$0	\$0
58a	Twentyfive Mile Creek spawning channel enhancement	Chelan, Interior	\$50,000	\$0	\$4,150
58b	Resident fish/fishing enhancement measures <sup>i</sup>	WDFW, Staff	\$50,000	\$0	\$4,150
59	Resident fish monitoring and evaluation	Chelan, WDFW, Staff	\$0	\$6,000	\$6,000
<b>Bull Trout Management Plan and Measures<sup>l</sup></b>					
60	Video count expansion to off-season for an experimental period of one year to evaluate bull trout use of the fishway during periods outside the salmon migration <sup>m</sup>	Chelan, WDFW, Interior, Staff	\$0	\$0	\$0
61	Bull trout radio-tagging and PIT tagging, 2005–2007 <sup>m</sup>	Chelan, WDFW, Interior, Forest Service, Staff	\$0	\$12,050	\$12,050
62	Sub-adult PIT tagging (2006–2009) <sup>m</sup>	Chelan, WDFW, Interior, Forest Service, Staff	\$0	\$2,190	\$2,190

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
63	Stranding and entrapment study <sup>m</sup>	Chelan, WDFW, Interior, Staff	\$0	\$0	\$0
64	Impact minimization measures <sup>m</sup>	Chelan, WDFW, Interior, Staff	\$0	\$0	\$0
65	Conservation measures, including off-season passage counts (2006) and PIT tagging (2006–2009) <sup>m</sup>	Chelan, WDFW, Interior, Forest Service, Staff	\$0	\$540	\$540
66	Radio telemetry study, correlation analysis, facility or operations modifications if required <sup>n,o</sup>	Chelan, WDFW, Interior, Forest Service, Staff	\$144,000	\$0	\$11,960
67	Sub-adult bull trout PIT tagging (starting 2018 and every 10 years thereafter) <sup>n</sup>	Chelan, WDFW, Interior, Forest Service, Staff	\$0	\$730	\$730
68	Collection and funding of tissue samples for genetic analysis (starting 2018 and every 10 years thereafter) <sup>n</sup>	Chelan, WDFW, Interior, Forest Service, Staff	\$0	\$790	\$790
69	Information exchange and regional monitoring efforts <sup>n</sup>	Chelan, WDFW, Interior, Forest Service, Staff	Unknown	Unknown	Unknown

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
70	Annual reports during tagging and monitoring years (2005–2008) and for all subsequent testing and monitoring <sup>n</sup>	Chelan, WDFW, Interior, Forest Service, Staff	Unknown	Unknown	Unknown
71	Funding for 1.0 FTE bull trout biologist <sup>i</sup>	WDFW	\$0	\$60,000	\$60,000
<b>Other Fisheries and Wildlife Measures</b>					
72	Establishment and maintenance of RR Fishery Forum (cost included in other measures)	Chelan, WDFW, Forest Service, Umatilla Tribes, Staff	\$0	\$0	\$0
73	Administrative support for RR Fishery Forum (cost included in other measures)	Chelan, WDFW, Staff	\$0	\$0	\$0
74	Detailed fishery operations plan	Umatilla Tribes, Yakama Nation	Unknown	Unknown	Unknown
75	Hatchery and habitat management plans	Umatilla Tribes	Unknown	Unknown	Unknown
76	Funding for 0.25 fish and wildlife biologist for permitting <sup>i</sup>	WDFW	\$0	\$15,000	\$15,000
77	Mid-Columbia River aquatic invasive species prevention program <sup>d</sup>	WDFW, Staff	\$7,500	\$0	\$620

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
78	Funding for 0.10 FTE aquatic invasive species inspector/biologist <sup>i</sup>	WDFW	\$0	\$6,000	\$6,000
<b>Wildlife Management Plan and Measures</b>					
79	Funding to support mule deer study <sup>c</sup>	Chelan, Interior	\$0	\$0	\$0
80a	Funding for wildlife surveys similar to those conducted during the first FERC license for the project for bald eagles and goose nesting <sup>c,p</sup>	Chelan, Interior	\$0	\$0	\$0
80b	Funding for T&E wildlife surveys and/or improvement projects for any species <sup>c,p</sup>	WDFW, Staff	\$0	\$3,000	\$3,000
81a	O&M funding for wildlife mitigation lands at Chelan WMA	Chelan, Interior	\$0	\$50,000	\$50,000
81b	O&M funding for the Chelan WMA <sup>i</sup>	WDFW	\$0	\$110,000	\$110,000
82a	Funding for restoration of Chelan WMA	Chelan, Interior	\$0	\$35,060	\$35,060
82b	Funding for equipment to restore 1,300 to 1,400 acres of shrub steppe habitat at Chelan WMA <sup>i</sup>	WDFW	\$1,038,000	\$0	\$86,240

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
83	Funding for BLM land management on lands in the Rocky Reach wildlife area <sup>d</sup>	Interior	\$0	\$40,000	\$40,000
84	Funding for Forest Service land management on lands in the Rocky Reach wildlife area <sup>d</sup>	Forest Service	\$0	\$10,000	\$10,000
85	Native wildlife habitat maintenance on Chelan PUD Sun Cove properties at its existing level of habitat function.	WDFW, Staff	\$0	\$555	\$555
86	Implementation of integrated noxious weed management program on lands affected by reservoir fluctuation.	Chelan, Interior, Staff	\$0	\$10,000	\$10,000
87	Implementation of noxious weed control for <i>Spiranthes diluvialis</i> protection in the Rocky Reach wildlife area	Chelan, Interior, Staff	\$0	\$5,000	\$5,000
88	Implementation of a <i>Spiranthes diluvialis</i> monitoring program to evaluate the ongoing status of the populations	Chelan, Interior, Staff	\$0	\$3,000	\$3,000

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
89	Funding for conservation easements on private lands where <i>Spiranthes diluvialis</i> occurs.	Chelan, Interior, Staff	Unknown	Unknown	Unknown
90	Improved opportunities for public to interact with nature and coordination between RR Wildlife Forum and RR Recreation Forum during planning (cost covered under item 108)	Chelan, Interior, Staff	\$0	\$0	\$0
	<b>Other Terrestrial Measures</b>				
91	Chain link fencing at Lincoln Rock Park and access maintenance to Eastbank hatchery outfall stream <sup>d</sup>	WDFW, Staff	\$3,500	\$0	\$290
92	Revegetation and fencing at Entiat Park (cost included in item 103)	WDFW, Staff	\$0	\$0	\$0
93	Entiatqua trail siting (cost included in item 108)	WDFW, Staff	\$0	\$0	\$0
94	Funding for native habitat improvement to mitigate for 50 acres of disturbance from recreational developments	WDFW	Unknown	Unknown	Unknown

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
95	Establish RR Wildlife Forum (cost included in other wildlife measures)	Chelan, WDFW, Staff	\$0	\$0	\$0
<b>Cultural Resource Management Plan and Measures</b>					
96	Cultural Plan implementation	Chelan, Staff	\$0	\$20,000	\$20,000
97	Cultural education and interpretation	Chelan, Staff	\$0	\$1,000	\$1,000
98	Erosion protection, mitigation, and monitoring plan for BLM cultural sites (costs included in items 3, 4, and 96) <sup>r</sup>	Interior, Staff <sup>r</sup>	\$0	\$0	\$0
<b>Recreation Resources Management Plan and Measures</b>					
99	Continued ownership, operation and maintenance of Rocky Reach reservoir park system <sup>c</sup>	Chelan, Staff	\$0	\$0	\$0
100	Renovations and enhancements at Lincoln Rock State Park and Daroga State Park	Chelan, Staff	\$6,000,000	\$0	\$498,520
101	Completion of a paved 1-mile trail from Lincoln Rock State Park to a fish bypass viewing station downstream of Rocky Reach dam	Chelan, Staff	\$500,000	\$0	\$41,540

	<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
102	Design and implementation of irrigation system at Orondo Park	Chelan, Staff	\$25,000	\$0	\$2,080
103	Design and implementation of Entiat Park upgrades	Chelan, Staff	\$6,000,000	\$0	\$498,520
104	Wastewater treatment plant upgrade to accommodate usage of Entiat Park facilities	Chelan, Staff	\$1,300,000	\$0	\$108,010
105	Ball field development	Chelan	\$700,000	\$0	\$58,160
106	Trade-lease/purchase of 17.85 acres Entiat shoreline acres currently owned by Chelan PUD <sup>s</sup>	Chelan, Staff	\$0	\$0	\$0
107	Annual operation and maintenance of Entiat Park	Chelan, Staff	\$0	\$328,000	\$328,000
108	Provide opportunities for interpretive/nature trails on project lands, including design and construction of Entiatqua Trail.	Chelan, Staff	\$1,200,000	\$0	\$99,700

<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
109 Recreation fund to provide public access, recreational enhancements, and educational/interpretive opportunities along project and other lands and waters	Chelan, Forest Service	\$1,000,000	\$211,739	\$294,830
110 Recreation use study beginning in year 20	Chelan, Staff	\$100,000	\$0	\$8,310
111 RR Recreation Forum for ongoing monitoring and evaluation	Chelan, WDFW, Staff	\$0	\$560	\$560
112 Administrative support for RR Recreation Forum (costs included in other measures)	WDFW, Staff	\$0	\$0	\$0
113 RR Recreation Forum reporting in concert with FERC Form 80 filing (costs included in other measures)	Staff	\$0	\$0	\$0
114 Continued milfoil harvesting <sup>c</sup>	Chelan, Staff	\$0	\$0	\$0
115 Recreation monitoring plan and implementation for BLM land <sup>d</sup>	Interior, Staff	\$0	\$3,000	\$3,000
116 Geographic information system (GIS) layer of Wenatchee River fishing easements <sup>d</sup>	WDFW	\$0	Nominal	Nominal

<b>Environmental Measures</b>	<b>Recommending Entities<sup>a</sup></b>	<b>Capital and One-time Costs (2006\$)<sup>b</sup></b>	<b>Annual Costs Including O&amp;M (2006\$)<sup>b</sup></b>	<b>Total Annualized Cost</b>
117 Funding for 1.0 FTE habitat technician <sup>i</sup>	WDFW	\$0	\$45,000	\$45,000
118 Funding for operation and maintenance of the Wenatchee fishing easements	WDFW	\$0	Unknown	Unknown
119 Information and education program for project recreational sites <sup>d</sup>	Forest Service, Staff	\$0	\$2,000	\$2,000
120 Funding for 1.0 FTE enforcement officer <sup>i</sup>	WDFW	\$0	\$90,000	\$90,000
121 Funding for enforcement vessel and trailer <sup>i</sup>	WDFW	\$227,100	\$0	\$18,870
122 Establish Rocky Reach Policy Committee to resolve conflicts <sup>d</sup>	WDFW, Interior	0	\$5,000	\$5,000

<sup>a</sup> Chelan = proposed by Chelan PUD in its July 2004 PDEA and License Application, agreed to in Chelan PUD's April 27, 2005 response letter, or part of Chelan PUD's FERC-approved Bull Trout Management Plan; Staff = recommended in staff alternative; Interior, WDFW, etc. = recommended by the party in its letter(s) to the Commission in response to the Commission's REA notice.

<sup>b</sup> Costs based on Chelan PUD estimates in the PDEA, except as noted.

<sup>c</sup> Cost included in no-action alternative; no incremental cost associated with Chelan PUD's proposal.

<sup>d</sup> Staff cost estimate.

<sup>e</sup> Staff assumes that the cost of achieving state water quality standards is reflected in the measures recommended for inclusion in the water quality plan.

- <sup>f</sup> Does not include acoustic studies in 2036 and 2046, which occur beyond the 30-year economic analysis period.
- <sup>g</sup> Does not include bypass R&M in 2047, which occurs beyond the 30-year economic analysis period.
- <sup>h</sup> Staff does not recommend hatchery construction at this time, but recommends that other elements of the proposed supplementation program be implemented on license issuance, and that the hatchery be constructed if monitoring and evaluation of initial measures indicates that it is needed to achieve White Sturgeon Management Plan goals.
- <sup>i</sup> WDFW cost estimate.
- <sup>j</sup> Does not include the cost of implementing feasible measures or operational changes if they are identified.
- <sup>k</sup> Does not include the cost of fishway modifications if they are needed.
- <sup>l</sup> Measures included in FERC-approved Bull Trout Management Plan.
- <sup>m</sup> Staff assumes that costs to be incurred in 2005 and 2006 to implement the FERC-approved Bull Trout Management Plan are part of the no-action alternative; costs to be incurred in 2007 and beyond are treated as incremental costs associated with Chelan PUD's proposal.
- <sup>n</sup> Post-licensing costs associated with implementation of the FERC-approved Bull Trout Management Plan are assumed to be incremental costs of Chelan PUD's proposal.
- <sup>o</sup> Does not include the cost of facility modifications or operational changes if they are identified.
- <sup>p</sup> Chelan PUD proposes to continue funding these surveys at the same level as they do under the current license, \$7,500 per year. Thus, the incremental cost of Chelan PUD's proposal would be zero. WDFW recommends that the studies be funded at cost of \$10,500 per year, which equals an incremental cost of \$3,000 annually.
- <sup>q</sup> Interior cost estimate.
- <sup>r</sup> Staff recommends adopting Interior's measure. Monitoring of cultural sites would be integrated into item 3, Shoreline Erosion Monitoring, and costs for monitoring are captured in item 3. Costs for stabilizing site 45CH254 are included in measure 4, and costs for stabilizing site 45DO504, if and when needed, are reflected in item 96.
- <sup>s</sup> Chelan PUD estimated a zero cost for this trade-lease/purchase agreement. Staff assumes the lands to be traded are of equal value.