

CONTENTS

EXECUTIVE SUMMARY	ES-1
ES.1 BACKGROUND	ES-1
ES.2 DESCRIPTION OF THE PROJECTS	ES-1
ES.3 PROPOSED ACTION AND ALTERNATIVES	ES-2
ES.3.1 No Action Alternative (Alternative A)	ES-2
ES.3.2 Proposed Action (Alternative B).....	ES-3
ES.3.3 Enhancement and Mitigation Measures (Alternative C).....	ES-4
ES.4 EFFECTS OF ALTERNATIVES.....	ES-5
ES.4.1 Geology and Soils	ES-5
ES.4.2 Water Quantity	ES-5
ES.4.3 Water Quality	ES-5
ES.4.4 Aquatic Resources.....	ES-9
ES.4.5 Botanical Resources	ES-11
ES.4.6 Wildlife Resources	ES-11
ES.4.7 Cultural Resources	ES-12
ES.4.8 Recreation	ES-12
ES.4.9 Land Management and Use.....	ES-12
ES.4.10 Aesthetic/Visual Resources.....	ES-13
ES.4.11 Socioeconomics	ES-13
ES.5 DEVELOPMENTAL ANALYSIS.....	ES-13
ES.6 COMPREHENSIVE DEVELOPMENT ANALYSIS.....	ES-14
1.0 PURPOSE OF ACTION AND NEED FOR POWER.....	1-1
1.1 PURPOSE OF THE ACTION.....	1-1
1.2 NEED FOR PROJECTS.....	1-3
1.2.1 PacifiCorp Operations.....	1-3
1.2.2 Cowlitz PUD Operations	1-6
1.2.3 Regional Demand	1-6
1.2.4 Need For Flood Management	1-6
1.3 SCOPING PROCESS.....	1-7
1.4 CONSULTATION	1-7
2.0 PROPOSED ACTION AND ALTERNATIVES	2-1
2.1 DESCRIPTION OF GENERAL LOCALE.....	2-1
2.1.1 Lewis River Basin.....	2-1
2.1.2 Project Area	2-2
2.2 ALTERNATIVE A: NO ACTION ALTERNATIVE.....	2-2
2.2.1 Existing Facilities, Operations and Environmental Measures	2-7
2.2.2 Summary of Ongoing Environmental Measures	2-12

CONTENTS (CONTINUED)

2.3	ALTERNATIVE B: APPLICANTS' PREFERRED ALTERNATIVE.....	2-18
2.3.1	Project Facilities, Operations, and Environmental Measures	2-23
2.4	ALTERNATIVE C.....	2-38
2.4.1	Project Facilities, Operations, and Environmental Measures	2-43
2.5	ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY	2-52
2.5.1	Project Decommissioning.....	2-52
2.5.2	Fish Ladders and Criteria Screens	2-53
3.0	ENVIRONMENTAL CONSEQUENCES	3-1
3.1	GEOLOGY AND SOILS	3-1
3.1.1	Resource Issues.....	3-1
3.1.2	Affected Environment.....	3-1
3.1.3	Effects of Alternatives	3-2
3.1.4	Conclusion	3-3
3.2	WATER QUANTITY	3-3
3.2.1	Resource Issues.....	3-3
3.2.2	Affected Environment.....	3-4
3.2.3	Effects of Alternatives	3-10
3.2.4	Conclusion	3-21
3.3	WATER QUALITY	3-23
3.3.1	Resource Issues.....	3-23
3.3.2	Affected Environment.....	3-23
3.3.3	Effects of Alternatives	3-25
3.3.4	Conclusion	3-36
3.4	AQUATIC RESOURCES.....	3-37
3.4.1	Resource Issues.....	3-37
3.4.2	Affected Environment.....	3-37
3.4.3	Effects of Alternatives	3-65
3.4.4	Conclusion	3-87
3.5	BOTANICAL RESOURCES.....	3-90
3.5.1	Resource Issues.....	3-91
3.5.2	Affected Environment.....	3-91
3.5.3	Effects of Alternatives	3-100
3.5.4	Conclusion	3-109
3.6	WILDLIFE RESOURCES	3-110
3.6.1	Resource Issues.....	3-110
3.6.2	Affected Environment.....	3-110
3.6.3	Effects of Alternatives	3-119
3.6.4	Conclusion	3-129

CONTENTS (CONTINUED)

3.7 CULTURAL RESOURCES..... 3-129
 3.7.1 Resource Issues..... 3-129
 3.7.2 Affected Environment..... 3-130
 3.7.3 Effects of Alternatives 3-134
 3.7.4 Conclusion 3-136
3.8 RECREATION..... 3-137
 3.8.1 Resource Issues..... 3-137
 3.8.2 Affected Environment..... 3-138
 3.8.3 Effects of Alternatives 3-143
 3.8.4 Conclusion 3-150
3.9 LAND MANAGEMENT AND USE..... 3-151
 3.9.1 Resource Issues..... 3-151
 3.9.2 Affected Environment..... 3-151
 3.9.3 Effects of Alternatives 3-160
 3.9.4 Conclusion 3-163
3.10 AESTHETIC/VISUAL RESOURCES 3-164
 3.10.1 Resource Issues..... 3-164
 3.10.2 Affected Environment..... 3-164
 3.10.3 Effects of Alternatives 3-168
 3.10.4 Conclusion 3-170
3.11 SOCIOECONOMICS..... 3-170
 3.11.1 Resource Issues..... 3-170
 3.11.2 Affected Environment..... 3-171
 3.11.3 Effects of Alternatives 3-181
 3.11.4 Conclusion 3-191
3.12 CUMULATIVELY AFFECTED RESOURCES 3-191
 3.12.1 Geographic Scope 3-192
 3.12.2 Temporal Scope 3-192
 3.12.3 Cumulative Effects of Alternatives..... 3-192
3.13 UNAVOIDABLE ADVERSE IMPACTS 3-198
 3.13.1 Geology and Soils..... 3-198
 3.13.2 Water Quantity..... 3-199
 3.13.3 Water Quality..... 3-199
 3.13.4 Aquatic Resources 3-199
 3.13.5 Botanical and Wildlife Resources..... 3-200
 3.13.6 Cultural Resources 3-200
 3.13.7 Recreation 3-200
 3.13.8 Socioeconomics 3-201
3.14 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF
 RESOURCES 3-201

CONTENTS (CONTINUED)

3.15 RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM PRODUCTIVITY	3-201
4.0 DEVELOPMENTAL ANALYSIS	4-1
4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECTS	4-1
4.2 COST OF ENVIRONMENTAL MEASURES.....	4-2
4.2.1 Geology and Soils Measures.....	4-3
4.2.2 Water Quantity Measures	4-3
4.2.3 Water Quality Measures	4-5
4.2.4 Fish Habitat Measures	4-6
4.2.5 Downstream Fish Passage Measures	4-7
4.2.6 Upstream Fish Passage Measures	4-8
4.2.7 Fish Hatchery Measures	4-8
4.2.8 Terrestrial Habitat Measures.....	4-9
4.2.9 Cultural Resources Measures.....	4-11
4.2.10 Recreational Resource Measures	4-12
4.2.11 Aesthetic Resource Measures	4-15
4.2.12 Socioeconomic Measures	4-15
4.3 COMPARISON OF ALTERNATIVES.....	4-16
4.4 POLLUTION ABATEMENT	4-17
5.0 COMPREHENSIVE DEVELOPMENT ANALYSIS.....	5-1
5.1 CONSISTENCY WITH COMPREHENSIVE PLANS.....	5-2
5.2 RELATIONSHIP OF LICENSE PROCESS TO LAWS AND POLICY	5-3
5.2.1 Water Quality Certification	5-3
5.2.2 Endangered Species Act	5-3
5.2.3 Coastal Zone Management Act.....	5-3
5.2.4 Pacific Northwest Power Planning and Conservation Act	5-3
5.2.5 Americans with Disabilities Act.....	5-4
5.2.6 National Historic Preservation Act.....	5-4
6.0 LITERATURE CITED	6-1

LIST OF TABLES

Table ES.4-1. Comparison of Alternatives A, B and C.....ES-6
 Table 1.1-1. The Lewis River Hydroelectric Projects. 1-1
 Table 2.2-1. Existing flood management storage and release for the three-
 reservoir system..... 2-11
 Table 2.2-2. Continuing measures under Alternative A. 2-12
 Table 2.2-3. Summary of PacifiCorp’s Swift No. 1, Yale and Merwin developed
 recreation facilities. 2-17
 Table 2.3-1. Measures proposed under Alternative B. 2-23
 Table 2.4-1. Measures proposed under Alternative C. 2-43
 Table 2.4-2. Flow contribution to Lewis River bypass reach under Alternative C. 2-48
 Table 3.1-1. Summary of reservoir shoreline bank heights. 3-2
 Table 3.2-1. Summary of streamflow statistics for Lewis River stream gages. 3-4
 Table 3.2-2. Magnitude and frequency of spill from Swift Creek Reservoir. 3-7
 Table 3.2-3. Flood magnitude and frequency by alternative for Lewis River
 below Merwin Dam. 3-9
 Table 3.2-4. Natural and regulated peak flows for Lewis River at Ariel (below
 Merwin Dam). 3-9
 Table 3.2-5. Alternative A reservoir operations summary. 3-12
 Table 3.2-6. Alternative B reservoir operations summary..... 3-15
 Table 3.2-7. Alternative C reservoir operations summary..... 3-20
 Table 3.2-8. Flow releases into the Lewis River bypass reach under Alternative C. 3-21
 Table 3.3-1. Summary of WDOE surface water quality standards for Class A,
 Class AA, and Lake Class water bodies. 3-24
 Table 3.3-2. Water quality monitoring sites. 3-25
 Table 3.4-1. Resident and anadromous fish species present in the Lewis River
 basin..... 3-38
 Table 3.4-2. Preferred temperature ranges, and upper lethal water temperatures
 for various life stages of resident and anadromous salmonids found
 in the Lewis River basin. 3-39
 Table 3.4-3. Current aquatic habitat metrics in measured stream reaches in the
 Lewis River watershed. 3-55
 Table 3.4-4. Minimum flow provisions downstream of Merwin, as stipulated in
 Article 49 of the existing Merwin Project license. 3-58
 Table 3.4-5. WDFW interim ramping rate criteria. 3-59
 Table 3.4-6. Current WDFW fish production goals for the Lewis River basin in
 2003. 3-62
 Table 3.4-7. The average number of salmon and steelhead harvested in the Lewis
 River recreation fishery based on punch card returns to WDFW. 3-63
 Table 3.4-8. Federally listed fish species in the Lewis River basin..... 3-63
 Table 3.4-9. Length of potentially accessible anadromous fish habitat and the
 percent of total accessible habitat in the three reaches of the Lewis
 River upstream of Merwin Dam. 3-71

LIST OF TABLES (CONTINUED)

Table 3.4-10. EDT estimates of adult abundance under current habitat conditions for spring Chinook, coho, and steelhead by geographic area..... 3-72

Table 3.4-11. Lewis River fish passage model estimates of adult coho production for Alternatives B and C..... 3-73

Table 3.4-12. Alternative C estimated adult fish passage survival rates by fish population..... 3-84

Table 3.4-13. Model-derived survival estimates for juvenile anadromous fish migrating from Swift, Yale, and Merwin reservoirs for Alternative C... 3-85

Table 3.5-1. Summary of cover type acreages in the study area for the Lewis River Projects. 3-97

Table 3.5-2. Utility land ownership in the Lewis River basin..... 3-100

Table 3.6-1. Special status species documented or potentially occurring in the study area for the Lewis River Projects..... 3-114

Table 3.6-2. Numbers of bald eagles recorded during PacifiCorp’s late-winter aerial surveys..... 3-118

Table 3.6-3. Bald eagle nest activity and productivity recorded during PacifiCorp’s summer aerial surveys..... 3-118

Table 3.9-1. Major land ownership within the Lewis River watershed..... 3-151

Table 3.10-1. Pool elevation photo documentation for Merwin, Swift, and Yale reservoirs. 3-166

Table 3.11-1. Recent growth rates in project vicinity..... 3-171

Table 3.11-2. Population estimates and forecasts for selected areas of Washington..... 3-172

Table 3.11-3. 2000 and 2002 labor force and employment estimates for Clark, Cowlitz, and Skamania counties. 3-173

Table 3.11-4. 2000 occupancy status by area. 3-175

Table 3.11-5. Comparison of Northwest utility electricity rates for 2002..... 3-177

Table 3.11-6. Cowlitz PUD and PacifiCorp customer base..... 3-178

Table 3.11-7. Combined Cowlitz PUD and PacifiCorp tax payment in 1999..... 3-179

Table 4.1-1. Assumed values for power and economic benefit analysis..... 4-2

Table 4.3-1. Summary of the levelized annual net benefits for Alternatives A through C for Swift No. 1, Yale and Merwin..... 4-16

Table 4.3-2. Summary of the annual lost generation and replacement power cost for Alternatives A through C for Swift No. 1, Yale and Merwin..... 4-17

Table 4.4-1. Equivalent amount of pollutants emitted annually (tons) if the Lewis River projects were replaced by fossil fuel generated energy..... 4-17

LIST OF FIGURES

Figure 1.1-1. Project area map..... 1-2
 Figure 2.2-1. Alternative A site plan. 2-3
 Figure 2.3-1. Alternative B site plan..... 2-19
 Figure 2.4-1. Alternative C site plan..... 2-39
 Figure 3.2-1. Swift Creek Reservoir average daily and seasonal water elevations,
 water years 1997 – 2001..... 3-5
 Figure 3.2-2. Yale Lake average daily and seasonal water elevations, water years
 1997 – 2001..... 3-6
 Figure 3.2-3. Lake Merwin average daily and seasonal water elevations, water
 years 1997 – 2001..... 3-6
 Figure 3.2-4. Daily flow exceedance curve for Lewis River at Ariel..... 3-8
 Figure 3.2-5. Swift Creek Reservoir levels under Alternatives A, B, and C..... 3-13
 Figure 3.2-6. Yale Lake levels under Alternatives A, B, and C..... 3-13
 Figure 3.2-7. Lake Merwin levels under Alternatives A, B, and C..... 3-14
 Figure 3.2-8. Daily average flow releases into the Lewis River bypass reach
 under Alternatives A, B, and C (50 percent exceedance values). 3-16
 Figure 3.2-9. Monthly flow releases downstream of Merwin Dam under
 Alternatives A, B, and C..... 3-17
 Figure 3.3-1. Recorded water temperatures in the Swift No. 2, Yale, and Merwin
 powerhouse tailraces and corresponding releases, July 15 through
 July 28, 1996..... 3-27
 Figure 3.3-2. Monthly median temperatures at the Swift Creek Reservoir inflow,
 Swift No. 1 tailrace, Swift No. 2 tailrace, Yale tailrace, and Merwin
 tailrace; May 1999 through April 2000..... 3-28
 Figure 3.3-3. Nitrogen to Phosphorus ratios for sites sampled monthly during
 May 1999 through April 2000..... 3-32
 Figure 3.3-4. Observed Swift Dam release temperature and modeled water
 temperature at downstream end of Lewis River bypass reach for
 four release flows under average temperature conditions..... 3-34
 Figure 3.4-1. Adult spring Chinook and fall Chinook returns to the North Fork
 Lewis River (1980 to 2001)..... 3-40
 Figure 3.4-2. Periodicity chart for various life stages of fish species in the Lewis
 River basin..... 3-41
 Figure 3.4-3. Adult coho returns to the North Fork Lewis River (1980 to 2001). 3-45
 Figure 3.4-4. The number of winter and summer steelhead harvested in the Lewis
 River basin recreation fishery (1980 through 1998). 3-47
 Figure 3.4-5. Annual peak counts of bull trout spawners observed in Cougar
 Creek 1979 through 2003..... 3-51
 Figure 3.4-6. Spawning population estimate of bull trout in Swift Creek
 Reservoir for the years 1994 through 2003..... 3-51
 Figure 3.4-7. Peak counts of kokanee spawning in Cougar Creek (1978 to 2002). 3-53
 Figure 3.5-1. Generalized vegetation cover type map..... 3-93
 Figure 3.9-1. Project area land ownership..... 3-156

ACRONYMS

ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities
ALP	Alternative Licensing Process
APE	Area of Potential Effect
ARG	Aquatic Resources Group
BLM	Bureau of Land Management
BMP	Best Management Practices
BPA	Bonneville Power Administration
BSAI	Bering Seas/Aleutian Islands
CFR	Code of Federal Regulations
cfs	Cubic feet per second
Cowlitz PUD	Public Utility District No. 1 of Cowlitz County
dbh	Diameter at breast height
DO	Dissolved oxygen
DPS	Distinct Population Segment
EDT	Ecosystem Diagnosis and Treatment
ERN	Engineering News Record
ESA	Endangered Species Act
ESD	Washington State Employment Security Department
ESU	Evolutionarily Significant Unit
FCE	Fish collection efficiency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulation Commission
Forest Plan	National Forest Land and Resource Management Plans
FPA	Federal Power Act
FPD	Fire protection district
FR	Forest Road
FTE	Full-time equivalent
GOA	Gulf of Alaska
GPNF	Gifford Pinchot National Forest
HEP	Habitat Evaluation Procedure
HPMP	Historic Properties Management Plan
I&E	Interpretation and Education
I-5	Interstate 5
IAC	Interagency Committee on Outdoor Recreation
IP	International Paper
IRP	Integrated Resource Plan
IWHMP	Integrated Wildlife Habitat Management Plan
KOP	Key Observation Point
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt hour
Monument	Mount St. Helens National Volcanic Monument

ACRONYMS (CONTINUED)

LWD	Large woody debris
MDN	Marine derived nutrients
msl	Mean sea level
MW	Megawatt
MWh	Megawatt hour
MWHMA	Merwin Wildlife Habitat Management Area
MWHMP	Merwin Wildlife Habitat Management Plan
NCEMS	North Country Emergency Medical Services
NEPA	National Environmental Policy Act
ng/l	Nanograms per liter
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
N:P	Nitrogen-to-phosphorous
NPPC	Northwest Power Planning Council
NRHP	National Register of Historic Places
NTU	Nephelometric turbidity units
O&M	Operations and maintenance
OAHP	Office of Archaeology and Historic Preservation
OFM	Washington State Office of Financial Management
OHV	Off highway vehicle
ORV	Off road vehicle
PAH	Polycyclic aromatic hydrocarbons
PDEA	Preliminary Draft Environmental Assessment
PHS	Priority Habitats and Species
PWC	Personal watercraft
RCW	Revised Code of Washington
READ	Resource Enhancement Alternatives Document
RM	River mile
RMAP	Road Maintenance and Abandonment Plan
ROW	Right-of-way
RRMP	Recreation Resource Management Plan
RV	Recreation vehicle
SAR	Smolt-to-adult return
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SD1	Scoping Document No. 1
SD2	Scoping Document No. 2
S/M	Survey/Manage
SR	State Route
SSTEMP	Stream Segment Temperature Model
TRG	Terrestrial Resources Group
TCP	Traditional cultural property
TCR	Traditional Cultural Resources

ACRONYMS (CONTINUED)

TDG	Total dissolved gas
TP	Total phosphorus
TPN	Total persulfate nitrogen
TSI	Trophic State Index
USFS	U.S. Forest Service
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
VCPRD	Vancouver-Clark Parks and Recreation Division
VQO	Visual Quality Objective
WAC	Washington Administrative Code
WDF	Washington Department of Fisheries
WDFW	Washington Department of Fish & Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
WDW	Washington Department of Wildlife
WNHP	Washington Natural Heritage Program
WSCC	Washington Systems Coordinating Council
WSWCB	Washington State Weed Control Board