
SCOPING DOCUMENT NO. 1

FINAL

**ENVIRONMENTAL ASSESSMENT FOR THE RELICENSING OF THE
LAKE CHELAN HYDROELECTRIC PROJECT
FERC Project No. 637**

October 5, 1998



**Public Utility District No. 1 of Chelan County
Wenatchee, Washington**

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ACRONYM LIST

ADA	Americans with Disabilities Act
ARP	Alternative Relicensing Process
Chelan PUD	Public Utility District No. 1 of Chelan County
Colville Confederated Tribes	Confederated Tribes of the Colville Reservation
CRMP	Cultural Resource Management Plan
DEA	Draft Environmental Assessment
District	Public Utility District No. 1 of Chelan County
EA	Environmental Assessment
EIS	Environmental Impact Statement
FEA	Final Environmental Assessment
FERC	Federal Energy Regulatory Commission
GIS	Geographic Informations Systems
Gorge	Bypass Reach
GPS	Global Positioning System
ICD	Initial Consultation Document
Lake Chelan Project	Lake Chelan Hydroelectric Project
LARC	Land Use, Aesthetics, Recreation & Cultural Working Group
MW	Megawatt
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PDEA	Preliminary Draft Environmental Assessment
ROS	Recreation Opportunity Spectrum
RTE	Rare, Threatened and Endangered
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SD1	Scoping Document No. 1
SD2	Scoping Document No. 2
USFS	United States Forest Service

SECTION 1: INTRODUCTION

The Federal Energy Regulatory Commission (FERC), under the authority of the Federal Power Act*, may issue licenses for up to 50 years for the construction, operation, and maintenance of non-federal hydroelectric developments. Public Utility District No. 1 of Chelan County (Chelan PUD) intends to file an application for a new license for the Lake Chelan Hydroelectric Project (FERC No. 637). The Lake Chelan Project is a major power project with an installed capacity of 48 megawatts (MW) and is currently operating under a license issued by the FERC on May 12, 1981, that expires on March 31, 2004. Chelan PUD intends to continue to operate and maintain the Lake Chelan Project, which is located approximately 32 miles north of Wenatchee, in Chelan County, Washington. All the power generated by the Lake Chelan Project is available to serve the homes and businesses of Chelan County.

Chelan PUD has requested and received approval from the Federal Energy Regulatory Commission (FERC) to employ an Alternative Relicensing Process for the Lake Chelan Project, as allowed under FERC's Final Rule issued on October 29, 1997 (Docket No. RM95-16-000; Order No. 596). The Alternative Relicensing Process proposed by Chelan PUD is intended to expedite the licensing process by combining the pre-filing consultation and environmental review processes into a single process, and by improving and facilitating communications among the participants in the licensing process.

Chelan PUD believes that this relicensing will not constitute a major federal action that would significantly affect the quality of the existing human and natural environment. As such, Chelan PUD proposes that the NEPA analysis for the Project relicensing can be completed as an Environmental Assessment (EA), rather than an Environmental Impact Statement (EIS). However, the format and outline of the EA presented in Section 5 of this scoping document has been designed to be easily convertible to that of an EIS if, later in the evaluation and study process, it is determined by either the participants in the consultation process or by FERC staff that an EIS is required.

As noted above, the Alternative Relicensing Process (ARP) proposed by Chelan PUD and approved by FERC is designed to expedite the relicensing process by improving and facilitating communications among the participants involved in the relicensing consultation process. The approach chosen by Chelan PUD includes the following key concepts that have been selected to support the relicensing goals for the Lake Chelan Project:

- Implementation of NEPA scoping at the beginning of the relicensing process to facilitate early involvement by all interested parties and to focus study efforts on issues determined to be directly related to the Lake Chelan Project;

* U.S.C. Sect. 791(a)-825(r).

- Implementation of a Communications Protocol designed to improve access to information developed during the consultation and study process by all interested parties;
- Preparation or conversion of relicensing and NEPA documents into electronic formats with the goal of reducing paperwork and creating documents that will be easily reusable by involved participants and the FERC;
- Completion of a series of pre-formal issues workshops with the resource agencies designed to provide interested parties with the opportunity to actively shape the content and direction of the proposed NEPA process; and
- Cooperatively scoping environmental issues and study approaches.

A Preliminary Draft Environmental Assessment (PDEA) will be completed by Chelan PUD, in coordination with the collaborative relicensing team and FERC Staff, and filed with FERC in lieu of the Exhibit E Environmental Report as part of the Draft License Application. The PDEA and Draft License Application will also be circulated for review and comment to all interested parties. FERC staff will then review the PDEA and the License Application for adequacy, consider all comments submitted on these filings, and then issue a Draft Environmental Assessment (DEA) for review and comment. The DEA will present FERC Staff's conclusions and recommendations for the Commission to consider in reaching its final licensing decision for the Lake Chelan Project. FERC will then issue the Final Environmental Assessment (FEA) and the License Order for the Project after considering and incorporating comments submitted on the DEA.

1.1 PURPOSE OF THE SCOPING DOCUMENT

The purpose of the scoping process is to:

- Identify important environmental and developmental issues related to the proposed Project relicensing;
- Identify reasonable alternatives that should be evaluated in the Environmental Assessment;
- Determine the scope and depth of analysis for environmental and developmental issues identified for evaluation in the Environmental Assessment; and
- Identify issues that are not important or that do not require detailed analysis.

This Scoping Document is intended to further all interested parties' understanding of the Project and to encourage the parties to actively participate and contribute to the issues scoping and the resulting resource study approaches designed for analysis of Project relicensing. This scoping

document (SD1) will be made available to all interested parties and a second scoping document (SD2) will be issued if needed.

The proposed Alternative Relicensing Process for the Lake Chelan Project will offer interested parties a forum for remaining actively involved during the entire consultation and study process. Moreover, this approach will also present three formal comment opportunities as follows:

- Scope of Environmental Assessment - during formal public scoping meeting(s);
- Content of the Draft PDEA - during the comment period prior to submittal to FERC for review; and
- Content of the Final PDEA - during the public comment period so that comments can be received by FERC to consider in the FEA.

1.2 SCOPING MEETINGS

Scoping of the issues related to the proposed relicensing began informally during the series of agency workshops sponsored by Chelan PUD beginning in March 1998. The agencies/public that have participated in the issues workshops have contributed significantly to the content of SD1. These informal scoping workshops progressed as follows:

- March 25 & 30: Issues Identification (Agencies)
- April 22 & 23: Management Goals and Objectives Identification
- May 12: Issue Identification (Public)
- May 20 & 27: Study Plan Identification and Development
- June 17 & 24: Review Issues and Study Scopes (White Papers)

Chelan PUD will be holding an informal meeting on September 23, 1998, to discuss the contents of SD1. Formal scoping meetings will be held on November 18 and 19, 1998. One meeting will occur on the evening of November 18, 1998. A second meeting will occur during the day on November 19, 1998. Based on comments and recommendations received at both meetings, Chelan PUD will distribute the final (revised) SD1 within 30 days after the formal scoping meeting, if necessary.

The formal scoping meetings held in November 1998 will be recorded by a stenographer and videotaped so that all statements submitted will become part of the formal public record for the Lake Chelan Project relicensing. Individuals desiring to present statements during the meeting will be asked to sign in and clearly identify themselves for the record. The amount of time allowed each speaker will be determined at the beginning of the meetings and will be based on the number of people desiring to speak and the amount of time available for comments during the meetings.

Interested parties who choose not to speak or are unable to attend the scoping meetings may provide written statements, comments or information as discussed in the next section.

Questions concerning the scoping process for the Lake Chelan Project should be directed to:

Mr. Gregg Carrington
Project Manager for the Lake Chelan Relicensing
Public Utility District No. 1 of Chelan County, WA
PO Box 1231
Wenatchee, WA 98807-1231
(509) 663-8121
gregg@chelanpud.org

or

Mr. Vince Yearick
Federal Energy Regulatory Commission
Office of Hydropower Licensing
888 First Street, NE
Washington, DC 20426
(202) 219-3073
vince.yearick@ferc.fed.us

1.3 REQUEST FOR INFORMATION

Federal, state and local governments and resource agencies, Tribes, NGOs, and individuals are requested to forward, or present at the scoping sessions, information they believe will assist Chelan PUD and FERC in conducting an accurate and thorough analysis of direct and indirect effects of the proposed Project relicensing. Types of information requested include, but are not limited to:

- Information, data, or professional opinions that may contribute to identifying and defining the scope of important environmental and developmental issues;
- Identification of, and information from any other similar analysis or study (completed, in progress, or planned) that is relevant to the proposed relicensing of the Lake Chelan Project;
- Information and quantified data that will aid in the characterization of the existing physical, chemical, biological, cultural, and socioeconomic environments;
- Information on resources that may be cumulatively affected; and
- Information on future projects proposed by others in the vicinity of the Project area.

Information should be submitted in writing to Chelan PUD postmarked no later than January 19, 1999, the end of the formal 60-day comment period following the scoping meetings. Comments on SD1 should clearly identify the Project as **The Lake Chelan Hydroelectric Project, Project No. 637-___** and be sent to the attention of:

Mr. Gregg Carrington
Project Manager for the Lake Chelan Relicensing
Public Utility District No. 1 of Chelan County, WA
PO Box 1231
Wenatchee, WA 98807-1231

1.4 EA PREPARATION SCHEDULE

The preliminary schedule for preparing the Lake Chelan Project Environmental Assessment is as follows:

Issued Discussion Copy of SD1	July 22, 1998
Issued Review Copy of SD1	August 14, 1998
Conducted Informal Scoping Meeting.....	September 23, 1998
(Preliminary Comments Due)	
Issue Formal SD1 and ICD	October 5, 1998
Formal Scoping Meetings	November 18 and 19, 1998
Comments on SD1 and ICD Due	January 19, 1999
Issue Informal Review Copies of Draft PDEA.....	January 2001
and Draft License Application	
Issue Draft PDEA and Draft License Application.....	April 2001
Issue Informal Review Copies of Final PDEA	December 2001
and Final License Application	
File PDEA and License Application	March 2002

SECTION 2: BACKGROUND

This section of the SD1 presents a brief summary of the existing Project features and operation. The Initial Consultation Document (ICD)[†] presents detailed discussions about these topics that support the following summaries.

2.1 PROJECT DESCRIPTION

PROJECT SETTING

Chelan PUD owns and operates the 48-MW Lake Chelan Project which is located on the Chelan River in Chelan County, Washington. The Project dam is located at the lower end of the 50.4-mile-long Lake Chelan and the powerhouse is located at the confluence of the Chelan River and the Columbia River, 4.1-miles downstream of the Project dam. Appendix C contains a map locating the Project.

Lake Chelan serves as the reservoir for the Project and is a deep, narrow, natural lake extending northwesterly from the City of Chelan, Washington, 50.4 miles up to the head of the lake near Stehekin, Washington. The maximum width of the lake is 1.8 miles and there are approximately 109.2 miles of shoreline. The maximum depth of Lake Chelan is 1,486 feet when the lake is at elevation 1,100 feet (extending approximately 400 feet below sea level). Lake Chelan is the third deepest freshwater lake in the United States, behind Crater Lake and Lake Tahoe. It has a maximum surface area of approximately 33,300 acres and contains 677,400 acre-feet of usable storage between a minimum elevation of 1,079 feet and a maximum elevation of 1,100 feet. Gross storage capacity of the Lake Chelan Project is 15.8 million acre-feet.

PROJECT FACILITIES

The dam is constructed at the lower or southeasterly end of Lake Chelan where it flows into the Chelan River. The dam is a concrete-gravity, steel-reinforced structure approximately 40-feet-high and 490-feet-long. Incorporated into the dam are a gated spillway section, a trash sluice, and a power conduit intake structure.

The intake structure contains seven 17-foot-wide inlet openings protected by sectionalized steel trashracks extending from elevation 1,068 to elevation 1,103. The trashracks are cleaned manually with rakes while the larger debris is floated to the debris removal bay located at the left abutment of the spillway. The intake structure also contains ten 17-foot-wide inlet openings (without trashracks) for a possible 17-foot-diameter power tunnel that is sealed off at the dam axis adjacent to the existing power tunnel inlet.

[†] The ICD will be distributed on October 5, 1998.

The 14-foot-diameter tunnel is 2.2 miles long and extends from the intake structure at the dam to the powerhouse. A 45-foot-diameter by 125-foot-high steel surge tank located on the hillside approximately 700 feet from the powerhouse is connected to the lower portion of the lined conduit by an 11-foot-diameter, steel-lined shaft. The capacity of the surge tank is 1,260,000 gallons. The conduit reduces to 12-foot-diameter and then divides into two 9-foot-diameter penstock branches leading to 7.5-foot-diameter control valves before entering the scroll cases of the two turbines.

The powerhouse is an indoor type approximately 140-feet long by 100-feet wide and 124-feet high that is operated remotely from Chelan PUD's dispatch center in Wenatchee, Washington. The powerhouse contains two vertical axis 34,000 hp Francis type turbines that drive generators rated at 24,000 kW each. At full gate and maximum head, the turbines discharge a maximum combined flow of approximately 2,200 cfs. The Project generates an average of 375,226 MWh annually. Section A2 of the ICD presents a detailed description of the installed Project facilities.

RECREATION FACILITIES

There is a range of recreation sites located within the Project boundary, distributed along the shoreline of Lake Chelan. These facilities provide the public with a variety of recreational opportunities ranging from drive-in to boating-access-only sites. Table 8 in the ICD presents a listing of these sites and Appendix C in the SD1 shows the location of each.

2.2 PROJECT OPERATION

EXISTING OPERATION

Chelan PUD operates the Lake Chelan Project to optimize use of the Chelan River water resource to produce electric energy while meeting flood control needs, irrigation requirements and recreational uses of Lake Chelan. The drainage basin encompasses approximately 924 square miles, of which approximately 50 percent is above 5,500 feet in elevation. The major portion of precipitation occurring within the watershed falls in the form of snow during the months of November through March. Flows into Lake Chelan are dominated by springtime snowmelt runoff, which generally occurs between April 15 and July 15. Historically, the annual peak runoff occurs in June.

The current operational regime generally includes power operation near the full installed flow capacity of the powerplant on a year-round basis. The discharge from Lake Chelan is regulated to assure with a 95-percent probability that the reservoir will refill to the normal maximum water surface elevation of 1,098.0 feet on or before June 30 of each year. To assure this refill, the inflow potential of the snowpack within the Chelan drainage basin is determined from snow measurements taken five times a year. Measurements are made by direct field or remote measurement methods from established snow courses. Runoff predictions are also based on probability curves defined by a relationship between the historical basin precipitation and the observed reservoir inflow.

The normal maximum elevation of the reservoir is elevation 1,098 feet. The maximum elevation is 1,100 feet and the minimum is elevation 1,079 feet. The average minimum drawdown of the reservoir over 43 years of operation (1952-1995) has been to approximately 1084.2 feet. Annual drawdown of the lake begins in early October as average streamflows into the lake decline from the warm summer season. From October through April, the water flow into the power tunnel at the dam typically exceeds inflows into the lake and the reservoir elevation continues to decline. The lowest annual lake elevation normally occurs in April. From May through June, the lake refills as the spring runoff exceeds the hydraulic capacity of the power tunnel. The reservoir is maintained at or above elevation 1,098 feet from June 30 through September 30 for the summer recreation season.

The Lake Chelan Project has historically been operated to reduce peak flood flows on the Chelan River and on the lower stretch of the Columbia River when requested by the U.S. Army Corps of Engineers. Chelan PUD proposes to continue the Project's role in regional flood control management. The Project is and will continue to be operated in accordance with all applicable FERC license requirements and the laws of the State of Washington.

PROPOSED OPERATION

Although Chelan PUD is not proposing any changes to the Project operation as part of relicensing, it is currently evaluating possible changes in consultation with the collaborative relicensing team.

SECTION 3: PROPOSED ACTION

This section of the scoping document describes the range of actions currently under consideration for the relicensing of the Lake Chelan Project. This listing was developed cooperatively with the interested parties during the series of informal workshops held over the past year.

3.1 APPLICANT'S PROPOSAL

Chelan PUD is proposing to identify Project-related issues and conduct studies designed to address these issues in order to obtain a new license for the continued operation of the Project. Chelan PUD will consider and propose appropriate enhancements to Project-related resources which are determined to be affected by the Project after consultation and field studies are completed. Chelan PUD will consider proposed changes to the existing facilities, changes to the Project operational regime and environmental enhancements.

3.2 OTHER ALTERNATIVES FOR CONTINUED PROJECT OPERATION

Any other alternatives proposed by agencies, non-government organizations (NGOs) and other interested parties will be considered by Chelan PUD and the collaborative relicensing team.

3.3 NO-ACTION ALTERNATIVE

The no-action alternative would relicense the Project for continued operation under the terms of the existing FERC license. No environmental enhancements would be provided under this alternative. The no-action alternative acts as the baseline against which the applicant's proposal and all other relicensing proposals developed during the consultation process are evaluated.

3.4 ISSUES CONSIDERED BUT ELIMINATED FROM FURTHER STUDY

This section will present issues that have been considered and discussed during the issues identification workshops held with the interested parties that have been eliminated from detailed study because they have been determined to be not significant, are not reasonable, or have not been advocated by any parties involved in the relicensing consultation to date. To date, federal takeover, nonpower license and decommissioning have been eliminated from further study. This list may change as studies are completed and the results are discussed with the collaborative relicensing team. A listing of the members of the collaborative relicensing team is attached to the Consultation Guidelines and Procedures dated September 23, 1998.

SECTION 4: ENVIRONMENTAL RESOURCE ISSUES

4.1 CUMULATIVE IMPACTS

According to the Council on Environmental Quality's regulations for implementing NEPA (§1508.7), an action may cause cumulative impacts on the environment if its impacts overlap in space and/or time with the impacts of other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time and include hydropower and other land and water development activities.

4.1.1 Resources That Could Be Cumulatively Affected

Cumulative impacts will be identified and addressed by the collaborative relicensing team.

4.1.2 Geographic Scope

The geographic scope of the Cumulative Analysis will be limited to the area within the Project boundary and other areas that are likely to be impacted by Project operations.

4.1.3 Temporal Scope

The temporal scope of the Cumulative Analysis will include past, present and future actions and their effect on each resource that could be cumulatively affected.

4.2 ISSUES IDENTIFIED FOR ANALYSIS IN THE EA

The issues identified below are a result of the informal workshops held with the agencies since March 1998 and the public since May 1998. All issues identified by interested parties to date in this process are provided in Appendix A. This all-inclusive list includes Project-related issues as well as non-Project-related issues.

The status of those important Project-related issues currently proposed to be directly addressed through relicensing are indicated in study plan outlines (white papers) contained in Appendix B. In general, the issues that could potentially be affected by Project operations are:

1. Water Quality
2. Shoreline Erosion
3. Bypass Reach Flows
4. Lake Chelan Fisheries
5. Columbia River Flows
6. Rare Plants
7. Riparian Habitat and Wildlife
8. Wildlife Habitat
9. Cultural Resources
10. Bypass Reach Fish Stranding
11. Recreational Access and Facilities
12. Whitewater Boating
13. Land Management & Aesthetics
14. Water Levels

The list of issues contained in Appendix A may change as a result of formal scoping and as studies are completed and the results are discussed with the collaborative relicensing team. A written record will be maintained that indicates the status of each issue (and how they were addressed).

SECTION 5: PROPOSED EA OUTLINE

- 1.0 EXECUTIVE SUMMARY
- 2.0 PURPOSE AND NEED FOR ACTION
 - 2.1 Purpose of Action
 - 2.2 Need for Power
- 3.0 PROPOSED ACTION AND ALTERNATIVES
 - 3.1 Project Description
 - 3.2 Project Operation
 - 3.3 Proposed Action
 - 3.4 Alternatives to the Proposed Action
 - 3.5 Alternatives Considered but Eliminated from Detailed Study
- 4.0 CONSULTATION AND COMPLIANCE
 - 4.1 Issue Identification
 - 4.2 NEPA Scoping
 - 4.3 Agency Consultation
 - 4.4 Interventions
 - 4.5 Water Quality Certification
 - 4.6 Shoreline Management Act
 - 4.7 Section 18 Fishway Prescription
 - 4.8 Section 4(e) Conditioning
 - 4.9 Pacific Northwest Power Planning and Conservation Act
 - 4.10 Section 10(j) Recommendations of Fish and Wildlife Agencies
- 5.0 EVALUATION OF ALTERNATIVES AND ANALYSIS

Introduction presenting alternatives considered during NEPA review and handling of the analysis within this section.

 - 5.1 General Description of the Locale
 - 5.2 Scope of Cumulative Impact Analysis
 - 5.2.1 Geographic Scope
 - 5.2.2 Temporal Scope

Section 5: Proposed EA Outline

- 5.3 Proposed Action and Action Alternatives
 - 5.3.1 Water Use and Quality
 - 5.3.2 Fish, Wildlife and Botanical Resources
 - 5.3.3 Historic and Archeological Resources
 - 5.3.4 Recreational Resources
 - 5.3.5 Land Management and Aesthetic Resources
 - 5.3.6 Geological and Soil Resources
 - 5.3.7 Socioeconomic Resources
- 5.4 No-Action Alternative

- 6.0 DEVELOPMENTAL ANALYSIS
 - 6.1 Power and Economic Benefits
 - 6.2 Cost of Environmental Measures

- 7.0 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

- 8.0 CONSISTENCY WITH COMPREHENSIVE PLANS

- 9.0 FINDING OF NO SIGNIFICANT IMPACT

- 10.0 LITERATURE CITED

- 11.0 LIST OF PREPARERS

- 12.0 DISTRIBUTION LIST

SECTION 6: MAILING LIST

Mr. David P. Boergers, Secretary
**FEDERAL ENERGY REGULATORY
COMMISSION**
M/S GC-10.2, Room 104-07
888 First Street NE
Washington DC 20426

Mr. Vince Yearick
**FEDERAL ENERGY REGULATORY
COMMISSION**
Division of Licensing & Compliance
M/S HL-11.4, Room 63-13
888 First Street NE
Washington DC 20426

Mr. Robert Easton, Fisheries Biologist
**FEDERAL ENERGY REGULATORY
COMMISSION**
Division of Licensing & Compliance
M/S HL-11.4, Room 6H-07
888 First Street NE
Washington DC 20426

Mr. Keith Brooks, Attorney
**FEDERAL ENERGY REGULATORY
COMMISSION**
Office of General Counsel
M/S GC-10.2, Room 101-52
888 First Street NE
Washington DC 20426

Ms. Carol Gleichman
Historic Preservation Specialist
**US ADVISORY COUNCIL ON HISTORIC
PRESERVATION**
12136 W Bayaud Ave
Lakewood CO 80228

Ms. Debbie Knaub
US ARMY CORPS OF ENGINEERS
P O Box 2829
Chelan WA 98816

Ms. Lori Morris
Environmental Protection Specialist
US ARMY CORPS OF ENGINEERS
Regulatory Branch
PO Box 3755
4735 E Marginal Way South
Seattle WA 98124-3755

Mr. Al Murphy
Chelan District Ranger
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
428 W Woodin Ave
Route 2, Box 680
Chelan WA 98816-9724

Mr. Stephen M. Senyitko
Chelan District Ranger
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
P O Box 655
623 Mountain View Drive
Chelan WA 98816-9724

Mr. Phil Archibald
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
P O Box 476
Entiat WA 98822

Mr. Rick Edwards
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
P O Box 476
Entiat WA 98822

Mr. Glenn Hoffman
FERC Coordinator
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
215 Melody Lane
Wenatchee WA 98801

Mr. Joe Kastenzholz
District FERC Coordinator
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
428 W Woodin Ave
Route 2, Box 680
Chelan WA 98816-9724

Section 6: Mailing List

Ms. Ann Fink
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
215 Melody Lane
Wenatchee WA 98801

Mr. Barbara Jackson
US DEPARTMENT OF AGRICULTURE
Forest Service
Wenatchee National Forest
215 Melody Lane
Wenatchee WA 98801

Ms. Andrea L. Mann-Lower, Wetland Specialist
US DEPARTMENT OF AGRICULTURE
Natural Resource Conservation Service
215 Melody Lane, Room 238
Wenatchee WA 98801

Mr. Keith Kirkendall, FERC Coordinator
US DEPARTMENT OF COMMERCE
Natl Oceanic & Atmospheric Admin
National Marine Fisheries Service
525 NE Oregon St, Suite 500
Portland OR 97232-2737

Mr. Brett Joseph
US DEPARTMENT OF COMMERCE
Natl Oceanic & Atmospheric Admin
National Marine Fisheries Service
7600 Sandpoint Wy NE
BIN #C-15700
Seattle WA 98115

Mr. Bill Hevlin
Senior Biologist, Hydro Program
US DEPARTMENT OF COMMERCE
Natl Oceanic & Atmospheric Admin
National Marine Fisheries Service
525 NE Oregon St, Suite 500
Portland OR 97232-2737

Mr. Bryan Nordlund
Hydraulic Engineer, Hydro Program
US DEPARTMENT OF COMMERCE
Natl Oceanic & Atmospheric Admin
National Marine Fisheries Service
525 NE Oregon St, Suite 500
Portland OR 97232-2737

Mr. Bernard Burnham
US DEPARTMENT OF THE INTERIOR

Bureau of Indian Affairs
911 NE Eleventh Avenue
Portland OR 97232

Ms. Sharon Redthunder
Real Property Officer
US DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs
Colville Agency
P O Box 111
Nespelem WA 99155

Mr. Gene Nicholson
Executive Director
US DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs
Colville Agency
P O Box 111
Nespelem WA 99155

Mr. Stan Speaks, Area Director
US DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs
Portland Area Office
911 NE Eleventh Avenue
Portland OR 97232

Mr. John Evans, Environmental Coordinator
US DEPARTMENT OF THE INTERIOR
Bureau of Indian Affairs
Yakama Agency
P O Box 632
Toppenish WA 98948

Mr. Jim Fisher, Area Manager
US DEPARTMENT OF THE INTERIOR
Bureau of Land Management
915 Walla Walla Avenue
Wenatchee WA 98801

Mr. Al Bolin, Electrical Engineer
US DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
1150 N Curtis, Suite 100
Boise ID 83706

Mr. Richard A. Smith
Fish & Wildlife Biologist
US DEPARTMENT OF THE INTERIOR
Fish & Wildlife Service
P O Box 1157
517 S Buchanan
Moses Lake WA 98837

Mr. Tom Dresser, Fish & Wildlife Biologist
US DEPARTMENT OF THE INTERIOR
Fish & Wildlife Service
P O Box 1157
517 S Buchanan
Moses Lake WA 98837

Mr. Brian Cates, Fish & Wildlife Biologist
US DEPARTMENT OF THE INTERIOR
Fish & Wildlife Service
12790 Fish Hatchery Rd
Leavenworth WA 98826

Mr. Kurt Campbell, Field Supervisor
US DEPARTMENT OF THE INTERIOR
Fish & Wildlife Service
P O Box 1157
517 S Buchanan
Moses Lake WA 98837

Mr. Estyn Mead, Energy & Power Coordinator
US DEPARTMENT OF THE INTERIOR
Fish & Wildlife Service
Division of Habitat Conservation
911 NE Eleventh Avenue
Portland OR 97232-4181

Mr. William F. Paleck, Superintendent
US DEPARTMENT OF THE INTERIOR
National Park Service
North Cascades National Park Service Complex
2105 State Route 20
Sedro-Woolley WA 98284-1799

Mr. Scott Stonum, Resource Management Specialist
US DEPARTMENT OF THE INTERIOR
National Park Service
North Cascades National Park Service Complex
Box 7
Stehekin WA 98852

Mr. Phil Campbell, Management Assistant
US DEPARTMENT OF THE INTERIOR
National Park Service
North Cascades National Park Service Complex
428 W Woodin
Chelan WA 98816-9724

Mr. Terence N. Martin, Team Leader
US DEPARTMENT OF THE INTERIOR
Office of Environmental Policy & Compliance
Natural Resources Management
Main Interior Bldg, MS 2340

1849 C Street, NW
Washington DC 20240

Mr. Preston Sleeper
Regional Environmental Officer
US DEPARTMENT OF THE INTERIOR
Office of the Environmental Project Review
500 NE Multnomah St, Suite 600
Portland OR 97232-2036

Mr. Nolan Shishido
US DEPARTMENT OF THE INTERIOR
Office of the Solicitor
500 NE Multnomah St, Suite 607
Portland OR 97232-2036

Mr. John Bregar
Environmental Protection Specialist
**US ENVIRONMENTAL PROTECTION
AGENCY**
Regional Office, Region 10
1200 Sixth Avenue
Mail Stop ECO-088
Seattle WA 98101

Mr. Rick Parkin
Unit Manager, Geographic Implementation
**US ENVIRONMENTAL PROTECTION
AGENCY**
Regional Office, Region 10
1200 Sixth Avenue
Mail Stop ECO-088
Seattle WA 98101

Mr. Rita Henry, Assistant
**US FEDERAL EMERGENCY MANAGEMENT
AGENCY**
National Dam Safety Program
500 C Street SW
Washington DC 20472

Mr. Harold Andress, Manager
**US FEDERAL EMERGENCY MANAGEMENT
AGENCY**
National Dam Safety Program
500 C Street SW
Washington DC 20472

Dr. Peter Paquet
Wildlife & Resident Fish Manager
**US NORTHWEST POWER PLANNING
COUNCIL**
851 SW Sixth Ave, Suite 1100
Portland OR 97204-1348

Section 6: Mailing List

Mr. William Frymire
Assistant Attorney General
WASHINGTON STATE
Attorney General's Office (WADFW)
P O Box 40100
Olympia WA 98504-0100

Ms. Linda Crerar
Policy Assistant, Natural Resources
WASHINGTON STATE DEPARTMENT OF AGRICULTURE
P O Box 42560
1111 Washington St, 2nd Floor
Olympia WA 98504-2560

Mr. Lee Faulconer
Policy Assistant to the Director
WASHINGTON STATE DEPARTMENT OF AGRICULTURE
P O Box 42560
1111 Washington St, 2nd Floor
Olympia WA 98504-2560

Ms. Christie O'Loughlin
SEPA Coordinator
WASHINGTON STATE DEPARTMENT OF AGRICULTURE
P O Box 42560
1111 Washington St, 2nd Floor
Olympia WA 98504-2560

Dr. Robert Whitlam
State Archaeologist
WASHINGTON STATE DEPARTMENT OF COMMUNITY, TRADE & ECONOMIC DEVELOPMENT
Archaeology & Historic Preservation Office
PO Box 48343
Olympia WA 98504-8343

Mr. Steve Mathison
WASHINGTON STATE DEPARTMENT OF COMMUNITY, TRADE & ECONOMIC DEVELOPMENT
Archaeology & Historic Preservation Office
P O Box 48343
Olympia WA 98504-8343

Mr. Greg Griffith
WASHINGTON STATE DEPARTMENT OF COMMUNITY, TRADE & ECONOMIC DEVELOPMENT
Archaeology & Historic Preservation Office

P O Box 48343
Olympia WA 98504-8343

Mr. Howard Schwartz
Senior Energy Policy Specialist
WASHINGTON STATE DEPARTMENT OF COMMUNITY, TRADE & ECONOMIC DEVELOPMENT
Energy Division
925 Plum Street SE, Bldg 4
P O Box 43173
Olympia WA 98504-3173

Mr. Arne Olson
Energy Policy Specialist/Economist
WASHINGTON STATE DEPARTMENT OF COMMUNITY, TRADE & ECONOMIC DEVELOPMENT
Energy Division
925 Plum Street SE, Bldg 4
P O Box 43173
Olympia WA 98504-3173

Mr. Tony Usbelli
Senior Energy Policy Specialist
WASHINGTON STATE DEPARTMENT OF COMMUNITY, TRADE & ECONOMIC DEVELOPMENT
Energy Division
925 Plum Street SE, Bldg 4
P O Box 43173
Olympia WA 98504-3173

Ms. Patricia S. Irle
Wenatchee Watershed Lead
WASHINGTON STATE DEPARTMENT OF ECOLOGY
Central Regional Office
Water Quality Program
15 W Yakima Ave, Suite 200
Yakima WA 98902-3401

Ms. Deborah Mull
WASHINGTON STATE DEPARTMENT OF ECOLOGY
Office of the Attorney General
Ecology Division
P O Box 40117
Olympia WA 98504-0017

Mr. Jeff Marti, Hydropower Coordinator
WASHINGTON STATE DEPARTMENT OF ECOLOGY
Water Resources Program

300 Desmond Drive
P O Box 47600
Olympia WA 98504-7600

Mr. Brad Caldwell
**WASHINGTON STATE DEPARTMENT OF
ECOLOGY**
Water Resources Program
300 Desmond Drive
P O Box 47600
Olympia WA 98504-7600

Ms. Joan Sterling
**WASHINGTON STATE DEPARTMENT OF
EMERGENCY MANAGEMENT DIVISION**
Washington Military Department
Emergency Management Division
P O Box 40955
Olympia WA 98504-0955

Mr. Tony Eldred, Fish & Wildlife Biologist
**WASHINGTON STATE DEPARTMENT OF
FISH & WILDLIFE**
608 S Elliott Avenue
Wenatchee WA 98801

Mr. Rodney M. Woodin, Fish Passage Manager
**WASHINGTON STATE DEPARTMENT OF
FISH & WILDLIFE**
Intergovernmental Fisheries
600 Capitol Way North
Olympia WA 98501-1091

Mr. Bill Boyum, Manager of the Southeast Region
**WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES**
713 East Bowers Road
Ellensburg WA 98926

Mr. Bill Koss, Manager of Planning & Research
**WASHINGTON STATE DEPARTMENT OF
PARKS & RECREATION COMMISSION**
7150 Cleanwater Lane
P O Box 42668
Olympia WA 98504-2668

Mr. Bill Fraser
Parks Planner
**WASHINGTON STATE DEPARTMENT OF
PARKS & RECREATION COMMISSION**
Eastern Region
2201 N Duncan Drive
Wenatchee WA 98801-1007

Mr. Fredrick M. Suter
Transportation Planner
**WASHINGTON STATE DEPARTMENT OF
TRANSPORTATION**
North Central Region
P O Box 98
1551 North Wenatchee Avenue
Wenatchee WA 98807

Ms. Jolene Gosselin, P.E.
Regional Planning Engineer
**WASHINGTON STATE DEPARTMENT OF
TRANSPORTATION**
North Central Region
P O Box 98
1551 North Wenatchee Avenue
Wenatchee WA 98807

Mr. Dan Sarles, Jr., P.E.
Regional Projects Development Engineer
**WASHINGTON STATE DEPARTMENT OF
TRANSPORTATION**
North Central Region
P O Box 98
1551 North Wenatchee Avenue
Wenatchee WA 98807

Mr. Jim Eychaner, Planner
**WASHINGTON STATE INTERAGENCY
COMMITTEE FOR OUTDOOR RECREATION**
1111 Washington St SE
P O Box 40917
Olympia WA 98504-0917

Honorable Jim Lynch, Commissioner
CHELAN COUNTY
Courthouse
Wenatchee WA 98801

Honorable Esther Stefaniw, Commissioner
CHELAN COUNTY
Courthouse
Wenatchee WA 98801

Mr. Bob Hughes, Planning Director
CHELAN COUNTY
Planning Department
Courthouse Annex
411 Washington St
Wenatchee WA 98801

Mr. John Harrington
CHELAN COUNTY

Section 6: Mailing List

Planning Department
Courthouse Annex
411 Washington St
Wenatchee WA 98801

Mr. Terry Nowka, Coordinator
**CHELAN COUNTY NOXIOUS WEED
CONTROL BOARD**
400 Washington Street
Wenatchee WA 98801

Mr. Mark Urdahl, Director
PORT DISTRICT OF CHELAN COUNTY
125 Easy Street
P O Box 849
Wenatchee WA 98807

Ms. Nanc Reznicek
PORT DISTRICT OF CHELAN COUNTY
125 Easy Street
P O Box 849
Wenatchee WA 98807

Ms. Bonnie Cannon, Port Commissioner
PORT DISTRICT OF CHELAN COUNTY
P O Box 849
Wenatchee WA 98807

Mr. Jerry Osterman, City Administrator
CITY OF CHELAN
317 E Johnson Avenue
P O Box 1669
Chelan WA 98816

Mr. Peter Rodionoff, City Council Member
CITY OF CHELAN
P O Box 1543
107 Junior Point Court
Chelan WA 98816

Mr. Dennis Osborn
Planning/Community Development Director
CITY OF CHELAN
317 E Johnson Avenue
P O Box 1669
Chelan WA 98816

Mr. David Sypher
Public Works Director/City Engineer
CITY OF CHELAN
50 Chelan Falls Highway
P O Box 1669
Chelan WA 98816

Mr. Greg Moser, Park and Recreation Director
CITY OF CHELAN
Parks and Recreation Department
619 W Manson Highway
P O Box 1669
Chelan WA 98816

Ms. Susan Young, Secretary
COMMUNITY COUNCIL OF CHELAN FALLS
851 First Street
P O Box 78
Chelan Falls WA 98817

Ms. Kathleen P. Miller, Chairman
COMMUNITY COUNCIL OF MANSON
P O Box 328
Manson WA 98831

Mr. Lanny Armbruster, Member
COMMUNITY COUNCIL OF MANSON
P O Box 328
Manson WA 98831

Ms. Kim Scutt
COMMUNITY COUNCIL OF STEHEKIN
Box 8
8 Stehekin Road
Stehekin WA 98852

Mr. Tom Taxelius
782 S Lakeshore Road
Chelan WA 98816

Mr. Steve Walter, Controller
BEEBE ORCHARD COMPANY
P O Box 878
80 McNeil Canyon Road
Chelan WA 98816

Mr. Art C. Campbell, Sr.
CAMPBELL'S RESORT
P O Box 278
Chelan WA 98816

Mr. Art C. Campbell, Jr.
CAMPBELL'S RESORT
P O Box 278
Chelan WA 98816

Mr. Clint Campbell
CAMPBELL'S RESORT
P O Box 278
Chelan WA 98816

Mr. Nick Nolen, President
CHELAN AIRWAYS
1328 W Woodin
P O Box W
Chelan WA 98816

Ms. Bonnie Newman, Secretary
CHELAN FALLS IRRIGATION DISTRICT
P O Box S
Chelan WA 98816

Ms. Lee Vonne Forney, Secretary
CHELAN RIVER IRRIGATION DISTRICT
P O Box 1837
Chelan WA 98816

Mr. Mike Mackey, Owner
COAST-TO-COAST HARDWARE
216 E Woodin
P O Box 129
Chelan WA 98816

Ms. Stella Walcker
HOTEL/MOTEL ASSOCIATION
322 W Woodin
P O Box 1509
Chelan WA 98816

Ms. Cindy Simmons, Secretary
ISENHART IRRIGATION DISTRICT
Highway 150
P O Box 428
Chelan WA 98816

Ms. Cindy Engstrom
LAKE CHELAN BOAT COMPANY
P O Box 186
1418 W Woodin Avenue
Chelan WA 98816

Mr. Jack Raines, President/Owner
LAKE CHELAN BOAT COMPANY
P O Box 186
1418 W Woodin Avenue
Chelan WA 98816

Mr. Chris Raines
LAKE CHELAN BOAT COMPANY
P O Box 186
1418 W Woodin Avenue
Chelan WA 98816

Ms. Loni Rahm, Executive Director
LAKE CHELAN CHAMBER OF COMMERCE
102 W Johnson
P O Box 216
Chelan WA 98816

Mr. Larry Peterson, CEO
LAKE CHELAN COMMUNITY HOSPITAL
P O Box 908
503 E Highland Avenue
Chelan WA 98816

Mr. Paul Cross, Secretary-Manager
LAKE CHELAN RECLAMATION DISTRICT
P O Box J
80 Wapato Way
Manson WA 98831

Mr. Rick Kamphaus, President
LAKE CHELAN RECLAMATION DISTRICT
P O Box J
80 Wapato Way
Manson WA 98831

Mr. Duane Hubbard, Vice-President
LAKE CHELAN RECLAMATION DISTRICT
P O Box J
80 Wapato Way
Manson WA 98831

Mr. Tom Pickett
Superintendent
LAKE CHELAN SCHOOL DISTRICT
P O Box 369
Chelan WA 98816

Mr. Robert Harris
LAKE LEVEL GROUP
Box 1920
Chelan WA 98816

Mr. Doug England
General Manager
MANSON GROWERS
1670 Manson Blvd
P O Box 322
Manson WA 98831

Mr. Lanny Armbruster, Manager
MANSON PARKS & RECREATION DISTRICT
P O Box 590
300 Quetilquasoon
Manson WA 98831

Section 6: Mailing List

Mr. Shannon Byquist, Chairman
MANSON PARKS & RECREATION DISTRICT
P O Box 590
300 Quetilquasoon
Manson WA 98831

Mr. Robin Bloch, Board Member
MANSON PARKS & RECREATION DISTRICT
P O Box 590
300 Quetilquasoon
Manson WA 98831

Mr. Dan Farrell, Superintendent
MANSON SCHOOL DISTRICT
P O Box A
Manson WA 98831

Ms. Phyllis Gleasman
TROUT APPLES
P O Box 669
Chelan WA 98816

Mr. Elmo Henry
TROUT BLUE CHELAN
P O Box 669
Chelan WA 98816

Mr. Paul Sebastian
TROUT BLUE CHELAN
P O Box 669
Chelan WA 98816

Mr. Tim Flood, Broker
WINDERMERE REAL ESTATE
126 E Johnson
P O Box 2382
Chelan WA 98816

Ms. Starla Kay Roels, Policy Analyst
COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 NE Oregon, Suite 200
Portland OR 97232

Mr. Bob Heinith, Hydro Coordinator
COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 NE Oregon, Suite 200
Portland OR 97008

Mr. Paul Ward, Environmental Biologist
CONFEDERATED TRIBES AND BANDS
Yakama Indian Nation

Fisheries Resource Management
P O Box 151
Toppenish WA 98948

Mr. Steve Parker
CONFEDERATED TRIBES AND BANDS
Yakama Indian Nation
Office of Legal Counsel
P O Box 151
Toppenish WA 98948

Mr. Joseph A. Pakootas, Chairman
CONFEDERATED TRIBES OF THE COLVILLE RESERVATION
Colville Business Council
P O Box 150
Nespelem WA 99155

Mr. Jerry Marco
CONFEDERATED TRIBES OF THE COLVILLE RESERVATION
Fish & Wildlife Program
P O Box 150
Nespelem WA 99155

Ms. Adeline Fredin
History/Archaeology Manager
CONFEDERATED TRIBES OF THE COLVILLE RESERVATION
Historical & Archaeological Department
P O Box 150
Nespelem WA 99155

Dr. Pete Rice, Tribal Archaeologist
CONFEDERATED TRIBES OF THE COLVILLE RESERVATION
Historical & Archaeological Department
P O Box 150
Nespelem WA 99155

Mr. Gregg Carrington, Licensing Manager
CHELAN COUNTY PUBLIC UTILITY DISTRICT
Licensing Department
327 N Wenatchee Avenue
P O Box 1231
Wenatchee WA 98807

Mr. Jack Vogel, Communications Director
NORTHWEST PUBLIC POWER ASSOCIATION
P O Box 4576
9817 NE 54th Street
Vancouver WA 98662-0576

Ms. Lorraine Bodi, Co-Director
AMERICAN RIVERS
Northwest Regional Office
400 E Pine Street, #225
Seattle WA 98122

Mr. John Gangemi
AMERICAN WHITEWATER AFFILIATION
482 Electric Avenue
Bigfork MT 59911

Mr. Audie Palmantier, President
CHELAN BASS CLUB
P O Box 212
314 Okanogan Street
Chelan WA 98816

Mr. Brian Mayer, Secretary
CHELAN BASS CLUB
HC 80 Box 274
Chelan WA 98816

Mr. Allen Steele, Commodore
LAKE CHELAN BOATING CLUB
P O Box 325
Chelan WA 98816

Mr. David Gray
LAKE CHELAN BOATING CLUB
482 Loop Avenue
Manson WA 98831

Mr. Larry Majchrzak
Site Monitor/President
LAKE CHELAN FLYERS
P O Box 907
1506 W Woodin Avenue
Chelan WA 98816

Mr. Lionel Space
LAKE CHELAN FLYERS
2354 W Prospect
Chelan WA 98816

Ms. Helen Kirkpatrick
LAKE CHELAN HISTORICAL SOCIETY
424 Highway 150
Chelan WA 98816

Mr. Rich Uhlhorn, Secretary
LAKE CHELAN RECREATION ASSOCIATION
315 E Woodin Avenue

P O Box 402
Chelan WA 98816

Mr. John Walker, President
LAKE CHELAN RECREATION ASSOCIATION
P O Box 402
Chelan WA 98816

Mr. Jim Urness, Board Member
LAKE CHELAN RECREATION ASSOCIATION
P O Box 402
Chelan WA 98816

Mr. Robert H. Watson, President
LAKE CHELAN SPORTSMEN'S COUNCIL
7750 South Lakeshore Rd #3
Chelan WA 98816

Mr. David Rush
LAKE CHELAN SPORTSMEN'S COUNCIL
118 Park
Chelan WA 98816

Mr. Mike Campbell
LAKE CHELAN SPORTSMEN'S COUNCIL
217 Trow Street
Chelan WA 98816

Mr. David Letnes, Commodore
LAKE CHELAN YACHT CLUB
12245-50 S Lakeshore Rd
Chelan WA 98816

Ms. Lauren Polson, Vice Commodore
LAKE CHELAN YACHT CLUB
P O Box 279
Waterville WA 98858

Mr. Ken Britt, Secretary/Treasurer
LAKE CHELAN YACHT CLUB
1307 Saddlerock Dr
Wenatchee WA 98801-3268

Mr. Paul Fielder
MULE DEER FOUNDATION
327 N Wenatchee Avenue
P O Box 1231
Wenatchee WA 98807

Ms. Judith Clark
NATIONAL AUDUBON SOCIETY/SAVE THE BUTTE

Section 6: Mailing List

1221 So Lakeshore Drive
Chelan WA 98816-9753

Mr. Dave Fluharty
**NORTH CASCADES CONSERVATION
COUNCIL**
3621 NW 64th Street
Seattle WA 98107

Mr. Patrick D. Goldsworthy
**NORTH CASCADES CONSERVATION
COUNCIL**
P O Box 95980
University Station
Seattle WA 98145-1980

Ms. Rosanna Detering
ROCK AND MINERAL CLUB
1120 Lower Joe Creek
Manson WA 98831

Ms. Phyllis Murra
SAVE CHELAN ALLIANCE
P O Box 1205
Chelan WA 98816

Mr. Phil Green
SNOWMOBILE CLUB
P O Box 1155
Chelan WA 98816

Ms. Jennifer Olsen
SILVERLINE PROJECTS, INC.
523 Valley Mall Parkway #432
East Wenatchee, WA 98802

Mr. Scott Yates
TROUT UNLIMITED
213 SW Ashe, Suite 211
Portland OR 97204

Ms. Mona Janopaul, Esq.
Conservation Counsel
TROUT UNLIMITED
1500 Wilson Blvd, Suite 310
Arlington VA 22209-2404

Mr. Gordon Goodwin
WASHINGTON SPORTSMEN ASSOCIATION
5002 Joe Miller Road
Wenatchee WA 98801

Mr. Jack Speer, Energy Manager
ALUMINUM COMPANY OF AMERICA
6200 Malaga Highway
Malaga WA 98828-9728

Mr. Jay Brueggeman
PARAMETRIX, INC.
5808 Lake Washington Blvd NE, Suite 200
Kirkland WA 98033-7350

Mr. Greg Green
PARAMETRIX, INC.
5808 Lake Washington Blvd NE, Suite 200
Kirkland WA 98033-7350

APPENDIX A: ISSUE IDENTIFICATION

APPENDIX A: Issue Identification **A-1**
LARC Group Agency Meeting, March 25, 1998..... A-3
Fish Group Agency Meeting, March 30, 1998 A-13
Public Meeting, May 12, 1998..... A-21

LARC GROUP AGENCY MEETING, MARCH 25, 1998

			White Papers/ICD															
Issue Identification	Rank	Mean	Water Quality Monitoring	Shoreline Erosion	Bypass Reach Flow Releases	Fisheries Investigation	Flow Augmentation	RTE Botanical	Riparian Zone Investigation	Wildlife Investigation	Cultural/ Historical	Fish Stranding Investigation	Recreational Plan Update	Recreational Flow Study	Land Mgmt & Aesthetics	Lake Levels	ICD	
<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
Shoreline issues: protection of shoreline	1	3.00		X							X				X			
Planning: coordination and communication of this and other public planning	2	2.94							X		X				X			
Economics: recreational impacts	3	2.94											X					
Bypass Reach/recreation: safety	4	2.91			X									X				
Economics: long-term ramifications, who maintains/funded how?	5	2.88													X			
Planning: consider recreational use trends (technology, etc.)	6	2.88											X					
Planning: integrated resource management as it relates to land use	7	2.88							X		X				X			
Planning: consideration into distant future	8	2.81													X			
Bypass Reach/recreation: safety: potential for being trapped	9	2.80			X									X				
Timing of the Drawdowns: no bath tub ring during high visit season	10	2.75														X		
Timing of the Drawdowns: no bath tub ring during high visit season	11	2.75														X		
Planning: consider recreational carrying capacity	12	2.75									X		X					
Planning: integrate with other resource objectives	13	2.75							X		X				X			
Planning: development of shoreline	14	2.75							X		X				X			
Lake Levels: use of recreational facilities	15	2.75									X		X			X		
Recreation: sanitation	16	2.75	X															
Recreation uplake from dam: erosion during high water	17	2.73		X					X									
More Water Quality: water quality enforcement:	18	2.71	X														X	

LARC GROUP AGENCY MEETING, MARCH 25, 1998

			White Papers/ICD															
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<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
dumping effluent from boats																		
Planning: consider changing demographics	19	2.69																
Planning: limits of acceptable change	20	2.69																
Lake Levels: operational flexibility as in recreational use seasons	21	2.69																
Lake Level Fluctuation: lake shore erosion	22	2.69		X														
Lake Level Fluctuation: public access areas	23	2.69																
Lake Level Fluctuation: impact on fisheries, flows attract Columbia River fish	24	2.69										X						
Development: impact on septic systems (higher use)	25	2.69	X															
Development: potential for increased pollution	26	2.69	X															
More Water Quality: water quality enforcement	27	2.67	X															
Bypass Reach/recreation: impact on power generation, cost of power	28	2.64			X													
Bypass Reach/recreation: safety: during spill and non-spill periods	29	2.64																
Timing of the Drawdowns: no bath tub ring during high visit season	30	2.63																
Economics: must be economically viable to PUD	31	2.63	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Planning: monitoring recreational use	32	2.63																
Planning: water quality (septic and storm waters)	33	2.63	X															
Lake Level Fluctuation: riparian habitat	34	2.63																
Erosion: loss of soil	35	2.63		X														
Erosion: habitat in general	36	2.63		X														

LARC GROUP AGENCY MEETING, MARCH 25, 1998

			White Papers/ICD															
Issue Identification	Rank	Mean	Water Quality Monitoring	Shoreline Erosion	Bypass Reach Flow Releases	Fisheries Investigation	Flow Augmentation	RTE Botanical	Riparian Zone Investigation	Wildlife Investigation	Cultural/ Historical	Fish Stranding Investigation	Recreational Plan Update	Recreational Flow Study	Land Mgmt & Aesthetics	Lake Levels	ICD	
<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
Erosion: shoreline access (undercut banks)	37	2.63		X					X									
Recreation: public boating access	38	2.63											X					
Land Use: spawning habitat, disruption and access to	39	2.62				X									X		X	
Bypass Reach/recreation: safety: concern for emergency services being access	40	2.60			X									X				
Timing of the Drawdowns:	41	2.60														X	X	
Development: more boating, potential for pollution	42	2.60	X															
Erosion: effect on cultural	43	2.60		X					X		X							
Recreation: carrying capacity	44	2.60									X							
Bypass Reach/recreation: impact on power generation, cost of power: associated with increased flows in the gorge	45	2.57			X													
Bypass Reach/recreation: impact on parks of higher use	46	2.56			X									X				
Recreation uplake from dam: lake access including low-water areas	47	2.56														X		
Recreation uplake from dam: year-round launch need	48	2.56											X			X		
More Water Quality: milfoil quality	49	2.56	X														X	
Erosion: loss of land	50	2.56		X							X				X			
Recreation: marine and boat moorage	51	2.56											X					
Education: uniqueness of lake	52	2.50									X							
Education: taking opportunities to educate public	53	2.50									X							
Planning: anticipate future pressure from Puget	54	2.50													X			

LARC GROUP AGENCY MEETING, MARCH 25, 1998

			White Papers/ICD															
Issue Identification	Rank	Mean	Water Quality Monitoring	Shoreline Erosion	Bypass Reach Flow Releases	Fisheries Investigation	Flow Augmentation	RTE Botanical	Riparian Zone Investigation	Wildlife Investigation	Cultural/ Historical	Fish Stranding Investigation	Recreational Plan Update	Recreational Flow Study	Land Mgmt & Aesthetics	Lake Levels	ICD	
<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
Sound, etc.																		
Planning: land conversions, lands that are changed for alternate uses (affects habitat)	55	2.50							X		X				X			
Planning: seasonal flow augmentation (t/e species)(bypass reach and Columbia River)	56	2.50					X								X			
Recreation uplake from dam: sand management (shifting): lack of, or too much	57	2.50		X														
More Water Quality: need for boat dumping areas, boat launches?	58	2.50											X					
Economics: impact of pool changes on fishing (tourism)	59	2.50													X	X		
Flooding: higher lake levels increase flooding risk	60	2.50														X		
Address Lake Chelan Valley comprehensive public trails plan	61	2.50		X					X						X			
Aesthetics – drawdowns ugly	62	2.50											X					
Flow impact on erosion in bypass	63	2.50					X				X		X		X			
Timing of the Drawdowns: no bath tub ring during high visit season	64	2.47															X	
Economics: upper lake recreation, distant draw downlake more local	65	2.47													X			
Shoreline issues: retaining wall encroachment and boat docks	66	2.47													X			
Bypass Reach/recreation: appropriate minimum flows	67	2.46			X									X	X			
Bypass Reach/recreation: impact on cultural resources	68	2.44												X				
Economics: fiscal needs of affected agencies	69	2.44													X			

LARC GROUP AGENCY MEETING, MARCH 25, 1998

			White Papers/ICD															
Issue Identification	Rank	Mean	Water Quality Monitoring	Shoreline Erosion	Bypass Reach Flow Releases	Fisheries Investigation	Flow Augmentation	RTE Botanical	Riparian Zone Investigation	Wildlife Investigation	Cultural/Historical	Fish Stranding Investigation	Recreational Plan Update	Recreational Flow Study	Land Mgmt & Aesthetics	Lake Levels	ICD	
<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
Lake Levels: shoreline erosion and structural damage	70	2.44		X														
Lake Level Fluctuation: wear and tear on docks, special docks required	71	2.44															X	
Lake Level Fluctuation: lwd fish habitat	72	2.44										X					X	X
More Water Quality: reservoir changes impact enforcement	73	2.44															X	
Economics: lack of year-round economic base	74	2.44													X			
Bypass Reach/recreation: positive economic benefit to Chelan Falls, City of Chelan	75	2.43			X								X	X				
Bypass Reach/recreation: safety: steep walls	76	2.40			X									X				
Bypass Reach/recreation: safety: flow impact on erosion in bypass	77	2.40			X									X				
Economics: higher summer use increases problems, more balance needed	78	2.40																
Timing of the Drawdowns: no bath tub ring during high visit season	79	2.38															X	
Timing of the Drawdowns: no bath tub ring during high visit season	80	2.38															X	
Timing of the Drawdowns: no bath tub ring during high visit season	81	2.38															X	
Planning: archeological (includes traditional cultural uses)	82	2.38													X			
Planning: disruptions of aesthetics	83	2.38													X	X		
Commercial Impacts: aesthetics	84	2.38													X			
Recreation uplake from dam: marina not useable during low water	85	2.38											X			X		

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<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
Erosion: structural damage (i.e. marina)	86	2.38							X									
Bypass Reach/recreation: safety: vehicle traffic in bypass reach area	87	2.33			X									X				
Recreation uplake from dam: sand management (shifting)	88	2.33		X									X					
Extent of Drawdowns: facilities designed for historic drawdowns	89	2.31							X		X					X		
Education: historic significance	90	2.31									X							
Planning: land ownership and jurisdiction (i.e., trust lands)	91	2.31							X		X							
Lake Level Fluctuation: aesthetics drawdowns ugly	92	2.31									X					X		
Recreation: user conflicts between activities	93	2.31									X							
Bypass Reach/recreation: appropriate minimum flows: aesthetics	94	2.31			X													
Land Use: vegetation manipulation	95	2.29													X			
Economics: can this be done in a way that generates new jobs for our people?	96	2.27													X			
Recreation: sports fishing and management differences (commercial and notoriety)	97	2.27				X							X					
Timing of the Drawdowns: no bath tub ring during high visit season	98	2.25														X		
Lake Levels: shoreline (erosion and buildings) structures that trap debris	99	2.25														X		
Extent of Drawdowns: not for maximum drawdown allowed	100	2.20							X							X		
Activities on the Butte on wildlife	101	2.19								X								

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<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
Upper/lower Lake Differences: opportunity differences, due to geography	102	2.19											×					
Lake Level Fluctuation: docks designed for ferries	103	2.19														×		
Lake Level Fluctuation: fluctuating levels silt deposits from river	104	2.19														×		
Access: safety providing dam crossing	105	2.19											×					
Development: jet skis, noise pollution, etc.	106	2.19											×					
More Water Quality: park lawn areas contribute to pollution, lawn fertilizers	107	2.19	×														×	
Flooding: higher lake reduces dock and seawall maintenance	108	2.19							×							×		
Recreation: swimming access	109	2.19											×					
Bypass Reach/recreation: positive economic benefit to Chelan Falls, City of Chelan: associated with higher use	110	2.14			×													
Bypass Reach/recreation: day-use hiking potential	111	2.13			×									×				
Education: relationship between LCH & lake	112	2.13											×					
Recreation: land available for trail linkages	113	2.13											×					
Bypass Reach/recreation: safety: vandalism, trash, graffiti, etc.	114	2.07			×									×				
Timing of the Drawdowns: no bath tub ring during high visit season	115	2.06														×		
Lake Levels: exposure to vandalism, cultural resources	116	2.06														×		
Commercial Impacts: jet skis	117	2.06											×					
Lake Level Fluctuation: increased use causes	118	2.06														×		

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<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
safety concerns at powerhouse and the switchyard																		
Recreation uplake from dam: wind erosion during low water, City Park	119	2.06		X														
More Water Quality: debris	120	2.06	X															
Economics: loss of fish in the bypass reach	121	2.06										X					X	
Erosion: perching trees for bald eagles	122	2.06		X						X								
Bypass Reach/recreation: interpretive opportunities	123	2.00											X	X				
Lake Level Fluctuation: drawdown exposes mud turns to dust	124	2.00															X	
Lake Level Fluctuation: flat ground is at a premium	125	2.00							X								X	
Recreation: shoreline casements	126	2.00													X			
Bypass Reach/recreation: land ownership along the bypass	127	1.94			X										X			
Extent of Drawdowns: proposed increase in drawdowns	128	1.94							X								X	
Recreation: fuel access	129	1.94											X					
Bypass Reach/recreation: safety: photography aesthetics - scenic viewing	130	1.93			X								X	X				
Bypass Reach/recreation: appropriate minimum flows: fishability	131	1.93			X													
Bypass Reach/recreation: safety: associated with further developments	132	1.92			X													
Commercial Impacts: commercial boating	133	1.88															X	
Lake Level Fluctuation: impact on private property owners	134	1.88															X	

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Lake Level Fluctuation: lwd debris boat safety	135	1.81															X	
Lake Levels: property values	136	1.80															X	
Access: link dam access to Riverwalk Park	137	1.80											X					
Water: flows could decrease downlake temperatures	138	1.79	X															
Bypass Reach/recreation: fishing potential	139	1.75			X													
Ball Field on PUD Property: potential for expansion of facilities	140	1.73											X					
Planning: irrigation projects	141	1.69													X			
Commercial Impacts: paragliding	142	1.69											X					
Lake Level Fluctuation: development over the penstock	143	1.69											X					
Access: across dam for the public	144	1.69											X					
Bypass Reach/recreation: safety: wildlife viewing	145	1.60			X					X								
Bypass Reach/recreation: zoning-school development, etc.	146	1.60			X													
Commercial Impacts: gaming decisions (casino)	147	1.56											X					
Hang Gliding and Paragliding: A place to land, front and back side of the Butte	148	1.50											X					
Bypass Reach/recreation: potential for kayaking	149	1.50			X									X				
Grand Mean		2.35																

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Fish management: Native Species: Cutthroat - status?	1	3.00				X												X
Fish management: Native Species: Bull Trout - status?	2	3.00				X												X
Fish management: Native Species	3	3.00				X												X
Fish management:	4	2.92				X												X
Land development control	5	2.86													X			
Don't know what we have	6	2.78							X									X
Lake level fluctuations: Tributary access (migration into and up)	7	2.77							X							X		X
Rare plant survey	8	2.77						X										X
Lake level fluctuations: Fish affects	9	2.75		X		X												X
Shoreline protection of plant areas	10	2.75		X														
ESA impacts	11	2.75								X		X						X
Impacts on habitat from high lake levels	12	2.75		X												X		
Impacts on habitat fluctuations	13	2.75							X							X		
Noxious Weeds	14	2.75						X										X
Comprehensive fishery management plan	15	2.69				X												
Lake level fluctuations:	16	2.67														X		X
Lake level fluctuations: Spawning (tributaries and along lake)	17	2.67	X			X										X		X
Fish management: Baseline condition	18	2.67				X			X									X
Spotted Frog endangered	19	2.67							X	X								

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Rearing (tailrace) - ESA	20	2.64										X					X	
Water quality records/background	21	2.64	X														X	
Fish management practices	22	2.63				X											X	
Lake level control	23	2.63														X		
Fish stranding (adult) during spill events	24	2.62										X					X	
Maintain Water Quality in tailrace: Spawning and incubation	25	2.62	X														X	
Land development - affecting water quality, fisheries:	26	2.62	X			X									X			
Comprehensive land management plan	27	2.62									X				X			
Lake level fluctuations: Stehekin flow affects: Channel morphology	28	2.62														X		
Loss of habitat for:	29	2.60														X		
Lake level fluctuations: Stehekin flow affects	30	2.58														X		
General amphibian habitat assessment	31	2.58							X	X								
Maintain Water Quality in tailrace:	32	2.54	X														X	
Rearing (tailrace) - ESA: Anadromous	33	2.54										X					X	
Lake level fluctuations: Riparian habitat (historic/pre-dam habitat)	34	2.54							X							X		
Nesting water birds: Loss of habitat at head of lake	35	2.54							X	X						X		
Nesting water birds:	36	2.50								X								
Maintain Water Quality in tailrace: And quantity	37	2.46	X														X	

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Maintain Water Quality in tailrace: Resident/mergence	38	2.46	X														X	
Nesting water birds: Water fluctuation equals failed nests	39	2.46								X							X	
Lake level fluctuations: Fish affects: Spawning	40	2.45				X										X	X	
Water quality - powerhouse releases	41	2.42	X														X	
Loss of habitat for: small mammals	42	2.42								X								
Impacts on habitat from people encroachment	43	2.38							X	X								
Woody debris: Amphibian, Invertebrate, fish, safety	44	2.31				X				X								
Fish management: Tributary access inspection	45	2.31				X			X								X	
Fish management: Fish stocking	46	2.31				X											X	
Loss of winter range	47	2.31								X								
Reintroduction - North Shore	48	2.31								X								
Lake level fluctuations: Stehekin	49	2.27														X		
Fern species waterline habitat loss	50	2.27														X		
Lake level fluctuations: Stehekin flow affects: All tributaries	51	2.25														X		
Loss of habitat for: song birds	52	2.25								X						X		
Impacts on biodiversity	53	2.25							X									
Impacts on non-native species	54	2.25				X			X									
Potential spawning area in lower bypass?	55	2.23										X					X	
Land development - affecting water quality,	56	2.23	X												X			

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fisheries: Boats/people																		
Fish management: Recreation fishing	57	2.23											X					X
Fish management: Fish distribution pattern	58	2.23				X												X
Fish management: Baseline condition: Larry Brown Rep?	59	2.22				X												X
Are project operations likely to eliminate plants	60	2.20																
Bighorn versus domestic grazing permits	61	2.17								X								
Bald Eagle and Osprey:	62	2.17								X								
Bald Eagle and Osprey: Loss of nesting habitat	63	2.17								X				X				
Fish management: Fish stocking: Genetics	64	2.15				X												X
Bypass reach flows	65	2.14			X													
Cruprina vulgaris	66	2.10						X										
Bald Eagle and Osprey: Reduced osprey numbers along Lake Chelan	67	2.09								X								
Knap weed	68	2.08						X										
Rearing (tailrace) - ESA: Resident	69	2.08			X							X						X
Fish occlusion	70	2.08				X						X						
Sediment transport via bypass: Gravel recruit for spawning?	71	2.08			X													
Land development - affecting water quality, fisheries: Building	72	2.08	X															
Fish management: Fish stocking: Disease	73	2.08				X								X				
Milfoil	74	2.08											X					

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Analysis of barriers	75	2.00				X						X				X		
Quality of potential habitat	76	2.00				X												
Woody debris:	77	2.00				X									X			
Loss of habitat from increased level	78	2.00				X										X		
Loss of habitat from water rising	79	2.00				X										X		
Fawning cover	80	2.00								X								
Thermal cover	81	2.00								X								
Water rights	82	2.00													X		X	
Chelan Mountain Snail	83	2.00								X					X			
Sediment transport via bypass	84	1.92			X													
Woody debris: recruit/removal	85	1.92							X									
Land development - affecting water quality, fisheries: Agricultural runoff	86	1.92	X												X		X	
Land development - affecting water quality, fisheries: Domestic use	87	1.92	X												X			
Habitat loss	88	1.92														X		
Protect until Reach 100 count	89	1.92								X								
Lake level fluctuations: Milfoil	90	1.91	X													X		
Water quality - powerhouse releases: TDG	91	1.89	X															
Land development - affecting water quality, fisheries: Erosion (waves due to boats)	92	1.85	X	X														
Land development - affecting water quality, fisheries: Aesthetics	93	1.85	X															

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Lake level fluctuations: Docks	94	1.85														X		
No escape cover during drawdown	95	1.85							X									
Maintain fir and maple habitat	96	1.85							X									
Invertebrate production?	97	1.83				X												
Kid survival rate, double the number	98	1.83							X	X								
Butterflies	99	1.78								X								
Supplementation of Columbia River Fish/water quality	100	1.77			X		X											
Water Temperatures - from powerhouse	101	1.77	X														X	
Quality of potential habitat: Gravel recruit	102	1.77			X													
Predation in winter	103	1.77								X								
Loss of foraging area	104	1.77								X								
Perrigrine Falcon: Predator/prey relationship	105	1.73								X								
Perrigrine Falcon:	106	1.71								X							X	
Upland birds:	107	1.71								X							X	
Mixing of fish species and genetics	108	1.69				X												
Human interaction	109	1.67								X								
Fish reproduction - minimum valve	110	1.62								X								
Black bear versus people	111	1.62				X				X								
Maintain pre-fire population buck-to-doe ratio	112	1.58								X								
Predation on deer winter/spring range	113	1.55								X								
Temperature control at dam	114	1.54	X															

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People and cougar interaction	115	1.50								X								
Big population = high predation on fawns	116	1.46								X								
Temperature changes due to potential changes in reservoir levels (lower end within Chelan area)	117	1.42														X		
Upland birds: Maintaining bird feeders	118	1.36								X							X	
Achieve huntable population	119	1.31								X								

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I.10	Impact on recreational facilities	1	3.00														X	
I.66	Recreational impacts	2	2.95								X							
I.64	Overall recreation - impact on economics - need for high quality recreational amenities	3	2.83										X					
I.11	Timing of the drawdowns: no bath tub ring during high visit season	4	2.81						X		X				X	X		
I.3	Integrated resource management as it relates to land use	5	2.80								X				X			
I.18	Lake levels higher May through September	6	2.78						X								X	
I.20	Lake fluctuation, including earlier and longer or up a month earlier than now	7	2.78						X								X	
I.35	Water quality monitoring	8	2.78	X														
I.42	Recreational carrying capacity	9	2.75										X					
I.43	Public boating access	10	2.74										X					
I.74	Economics of changing drawdown times	11	2.74												X			
I.6	Partnership with PUD agency to agency to share expertise, such as state grants, street-ends, others	12	2.71												X			
I.72	Need for year-round recreation economy	13	2.65										X					
I.41	Maintain fisheries programs	14	2.65			X												X
I.57	Protection of shore line	15	2.62		X						X							
I.51	Need better boating destination points	16	2.59										X					
I.58	Planning: development of shoreline	17	2.59												X			
I.4	Comprehensive fishery management plan	18	2.56			X												X

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I.33	Debris	19	2.55															
I.63	Stehekin maximum lake levels	20	2.52															
I.15	Impact on commercial facilities	21	2.50															
I.62	Stehekin mud flats safety (logs)	22	2.50															
I.54	Improved boating launches	23	2.48															
I.65	Stehekin mud flat debris (boating) and sediment buildup	24	2.48															
I.34	Water rights	25	2.48															
I.73	Impact of project operation on economic base	26	2.48															
I.25	Loss of soil/land	27	2.45															
I.19	Better navigation aids on the lake, either maintaining the current or new, improved ones	28	2.45															
I.70	Lack of year-round economic base	29	2.43															
I.37	Fish management	30	2.40															
I.44	Marine and boat moorage	31	2.39															
I.5	Fish management: Fish stocking	32	2.39															
I.1	Coordination and communication of this and other public planning	33	2.37															
I.27	Structural damage (i.e. marina)	34	2.35															
I.36	Need for public marina at lower end of lake, use of District property/Goodfellow fill	35	2.35															
I.75	Economics of efficiency improvements and plant upgrades	36	2.33															

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I.17	Stehekin mud flats	37	2.32								X					X		
I.52	More parking at existing boat launches	38	2.32										X					
I.53	More boat launches	39	2.32										X					
I.68	Education: uniqueness of lake	40	2.32	X							X							
I.26	Shoreline access (undercut banks)	41	2.32								X				X			
I.7	Irrigation and pumping capabilities	42	2.29										X		X			
I.59	Stehekin debris on mud flats	43	2.27						X									
I.8	Centralization of information	44	2.24								X				X			
I.55	Loss of public access points	45	2.23										X					
I.69	Education: taking opportunities to educate public	46	2.22										X					
I.2	Long-term ramifications, who maintains, funded how	47	2.21			X							X		X			
I.13	Erosion during high water	48	2.21	X	X						X				X	X		
I.28	Shoreline erosion caused by raising of the lake	49	2.20	X	X				X		X				X	X		
I.14	Structural damage, wear and tear on docks, special docks required	50	2.19										X		X	X		
I.32	Bio-engineering, rip rap, erosion control	51	2.18		X						X				X			
I.9	Large woody debris and fish habitat	52	2.16			X												
I.30	Sand drifting and impact of draw down	53	2.15													X		
I.21	Improved snowpack forecasting	54	2.14													X		
I.49	Impacts on recreation facilities that are not water-related	55	2.14										X					
I.60	Stehekin aesthetics regarding the mud flats	56	2.14						X						X	X		

PUBLIC MEETING, MAY 12, 1998

				White Papers/ICD														
Issue Identification	Rank	Mean	Water Quality Monitoring	Shoreline Erosion	Bypass Reach Flow Releases	Fisheries Investigation	Flow Augmentation	RTE Botanical	Riparian Zone Investigation	Wildlife Investigation	Cultural/Historical	Fish Stranding Investigation	Recreational Plan Update	Recreational Flow Study	Lands Mgmt & Aesthetics	Lake Levels	ICD	
<i>All meeting attendees ranked the issues using a three-point scale: high priority (3), medium priority (2), or low priority (1). Refer to meeting minutes for details.</i>																		
I.40	Timing of stocking/effectiveness	57	2.13				X											
I.48	Chelan Butte Trails	58	2.13										X					
I.50	Navigation on Stehekin River	59	2.10										X		X			
I.39	Comprehensive land management plans	60	2.05								X							
I.45	Address Lake Chelan Valley comprehensive public trails plan	61	2.05								X							
I.12	Aesthetics - drawdowns ugly	62	2.00						X						X	X		
I.22	Flow impact on erosion in bypass	63	2.00	X		X												
I.46	PUD recreational study plan does not address hang gliding or trails	64	1.96										X					
I.38	Land development control	65	1.95												X			
I.23	Day-use hiking potential	66	1.90										X					
I.31	Erosion during high water periods	67	1.90		X						X					X		
I.67	Must be economically viable to PUD	68	1.90	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
I.56	Penstock property as a recreation resource	69	1.90										X					
I.29	Funds needed to mitigate erosion	70	1.89		X				X									
I.47	Need for paragliding/hangliding landing areas - must secure landing zones	71	1.87						X									
I.16	Flooding: higher lake levels increase flooding risk Stehekin	72	1.85						X							X		
I.24	Trails in Chelan Gorge	73	1.82			X					X							
I.71	Bypass Reach/recreation: positive economic benefit to Chelan Falls, City of Chelan	74	1.80			X												
I.61	Stehekin mud flats - dust	75	1.59						X		X					X		
	Grand Mean		2.33															

APPENDIX B: WHITE PAPERS

APPENDIX B: White Papers	B-1
Water Quality Monitoring	B-3
Shoreline Erosion Control	B-7
Bypass Reach (Gorge) Flow Releases*	B-9
Fishery Investigation*	B-13
Columbia River Flow Augmentation*	B-17
RTE Botanical.....	B-21
Riparian Zone Investigation	B-23
Wildlife Investigation.....	B-27
Cultural/Historical Survey	B-29
Fish Stranding Investigation*.....	B-33
Recreational Plan Update	B-35
Chelan River Recreational Flow Study	B-39
Project Lands Management & Aesthetics.....	B-41
Lake Level Investigation	B-45

* Modified at August 25, 1998, Fisheries Subcommittee Meeting.

**CHELAN COUNTY PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT
STUDY PLAN OUTLINE**

WATER QUALITY MONITORING

Study Goals

Quality of Lake Chelan water is often cited as an important element of the quality of life in the Chelan Basin as well as an important factor in the economic livelihood of the area. The lake is categorized as an oligotrophic lake having deep, cold, clear waters with low nutrient levels to support aquatic plants or fish species. The quality of water in Lake Chelan is influenced only to a minor degree, if at all, by the operation of the Chelan Hydroelectric Project. To a greater extent, water quality in the Chelan River downstream of the dam may be influenced by Project operations.

Resource Goals

A stated objective of the Lake Chelan Water Quality Committee (of which the District is a member) is to maintain the water quality of the lake at or near its present state while providing for growth in population and increases in tourism and recreational uses of the lake. The District continues to subscribe to the stated goal.

- Primary Objectives: Determine the effects of Project operations on lake water quality
- Determine the effects of Project operations on bypass reach (Chelan River Gorge) water quality.
- Determine the effects of Project operations on tailrace (powerhouse discharge) water quality.

Issues To Be Addressed

Potential issues identified during the several meetings with agencies and the public during March, April and May 1998 included the following:

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Recreation: sanitation	LARC	16/149
Dumping effluent from boats	LARC	18/149
Development: impact on septic systems (higher use)	LARC	25/149
Development: potential for increased pollution	LARC	26/149
Water quality enforcement	LARC	27/149
Economics: must be economically viable to PUD	LARC	31/149
Water quality (septic and storm waters)	LARC	33/149
Development: more boating, potential for pollution	LARC	42/149
Lake level fluctuations: Milfoil	LARC	49/149

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Park lawn areas contribute to pollution, lawn fertilizers	LARC	107/149
Debris	LARC	120/149
Flows could decrease downlake temperatures	LARC	138/149
Temperature changes due to potential changes in reservoir levels (lower end within Chelan area)	Fish	17/119
Water quality records/background	Fish	21/119
Maintain Water Quality in tailrace: Spawning and incubation	Fish	25/119
Land development - affecting water quality, fisheries:	Fish	26/119
Maintain Water Quality in tailrace:	Fish	32/119
Maintain Water Quality in tailrace: And quantity	Fish	37/119
Maintain Water Quality in tailrace: Resident/emergence	Fish	38/119
Water quality - powerhouse releases	Fish	41/119
Land development affecting water quality, fisheries: Boats/people	Fish	56/119
Land development affecting water quality, fisheries: Building	Fish	72/119
Land development affecting water quality, fisheries: Agricultural runoff	Fish	86/119
Land development affecting water quality, fisheries: Domestic use	Fish	87/119
Milfoil	Fish	90/119
Water quality - powerhouse releases: TDG	Fish	91/119
Land development affecting water quality, fisheries: Erosion (waves due to boats)	Fish	92/119
Land development affecting water quality, fisheries: Aesthetics	Fish	93/119
Water Temperatures - from powerhouse	Fish	101/119
Temperature control at dam	Fish	114/119
Water quality monitoring	Public	8/75
Water rights	Public	25/75
Education: uniqueness of the lake	Public	40/75
Erosion during high water	Public	48/75
Shoreline erosion caused by raising of the lake	Public	49/75
Flow impact on erosion in bypass	Public	63/75
Must be economically viable to PUD	Public	68/75

Informational Needs

- Description of existing water quality, uses and issues.
- Description of current activities which will have a bearing on water quality.
- Growth Management Planning.
- Sewer system improvements and extensions.
- Review current activities to determine if water quality issues are being appropriately addressed.

- Review recreation planning information to determine if water quality issues are being appropriately addressed.
- Collect data on temperature, dissolved gasses and specific conductivity.
- Develop information sufficient to obtain a Section 401 Water Quality Certification.
- Screen the list of issues to determine which are Project related and which are not.
- (Erosion will be addressed in a separate study except to the extent that erosion may result in a water quality problem.)

Level of Analysis

- Water quality data is currently being collected (starting in 1998) pursuant to a \$25,000 grant from the Washington Department of Ecology.
- District to supplement current activities to fund collection of temperature and total dissolved gas data in Lake Chelan, the Chelan River and in the tailrace at the outlet of the powerhouse.
- Summarize existing and historical data on lake water quality.
- Evaluate water quality impacts or benefits attributable to Project operation.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

SHORELINE EROSION CONTROL

Study Goal

- Identify erosion areas along Lake Chelan and develop conceptual erosion control design alternatives for consideration by relicensing team.

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Protection of shoreline	LARC	1/149
Erosion during high water	LARC	17/149
Lake shore erosion	LARC	22/149
Economics: must be economically viable to PUD	LARC	31/149
Loss of soil	LARC	35/149
Impacts on habitat in general	LARC	36/149
Impacts on shoreline access	LARC	37/149
Impacts on cultural resources	LARC	43/149
Loss of land	LARC	50/149
Recreation uplake from dam: sand management (shifting): lack of, or too much	LARC	57/149
Impacts on riparian habitat	LARC	61/149
Shoreline erosion	LARC	70/149
Recreation uplake from dam: sand management (shifting)	LARC	88/149
Recreation uplake from dam: wind erosion during low water, City Park	LARC	119/149
Impact on trees for bald eagles	LARC	122/149
Reservoir Fluctuations	Fish	9/119
Impact on Fish		
Shoreline protection of plants	Fish	10/119
Impact on habitat from high levels	Fish	12/119
Land development – erosion	Fish	92/119

Shoreline Erosion Control

Protection of shoreline	Public	15/75
Loss of soil/land	Public	27/75
Erosion during high water	Public	48/75
Shoreline erosion caused by Reservoir Fluctuations	Public	49/75
Bio-engineering, rip rap, erosion Control	Public	51/75
Erosion during high water	Public	67/75
Must be economically viable to PUD	Public	68/75
Funds needed to mitigate	Public	70/75

Informational Needs

- Description of areas along Lake Chelan that have been subject to erosion.
- Description of past erosion control measures that have been implemented and a description of the success of those measures.
- Description of potential erosion control alternatives along with relative costs and effectiveness (literature review).
- Description of existing erosion sites along Lake Chelan with photo documentation.

Level of Analysis

- Summary of existing information: (1) past erosion control measures and (2) potential erosion control alternatives.
- Field reconnaissance: for entire Lake Chelan shoreline, document shoreline erosion areas greater than 50 feet long or that have the potential to affect areas of significant value.
- Preliminary/Conceptual Design: for each site identified, determine possible erosion control measures (e.g. bio-engineering) and make recommendation for most appropriate solution. Emphasis should be placed on low-cost and effective conceptual designs that can be implemented by local landowners.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

BYPASS REACH (GORGE) FLOW RELEASES

Study Goals

- Identify the need for releases into the bypass reach for water quality, fisheries, and recreational purposes.
- Determine the most appropriate releases to protect and enhance anadromous species in the lower section of the bypass reach and resident species in the upper section with consideration of the potential limiting factors.
- Anadromous passage evaluation.

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Safety	LARC	4/149
Potential for being trapped	LARC	9/149
Impact on power generation	LARC	28/149
Economics: must be economically viable to PUD	LARC	31/149
Emergency access	LARC	40/149
Costs associated with flows	LARC	45/149
Impacts on parks	LARC	46/149
Appropriate minimum flows	LARC	67/149
Positive economic benefit	LARC	75/149
Safety: steep walls	LARC	76/149
Impact on erosion	LARC	77/149
Safety: vehicle traffic	LARC	87/149
Aesthetic flows	LARC	94/149
Positive economic benefit	LARC	110/149
Day-use hiking potential	LARC	111/149
Vandalism, trash, graffiti	LARC	114/149
Land ownership	LARC	127/149
Scenic viewing	LARC	130/149
Fishability	LARC	131/149
Safety/development	LARC	132/149
Fishing potential	LARC	139/149

Wildlife maintenance viewing	LARC	145/149
Development	LARC	146/149
Potential for kayaking	LARC	149/149
Bypass reach flows	Fish	65/119
Rearing (tailrace) – ESA: Resident	Fish	69/119
Sediment transport	Fish	71/119
Analysis of barriers	Fish	75/119
Sediment transport	Fish	84/119
Supplementation of Columbia River	Fish	100/119
Quality of potential habitat: Gravel recruit	Fish	102/119
Flow impact on erosion	Public	63/75
Must be economically viable to PUD	Public	68/75
Trails in gorge	Public	73/75
Economic benefit of recreation	Public	74/75

Potential Limiting Factors and Considerations

Fishery Resources:

- Not capable of developing self-sustaining population of fish in the bypass
 - Low nutrient water
 - Limited food supply (benthic productivity)
 - Poor habitat (medium to large round boulders)
 - Difficult to hold fish in bypass reach
 - High summer temperatures
- Stocking of sport-fish in bypass reach not best use of resource
- Fishability limited
 - Visibility of water very high
 - Access limited

Safety:

- Potential for people getting trapped during releases
- Emergency access limited
- Vandalism

Power Benefits:

- Impact on power generation

Informational Needs

- General description of bypass reach including setting, length, slope, substrate types, etc.
- Determine depths and velocities at various cross-sections and flows and fish observation for use curve calibration.

- Obtain preferences curves for steelhead and chinook (depth, velocity, substrate and water quality) spawning, rearing and incubation.
- Obtain temperature data from operator logs (penstock).
- Obtain hydrology data to determine frequency of spill in bypass reach and potential flushing or scouring flows.
- Surveys of fish use of bypass reach under current operations in conjunction with stranding observations.
- Presence or absence of lamprey.

Level of Analysis

- Collect field information necessary to determine potential limiting factors.
- Determine impact on power generation.
- Select critical cross-sections in lower section and field verify flow/depth/velocity relationships.
- Develop hydraulic model to determine other flow/depth/velocity relationships in all sections of bypass reach.
- Analyze data to determine feasibility of lower section bypass reach supporting anadromous species and upper section of the bypass reach supporting resident species.
- Document aesthetics of all potential flow releases.
- Document relicensing group decision regarding appropriate flow levels in the bypass reach (gorge) supported by factual information.
- Mitigation/enhancement potential of developing additional spawning substrate in the tailrace.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

FISHERY INVESTIGATION

Study Goal

- Evaluate the efficacy of Chelan’s kokanee, cutthroat and rainbow hatchery programs in terms of contribution to Lake Chelan spawning populations of these species and potential for adaptation towards supplementing existing populations or reintroduction of fish into restored habitat.
- Evaluate impact on lake sport fishery salmonids, the effect of lake level fluctuations.

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Economics: must be economically viable to PUD	LARC	31/149
Land Use: spawning habitat, disruption and access to	LARC	39/149
Recreation: sports fishing and management differences (commercial and notoriety)	LARC	97/149
Native Species: Cutthroat - status	Fish	1/119
Fish management: Native Species: Bull Trout – status?	Fish	2/119
Fish management: Native Species	Fish	3/119
Fish Management	Fish	4/119
Lake level fluctuations: Fish affects	Fish	9/119
Comprehensive fishery management plan	Fish	15/119
Lake Level fluctuations: Spawning	Fish	17/119
Fish Management: Baseline condition:	Fish	18/119
Maintain fisheries programs	Fish	22/119
Land development - affecting water quality, fisheries:	Fish	26/119
Lake level fluctuations: Fish affects: Spawning	Fish	40/119
Woody debris: Amphibian, Invertebrate, fish, safety	Fish	44/119
Fish Management: Tributary access inspection	Fish	45/119
Fish management: Fish Stocking, especially cutthroat	Fish	46/119
Impacts of non-native species	Fish	54/119
Fish Management: Fish distribution pattern	Fish	58/119
Fish Management: Baseline condition: Larry Brown Rep?	Fish	59/119
Fish management: Fish Stocking: Genetics	Fish	64/119

Fish occlusion	Fish	70/119
Fish management: Fish Stocking: Disease	Fish	73/119
Analysis of barriers, especially in lake levels	Fish	75/119
Quality of potential habitat	Fish	76/119
Woody debris:	Fish	77/119
Loss of habitat from increased level	Fish	78/119
Loss of habitat from water rising	Fish	79/119
Invertebrate production?	Fish	97/119
Mixing of fish species and genetics	Fish	108/119
Fish reproduction - minimum value	Fish	111/119
Maintain fisheries programs	Public	14/75
Comprehensive fishery management plan	Public	18/75
Fish Management	Public	30/75
Fish Management: Fish stocking	Public	32/75
Coordination and communication of this and other public planning	Public	33/75
Long-term ramifications, who maintains, funded how	Public	47/75
Large woody debris and fish habitat	Public	52/75
Timing and manner of stocking/effectiveness	Public	57/75
Must be economically viable to PUD	Public	68/75

Informational Needs

- Description of hatchery stocking program, stocks used, release strategies used, fish size, stocking locations, marking studies.
- Review of current literature and information on “native” west slope cutthroat of the Lake Chelan drainage and current classification of Twin Lakes stock.
- Literature review on role of woody debris in oligotrophic lakes.
- Data from tributary access/litoral inspection for adfluvial salmonids.

Level of Analysis

- Field truthing of current conditions in tributaries to update description in Brown (1984) of existing tributary access, analysis of barriers, quality of potential habitat and potential enhancement, existing fish density.
- Summarize existing information and compare with spot checks of current habitat and fish populations. Compare current status with tributary assessment in Brown, 1984.
- Analysis of options for revision of hatchery rearing and stocking strategies to encourage augmentation of natural spawning populations as well as sport fishing enhancement.
- Analysis of current hatchery fish stocks and recommendations for changes based on current ESA objectives and comprehensive management plan.
- Analysis of potential lake operation changes and impact on wild salmonids, egress/ingress to or from tributary streams.
- Assessment—Tributary enhancement or mitigation for lake level effects, including use of woody debris.

- Creel documentation of distribution and contribution of hatchery rainbow and lake trout population statistics.
- Stehekin basin data gap survey needs and cost sharing.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

COLUMBIA RIVER FLOW AUGMENTATION

Issues To Be Addressed

The National Marine Fisheries Service and the Washington State Department of Fish and Wildlife, Columbia River Operations Section, have requested that the Chelan Hydroelectric Project relicensing process consider use of specific amounts and timing of flows to provide augmentation of Columbia River flows to protect salmon and steelhead listed under the Endangered Species Act. Specifically, that the potential of providing 30 days of flow augmentation of 15,000 cfs or greater during the month of April be evaluated. NMFS considers waters impounded by the Chelan Hydroelectric Project as a portion of the system that can provide augmentation flows because the Project impounds flows destined for the Columbia River.

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Economics: must be economically viable to PUD	LARC	31/149
Planning: seasonal flow augmentation (t/e species)(bypass reach and Columbia River	LARC	56/149
Flow impact on erosion in bypass	LARC	63/149
Supplementation of Columbia River Fish/water quality	Fish	100/119
Must be economically viable to PUD	Public	68/75

Project Operations and Capabilities

Currently, the Chelan Project operates the reservoir (Lake Chelan) at full pool (elevation 1,098 – 1,100) from June 30 - September 3. The powerhouse generates power using inflow to the lake during this period, with drafting from storage beginning after September. The reservoir is drafted for power generation through the winter months, with the annual minimum reservoir level managed by Chelan PUD in response to inflow and runoff forecasts to ensure refill by June 30. The average drawdown elevation is about 1,084.2, which usually occurs in March and April. The maximum allowable drawdown is to 1,079, but the lake is rarely drafted to 1,083. The reservoir is refilled to 1,088, if possible, by May 15 so that most irrigation pump intakes are functional for the beginning of the irrigation season.

The powerhouse is capable of discharges from 2,000 - 2,200 cfs, depending on headwater and tailwater conditions. To provide flows to the Columbia River that exceed this level requires

spilling water from the reservoir. This is only possible at reservoir elevations exceeding 1087, which is the elevation of the spillway crest. While the spillway is capable of passing 31,000 cfs at full reservoir, the spillway discharge capacity diminishes rapidly as reservoir elevations are lowered. Spills above 12,000 - 15,000 cfs may cause severe erosion problems in the Chelan River Gorge.

Inflows to the reservoir are seasonally and annually variable, with peak inflow generally occurring in May, June and July. Inflows average about 1,000 cfs in March, 2,000 cfs over the month of April, and 5,000 in May, but the inflows in May can vary considerably based on annual snowpack and the timing of warm weather or rainfall that hastens runoff. By September, inflow has decreased to below 1,000 cfs and ranges from 500 - 1,000 cfs on average until April.

Conflicting Objectives for Reservoir Operations

The use of reservoir storage to augment Columbia River flows for protection of salmon and steelhead would require drafting of the reservoir during the month of April, when Columbia River flows are low and Columbia River reservoir operations are attempting to manage for flood control, flow augmentation for fish protection, and refill requirements.

Lake Chelan is heavily used for recreation and the current license mandates reasonable efforts be made to be within 2 feet of full pool by June 30 to accommodate recreation and recreation-based tourist industries. The current operation curtails drawdown in March and April to assure reaching elevation 1098 by June 30. Issues raised by other stakeholders include an earlier refill schedule, which would require further limits in drawdown and earlier initiation of refill.

Use of the reservoir for production of electricity is most needed during the months of October - February, when inflows are lowest and demand for electrical power are highest. Releasing 15,000 cfs for 30 days would require that the spillway and gates be entirely replaced with a larger structure.

Other fisheries protection objectives have potential conflicts with use of the reservoir for flow augmentation. Protection of spawning and incubation habitat below the powerhouse may require maintenance of powerhouse flow rates through incubation and emergence, which probably occurs in April and May. Delaying the refill period by using storage for flow augmentation will require curtailment of powerhouse flow to refill. Further, the erosion and sediment load carried across the salmon spawning area by spill in April would coincide with the most critical period for incubating embryos. Stakeholders interested in protection of fisheries resources in the reservoir have raised the issue of spillway discharge resulting in emigration of fish from the lake, which, if it occurs, would be a bigger problem for the lake's landlocked chinook fisheries if spill came in April during the normal smolting and downstream migration period for juvenile chinook.

Ability of Project Storage to Augment Columbia River Flows

The usable storage of the Chelan Project to augment Columbia River flows is limited by several factors. These include the spillway crest elevation (1,087), which limits the amount of usable storage for flows exceeding powerhouse capacity to 13 feet (about 213,000 sfd) if the reservoir is

held full through the winter. By way of comparison, this amount of storage is equivalent to about 5.3 feet of the Grand Coulee reservoir (approximately 40,000 sfd per foot). This usable storage in Lake Chelan is less if the reservoir is drafted for winter power production. Also, the amount of daily flow that could be used for Columbia River augmentation is limited to 15,000 sfd above normal powerhouse flows because of erosion concerns in the Chelan River Gorge. Further, unless recreation values of Lake Chelan are to be sacrificed for fish flows, the use of storage for augmentation will be further limited, especially in years with low snowpack, to assure timely refill of the lake.

If the Project structures were modified to create a deep spillgate or flow release structure below the 1,087-foot elevation of the spillway crest, additional storage could be used for flow augmentation, but the lake would not refill until late in the year even with curtailment of powerhouse flows.

Level of Analysis

The reservoir operations model developed by Chelan PUD has been used to further analyze the potential levels of augmentation possible with existing and modified Project structures, the potential to refill the reservoir by June 30 with these augmentation operations, and the effect of the augmentation on Columbia River flows. On June 17, 1998, the Washington State Department of Fish and Wildlife indicated that model investigations should examine the possibility of releasing as much water as possible from Lake Chelan storage (15,000 cfs or more) during the month of April. In response, Chelan PUD investigated two scenarios: releasing the maximum amount of flow up to 15,000 cfs during the month of April with existing Project structures; and modifying Project structures to allow a constant release of 15,000 cfs throughout the month of April.

The existing Project structures limit the augmentation flows to an average of 8,000 cfs for the 30 day period (month of April). If Lake Chelan were completely full at the beginning of April, the Project would be capable of releasing 15,000 cfs for a total of six days before the discharge capacity of the spillway would be reduced by the lowering lake elevation. The flow at the end of April would be approximately 4,000 cfs and the average flow over the 30 days would be 8,000 cfs. Lake Chelan would refill by July 1 if no discharge (powerhouse or spill) were made from the lake during May and part of June. This operation regime would also greatly reduce Project generation by reserving all storage for Columbia River flow augmentation rather than for winter power production.

The average flow of the Columbia River at Vernita Bar for the month of April was 116,000 cfs for the period of 1960 through 1996. Flow augmentation of 8,000 cfs from Lake Chelan would increase flows at Vernita Bar by approximately seven percent.

Modification of the Project structures to allow discharge of 15,000 cfs for the full 30 days would result in the lake not refilling by July 1 in years with average or lower than average snowpack. The Lake would not reach elevation 1088 until after June 1 in many years, which would affect irrigation pump intakes that are used in May. Discharge from the lake would be curtailed for most of the summer in years with below average snowpack in order to achieve refill.

Columbia River Flow Augmentation

As part of this investigation, Chelan PUD will determine the feasibility of providing Columbia River flow augmentation at levels less than 15,000 cfs. Chelan PUD will consult with NMFS during this study.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

RTE BOTANICAL

Study Goals

- Identify occurrences of rare plant species, their distribution, and relative abundance.
- Provide management and enhancement recommendations when appropriate

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Economics: must be economically viable to PUD	LARC	31/149
Rare plant survey	Fish	8/119
Noxious Weeks	Fish	14/119
Cruprina vulgaris	Fish	66/119
Knap weed	Fish	68/119
Must be economically viable to PUD	Public	68/75

Informational Needs

- Review existing literature
- Conduct field studies to identify, map, and describe rare plant species in the project area.
- Input data into GIS database

Level of Analysis

- Once located and positively identified, map and document populations of rare plant species according to Washington Natural Heritage Program (WNHP) guidelines.
- Summarize survey results in a final report
- Include summary narrative of the natural history of plants found, potential threats to plant populations, and a complete list of all plant species found in the project area.
- Develop enhancement plans in coordination with resource agencies.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

RIPARIAN ZONE INVESTIGATION

Study Goals:

Assess the riparian zone health so that basin wide issues can be addressed. Two key objectives are to evaluate existing riparian plant and wildlife species and current distribution, extent and structure of riparian habitat. This will include terrestrial components as well as aquatic. This information will be blended with other safety, recreational, fisheries, ownership, and navigation concerns to form a comprehensive plan that addresses the needs of the resources.

Issues To Be Addressed:

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Integrated Resource Planning and Management:		
Coordination and Communication of this and other public planning	LARC	2/149
Integrated resource resource management as it relates to land use	LARC	7/149
Integrate with other resource objectives	LARC	13/149
Development of shoreline	LARC	14/149
Economics: must be economically viable to PUD	LARC	31/149
Land conversions, lands that are changed for alternate uses	LARC	55/149
Land ownership and jurisdiction	LARC	91/149
Fish management: Baseline condition	Fish	18/118
Reservoir Fluctuation:		
Aesthetics - drawdowns ugly	LARC	2/149
Erosion during high water(Recreation uplake from dam)	LARC	17/149
Erosion - loss of soil	LARC	35/149
Erosion - habitat in general	LARC	36/149
shoreline access(undercut banks)	LARC	37/149
Erosion - effect on cultural	LARC	43/149
impacts on riparian	LARC	61/149
structural damage (i.e.,marina)	LARC	86/149
Extent of Drawdowns: facilities designed for historic drawdowns	LARC	89/149
Extent of Drawdowns: not for maximum drawdown allowed	LARC	100/149
Dock and seawall maintenance during high water	LARC	108/149

Value of property and availability of flat ground	LARC	125/149
Extent of Drawdowns: proposed increase in drawdowns	LARC	128/149
Don't know what we have	Fish	6/119
Lake level fluctuation: Tributary access and lake spawning	Fish	7/119
Impact on (riparian) habitat fluctuations	Fish	13/119
Spotted Frog endangered (project within historic range)	Fish	19/119
General amphibian habitat assessment	Fish	31/119
Lake level fluctuations: Riparian habitat (historic/pre-dam habitat)	Fish	34/119
Nesting birds: Loss of habitat at head of lake and failed nests	Fish	35/119
Loss of habitat for: small mammals	Fish	43/119
Amphibian, Invertebrate, Fish, safety	Fish	45/119
Loss of habitat for: song birds	Fish	53/119
Impacts on biodiversity	Fish	54/119
Recruitment/Removal	Fish	85/119
No escape cover during drawdown	Fish	95/119
Maintain fir and maple habitat	Fish	96/119
Invertebrate production	Fish	98/119
Timing of the Drawdowns: no bath tub ring during high visit season	Public	4/75
Lake levels higher May through September	Public	6/75
Lake fluctuation, including earlier and longer or up a month earlier than now	Public	7/75
Impact on commercial facilities	Public	21/75
Stehekin mud flats safety (logs)	Public	22/75
Stehekin debris on mud flats	Public	43/75
Shoreline erosion caused by raising of the lake	Public	49/75
Stehekin aesthetics regarding the mud flats	Public	56/75
Aesthetics - drawdowns ugly	Public	62/75
Must be economically viable to PUD	Public	68/75
Funds needed to mitigate erosion	Public	70/75
Structural damage, wear and tear on docks, special docks required	Public	71/75
Flooding: higher lake levels increase flooding risk (Stehekin)	Public	72/75
Dust in Stehekin and other areas	Public	75/75

Informational Needs:

- Map of pre-dam riparian habitat
- Map existing zones of riparian habitat
- Survey riparian, plant and wildlife species, common and sensitive
- Assessment of riparian habitat types and structures (number of canopy layers, snags, down woody debris, shoreline configuration)

Level of Analysis:

- Summarize existing information about current and pre-Project riparian habitat
- Evaluate existing habitat structure and species conditions
- Identify opportunities for enhancements

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

WILDLIFE INVESTIGATION

Study Goals

- The PUD has established comprehensive programs at Lake Chelan to reduce the impact of the Project operations on fish and wildlife. Surveys of deer, mountain goat and bald eagle populations are conducted by boat along the reservoir to track their abundance and distribution, as well as the age and sex composition of the animals. Information derived from these surveys is used to manage the level of harvest and assess the condition of the wildlife habitat. Funds are provided for improving mule deer winter forage through prescribed burns and planting forage plants. The PUD also assists wildlife during the winter months by maintaining upland bird feeders and mineral blocks for mule deer and mountain goats.
- The impact of Project operations on large-game species will be determined through existing wildlife surveys and consultation with the relicensing team. The impact of Project Operations on small-game and other species will be determined through the proposed Riparian Zone Investigation.

Issues Being Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Economics: must be economically viable to PUD	LARC	31/149
Activities on the Butte on wildlife	LARC	101/149
Erosion: perching trees for bald eagles	LARC	122/149
Bypass Reach/recreation: safety: wildlife viewing	LARC	145/149
ESA impacts	Fish	11/119
Spotted Frog endangered	Fish	19/119
General amphibian habitat assessment	Fish	31/119
Nesting water birds: Loss of habitat at head of lake	Fish	35/119
Nesting water birds:	Fish	36/119
Nesting water birds: Water fluctuation equals failed nests	Fish	39/119
Loss of habitat for: small mammals	Fish	42/119
Impacts on habitat from people encroachment	Fish	43/119
Woody debris: Amphibian, Invertebrate, fish, safety	Fish	44/119
Loss of winter range	Fish	47/119
Reintroduction – North Shore	Fish	48/119

Wildlife Investigation

Loss of habitat for: song birds	Fish	52/119
Bighorn versus domestic grazing permits	Fish	61/119
Bald Eagle and Osprey:	Fish	62/119
Bald Eagle and Osprey: Loss of nesting habitat	Fish	63/119
Bald Eagle and Osprey: Reduced osprey numbers along Lake Chelan	Fish	67/119
Fawning cover	Fish	80/119
Thermal cover	Fish	81/119
Chelan Mountain Snail	Fish	83/119
Protect until reach 100 count	Fish	89/119
Kid survival rate, double the number	Fish	98/119
Butterflies	Fish	99/119
Predation in winter	Fish	103/119
Loss of foraging area	Fish	104/119
Perrigrine Falcon: Predator/prey relationship	Fish	105/119
Perrigrine Falcon:	Fish	106/119
Upland birds:	Fish	107/119
Human interaction	Fish	109/119
Fish reproduction - minimum valve	Fish	110/119
Black bear versus people	Fish	111/119
Maintain pre-fire population buck-to-doe ratio	Fish	112/119
Predation on deer winter/spring range	Fish	113/119
People and cougar interaction	Fish	115/119
Big population = high predation on fawns	Fish	116/119
Upland birds: Maintaining bird feeders	Fish	118/119
Achieve huntable population	Fish	119/119
Coordination and communication of this and other public planning	Public	33/75
Must be economically viable to PUD	Public	68/75

Information Needs

- None

Level of Analysis

- Continue with current wildlife surveys.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

CULTURAL/HISTORICAL SURVEY

Study Goal

- Fulfillment of Section 106 consultation requirements for the relicensing of the Lake Chelan Hydroelectric Project through development of a Programmatic Agreement among Chelan County PUD No. 1 (Chelan PUD), U.S. Forest Service, National Park Service, Confederated Tribes of the Colville Reservation (Colville Confederated Tribes), Confederated Tribes of the Yakama Nation (Yakama Indian Nation), Bureau of Indian Affairs--Portland, and the Washington State Historic Preservation Officer. The Federal Energy Regulatory Commission (FERC) and the Advisory Council will be involved at the approval stage.

Issues Being Addressed

- Establishment of a clearly understood, mutually agreed upon method for taking into account provisions of the National Historic Preservation Act for the undertakings of Chelan PUD associated with the Lake Chelan Hydroelectric Project.

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Shoreline issues: protection of shoreline	LARC	1/149
Planning: coordination and communication of this and other public planning	LARC	2/149
Planning: integrated resource management as it relates to land use	LARC	7/149
Planning: consider recreational carrying capacity	LARC	12/149
Planning: integrate with other resource objectives	LARC	13/149
Planning: development of shoreline	LARC	14/149
Lake Levels: use of recreational facilities	LARC	15/149
Economics: must be economically viable to PUD	LARC	31/149
Erosion: effect on cultural	LARC	43/149
Recreation: carrying capacity	LARC	44/149
Erosion: loss of land	LARC	50/149
Education: uniqueness of lake	LARC	52/149
Education: taking opportunities to educate public	LARC	53/149
Planning: land conversions, lands that are changed for alternate uses (affects habitat)	LARC	55/149
Recreation: trails and coordinated trails planning	LARC	63/149

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Extent of Drawdowns: facilities designed for historic drawdowns	LARC	89/149
Education: historic significance	LARC	90/149
Planning: land ownership and jurisdiction (i.e., trust lands)	LARC	91/149
Lake Level Fluctuation: aesthetics drawdowns ugly	LARC	92/149
Recreation: user conflicts between activities	LARC	93/149
Comprehensive land management plan	Fish	27/119
Recreational impacts	Public	2/75
Timing of the drawdowns: no bath tub ring during high visit season	Public	4/75
Integrated resource management as it relates to land use	Public	5/75
Protection of shore line	Public	15/75
Loss of soil/land	Public	27/75
Stehekin mud flats	Public	37/75
Education: uniqueness of lake	Public	40/75
Shoreline access (undercut banks)	Public	41/75
Centralization of information	Public	44/75
Erosion during high water	Public	48/75
Shoreline erosion caused by raising of the lake	Public	49/75
Bio-engineering, rip rap, erosion control	Public	51/75
Comprehensive land management plans	Public	60/75
Address Lake Chelan Valley comprehensive public trails plan	Public	61/75
Erosion during high water periods	Public	67/75
Must be economically viable to PUD	Public	68/75
Trails in Chelan Gorge	Public	73/75
Stehekin mud flats – dust	Public	75/75

Informational Needs

Conduct Survey:

- Preparation of an historic and prehistoric overview of existing information and themes.
- Complete a survey of historic and prehistoric properties and properties possessing cultural value to Native Americans and others in the Project area. This includes areas of traditional religious practices (TCPs). A survey describes the distribution of properties in the area; determines the number, location, and condition of properties; determines the types of properties actually present within the area; permits classification of individual properties; and records the physical extent of the physical properties. Special emphasis should be placed on areas of shoreline erosion, recreation sites and within the lake drawdown zone.

- Ensure that the survey is performed in accordance with accepted archaeological practices as defined in 36 CFR Part 800, Section 110 Guidelines, and the Secretary of the Interior's Standards and Guidelines, if required. Methods and protocols should be coordinated and integrated with those of others with cultural resource responsibilities of Lake Chelan
- Surveys and evaluation to be conducted with the appropriate members of the Programmatic Agreement.
- Laws and directives for cultural resources management.
 - The National Historic Preservation Act
 - American Indian Religious Freedom Act
 - Antiquities Act
 - Archaeological Resources Protection Act
 - Native American Graves Protection and Repatriation Act
 - Executive Order 11593 (Cultural Resources)
 - Executive Order 13007 (Indian Sacred Sites)
 - Archaeological and Historic Preservation Act of 1974
 - 36 CFR Part 800
 - 43 CFR Part 7
 - Wenatchee Forest Plan
 - North Cascades Management Plan

Level of Analysis

Develop Management Plan:

- Chelan PUD will consult with the appropriate parties to the Programmatic Agreement to develop a draft Cultural Resource Management Plan (CRMP).
- The CRMP will identify:
 - Management techniques and objectives (including criteria for determining which properties may be likely to yield information important in prehistory and history).
- A data recovery plan will be developed in the agreement. This plan will include how any recovery of Native American human remains will be treated.

Determine National Register Eligibility:

Methods of mitigating adverse effects on National Register and National Register eligible sites (including in situ preservation and law enforcement), monitoring, and curation.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

FISH STRANDING INVESTIGATION

Study Goals

- To determine types and numbers of fish that may be in the bypass reach after spillage.
- To identify a mitigation strategy to protect anadromous and resident fish that may be stranding in the bypass reach when spillage in the bypass flow is reduced or stopped.

Issues To Be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Impact on fisheries, flows attract Columbia River fish	LARC	24/149
Economics: must be economically viable to PUD	LARC	31/149
Lake Level Fluctuation: lwd recruitment	LARC	72/149
Loss of fish in the bypass reach	LARC	121/149
ESA Impacts	Fish	11/119
Rearing Tailrace – ESA	Fish	20/119
Fish stranding (adult) during spill events	Fish	24/119
Rearing (tailrace) – ESA: anadromous fish	Fish	33/119
Potential spawning areas in lower bypass	Fish	55/119
Rearing (tailrace) – ESA: Resident	Fish	69/119
Fish occlusion	Fish	70/119
Analysis of barriers	Fish	75/119
Must be economically viable to PUD	Public	68/75

Informational Needs

- Determine type and quantity of fish stranded in bypass reach after spillage occurs. (Include water quality, dissolved-oxygen gasses and temperature as part of the data collection.)
- Determine temporal pattern of outmigration of resident game fish from Lake Chelan.

Level of Analysis

- At the end of spill events, flows will be reduced slowly enough so that the pools remain connected.
- Initial ramping rates of 250 cfs will be employed.
- Depth of water will be measured in critical areas (lower-end of bypass reach between pools).

Fish Stranding Investigation

- As flows approach 500 cfs, ramp rate increments will decrease (to approximately ½ the total flow) and will stop when a minimum depth of one foot is obtained in the critical areas (for pool connectivity).
- Water temperatures will be monitored during ramping.
- Pools will be isolated long enough to conduct field observation (where safe) to verify that fish presence. Quantity and type of fish will be recorded in all pools.

Coordination With Agencies

- Representatives from agencies will be present during field investigation. Results will be presented to relicensing team.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

RECREATIONAL PLAN UPDATE

Study Goals

- Update the 1977 Recreational Development Plan.
- Prepare short and long-range alternatives for recreational development.
- Examine strategies for implementation of a Recreation Development Plan.

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Overall recreational impact on economy-need for high quality year-round recreational economic base	LARC	3/149
Recreational use trends (technology, etc.)	LARC	6/149
Recreational carrying capacity	LARC	12/149
Impacts on use of recreational facilities	LARC	15/149
Operational flexibility as in recreational use seasons	LARC	21/149
Economics: must be economically viable to PUD	LARC	31/149
Monitoring recreational use	LARC	32/149
Improved public boating access including: improved/more boat launches/lanes; more boat parking; marine and boat moorage; year-round access	LARC	38/149
Recreation uplake from dam: year-round launch need	LARC	48/149
Recreation: marine and boat moorage	LARC	51/149
Recreation: sanitation/dumping effluent from boats	LARC	58/149
Camping	LARC	62/149
Public trails and coordinated public trails planning	LARC	63/149
Bypass Reach/ recreation: positive economic benefit to Chelan Falls and City of Chelan	LARC	75/149
Recreation uplake from dam: marina not useable during low water	LARC	85/149
Recreation uplake from dam: sand management (shifting)	LARC	88/149
Recreation: sports fishing and management differences (commercial and notoriety)	LARC	97/149
Upper/lower Lake Differences: opportunity differences, due to geography	LARC	102/149
Provide safe “across dam” crossing and trail link to Riverwalk Park	LARC	105/149

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Development: jet skis, noise pollution, etc.	LARC	106/149
Education: relationship between LCH & lake	LARC	112/149
Recreation: land available for trail linkages	LARC	113/149
Commercial Impacts: jet skis	LARC	117/149
Swimming access	LARC	109/149
Interpretive opportunities	LARC	123/149
Recreation: fuel access	LARC	129/149
Photography, aesthetics-scenic and wildlife viewing	LARC	130/149
Access: link dam access to Riverwalk Park	LARC	137/149
Ballfield on PUD property: potential for expansion of facilities	LARC	140/149
Commercial Impacts: paragliding	LARC	142/149
Penstock property as a recreational resource	LARC	143/149
Access: across dam for the public	LARC	144/149
Commercial Impacts: gaming decisions (casino)	LARC	147/149
Hang Gliding and Paragliding: A place to land, front and back side of the Butte	LARC	148/149
Impacts on sport fishing (tourism)	Fish	57/119
Milfoil	Fish	74/119
Overall recreational impact on economy-need for high quality year-round recreational economic base	Public	3/75
Recreational carrying capacity	Public	9/75
Improved public boating access including: improved/more boat launches/lanes; more boat parking; marine and boat moorage; year-round access	Public	10/75
Maintain fisheries programs	Public	14/75
Need better boating destination points	Public	16/75
Improved boating launches	Public	23/75
Better navigation aids on the lake, either maintaining the current or new, improved ones	Public	28/75
Marine and boat moorage	Public	31/75
Need for public marina, with fuel access, at the lower end of the lake	Public	35/75
More boat launches	Public	39/75
More parking at existing boat launches	Public	38/75
Irrigation and pumping capabilities	Public	42/75
Loss of public access points	Public	45/75
Education: taking opportunities to educate public	Public	46/75

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Long-term ramifications, who maintains, funded how	Public	47/75
Lake level fluctuations/structural damage/wear and tear on docks/special docks required	Public	50/75
Impacts on recreational facilities that are not water related	Public	55/75
Chelan Butte Trails	Public	58/75
Navigation on Stehekin River	Public	59/75
PUD recreational study plan does not address hang gliding or trails	Public	64/75
Day-use hiking potential	Public	66/75
Must be economically viable to PUD	Public	68/75
Penstock property as a recreation resource	Public	69/75

Informational Needs

- Review of existing recreation resource assessment work.
- Recreational facility (GIS) mapping.
- Recreation resource inventory.
- Recreational use assessment. (*Currently underway*)
- Determine recreational impacts as a result of Project operations.
- Investigate feasibility of providing whitewater boating opportunities in the Bypass Reach.
- Investigate impact of reservoir fluctuations on recreational facilities.

Level of Analysis

- Define the overall context of recreation planning for Lake Chelan and develop a concept for the coordinated development and utilization of the lake's recreational resources.
- Provide additional information regarding existing recreational use and future demands and needs.
- Examine the need for additional recreational facilities, identify potential recreation sites, evaluate site suitability and resource capacity.
- Compile, review, and summarize all existing recreational resource management plans relevant to the recreational resources of the study area.
- Integrate resource management plans with land use and recreation plans.
- Map the existing recreational facilities, and areas reserved for future recreational development. Recreation resource mapping will show the location, nature and managing authority of existing and proposed recreational facilities, public access areas, undeveloped informal use locations, and areas set aside for future recreational development within the study area. Mapping should also identify the location and nature of Land and Water Conservation Fund Lands within the study area and all lands that have been designated for study for inclusion in

the National Wild and Scenic Rivers System, or that have been designated as wilderness area, recommended for such designation, or designated for wilderness area under the Wilderness Act. Mapping will also identify State, Federal and Indian Tribal agencies with responsibility for management of recreational resources on the affected lands and waters within study area.

- Provide a description and general overview of the existing recreation resources available for public use in the study area by identifying and mapping existing:
 1. Recreation Features (location, type, significance and sensitivity).
 2. Recreation Activity Areas (per SCORP planning) as they relate to the study area.
 3. Recreation Opportunity Spectrum (ROS) classes per USFS.
 4. ADA compliance.
 5. Physical carrying capacity of the Recreation Resources.
 6. Identification of any safety features to protect the public engaged in recreation.
 7. Determine the adequacy and condition of existing recreation facilities.
 8. Determine estimated operating costs, and identify the operating agencies, of existing recreation facilities.

- Define the existing recreational use in the study area including recreational activity types, high use locations by activity, daytime and overnight visits and temporal trends. Evaluate recreation needs in the study area to determine whether the needs can be accommodated by existing facilities, or if additional facilities are needed in the study area. The information gathered will be recorded in a computerized database and analyzed. A recreation study report including a concise summary of the Recreational Use Assessment information required for the Lake Chelan Project ICD will be prepared upon completion of the field season. Interim reports including the data collected-to-date will be compiled in July and September of 1998.

- Update the existing (1977) Lake Chelan Recreational Development Plan by defining short and long-range alternatives for recreation development and examining strategies for implementation.

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STUDY PLAN OUTLINE**

CHELAN RIVER RECREATIONAL FLOW STUDY

Study Goals

Identify the minimum and optimum flows for whitewater boating in the Chelan River, determine the flow suitability for different water craft; assess the quality of the whitewater resources (challenge, play spots, safety, etc.), and compare the whitewater resources of the Chelan River to whitewater resources statewide.

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Bypass reach/recreation: safety	LARC	4/149
Bypass reach/recreation: safety potential for being trapped	LARC	9/149
Bypass reach/recreation: impact on power generation, cost of power	LARC	28/149
Bypass reach/recreation: safety - during spill and non-spill periods	LARC	29/149
Economics: must be economically viable to PUD	LARC	31/149
Erosion: loss of soil	LARC	35/149
Erosion: habitat in general	LARC	36/149
Bypass reach/recreation: safety - concern for emergency services being accessible	LARC	40/149
Bypass reach/recreation: impact on parks with higher use	LARC	46/149
Bypass reach/recreation: appropriate minimum flows	LARC	67/149
Bypass reach/recreation: impact on cultural resources	LARC	68/149
Bypass reach/recreation: positive economic impact to Chelan Falls, City of Chelan	LARC	75/149
Bypass reach/recreation: safety - steep walls	LARC	76/149
Bypass reach/recreation: flow impact on erosion in bypass	LARC	77/149
Bypass reach/recreation: vehicle traffic in bypass reach area	LARC	87/149
Bypass reach/recreation: day-use hiking	LARC	111/149
Bypass reach/recreation: safety, vandalism, trash, graffiti	LARC	114/149
Bypass reach/recreation: interpretive opportunities	LARC	123/149
Bypass reach/recreation: land ownership along bypass	LARC	127/149
Bypass reach/recreation: safety - photography, aesthetics, scenic viewing	LARC	130/149

Issues to be Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Bypass reach/recreation: potential for kayaking	LARC	149/149
Flow impact on erosion in bypass	Public	63/75
Must be economically viable to PUD	Public	68/75
Trails in Chelan Gorge	Public	73/75

Informational Needs

- Description of the Chelan River (length, topography, setting, accessibility).
- Description of whitewater resources throughout Washington – class of whitewater, length of run, seasonal availability, use levels (literature review).
- Summary of expert opinions on minimum and optimum flows, suitability for different watercraft, and quality of the whitewater resources in the Chelan River.
- Description of the impacts of recreational flow releases on power and non-power resources.

Level of Analysis

- Summary of existing information: (1) description of the Chelan River and (2) description of statewide whitewater resources.
- Field effort: (1) Conduct a controlled flow field assessment at two or three flows using 5-20 pre-selected whitewater experts to determine minimum and optimum flows, suitability for different watercraft, and quality of the whitewater resources in the Chelan River. (2) Document the effects of recreational flow releases on erosion, sediment transport, water quality, botanical resources, and wildlife resources.
- Develop report that summarizes results of field effort.

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STUDY PLAN OUTLINE**

PROJECT LANDS MANAGEMENT & AESTHETICS

Study Goals

- Assess adequacy of Chelan PUD’s Project lands management and aesthetics process for reviewing, evaluating, and permitting (or seeking FERC approval) for development within Project boundary.

Issues to be Addressed

<u>Issue</u>	<u>Rank</u>	<u>Group</u>
Shoreline issues: protection of shoreline	LARC	1/149
Planning: coordination and communication of this and other public planning	LARC	2/149
Economics: long-term ramifications, who maintains/funded how?	LARC	5/149
Planning: integrated resource management as it relates to land use	LARC	7/149
Planning: consideration into distant future	LARC	8/149
Planning: integrate with other resource objectives	LARC	13/149
Planning: development of shoreline	LARC	14/149
Planning: consider changing demographics	LARC	19/149
Planning: limits of acceptable change	LARC	20/149
Economics: must be economically viable to PUD	LARC	31/149
Land Use: spawning habitat, disruption and access to	LARC	39/149
Erosion: loss of land	LARC	50/149
Planning: anticipate future pressure from Puget Sound, etc.	LARC	54/149
Planning: land conversions, lands that are changed for alternate uses (affects habitat)	LARC	55/149
Planning: seasonal flow augmentation (t/e species)(bypass reach and Columbia River)	LARC	56/149
Economics: impact of pool changes on fishing (tourism)		
Erosion: impacts on riparian	LARC	61/149
Recreation: trails and coordinated trails planning	LARC	63/149
Economics: upper lake recreation, distant draw downlake more local		65/149

Issues to be Addressed

<u>Issue</u>	<u>Rank</u>	<u>Group</u>
Shoreline issues: retaining wall encroachment and boat docks	LARC	66/149
Bypass Reach/recreation: appropriate minimum flows	LARC	67/149
Economics: fiscal needs of affected agencies	LARC	69/149
Economics: lack of year-round economic base	LARC	74/149
Planning: archeological (includes traditional cultural uses)	LARC	82/149
Planning: disruptions of aesthetics	LARC	83/149
Commercial Impacts: aesthetics	LARC	84/149
Land Use: vegetation manipulation	LARC	95/149
Economics: can this be done in a way that generates new jobs for our people?	LARC	96/149
Recreation: shoreline casements	LARC	126/149
Planning: irrigation projects	LARC	141/149
Land development control	Fish	5/119
Land development - affecting water quality, fisheries:	Fish	26/119
Comprehensive land management plan	Fish	27/119
Land development – affecting water quality, fisheries:	Fish	56/119
Boats/people		
Woody debris:	Fish	77/119
Water rights	Fish	82/119
Land development - affecting water quality, fisheries:	Fish	86/119
Agricultural runoff		
Land development - affecting water quality, fisheries: Domestic use	Fish	87/119
Timing of the drawdowns: no bath tub ring during high visit season	Public	4/75
Integrated resource management as it relates to land use	Public	5/75
Economics of changing drawdown times	Public	11/75
Partnership with PUD agency to agency to share expertise, such as state grants, street-ends, others	Public	12/75
Planning: development of shoreline	Public	17/75
Debris	Public	19/75
Impact of project operation on economic base	Public	26/75
Loss of soil/land	Public	27/75
Lack of year-round economic base	Public	29/75
Coordination and communication of this and other public planning	Public	33/75
Shoreline access (undercut banks)	Public	41/75
Irrigation and pumping capabilities	Public	42/75

Issues to be Addressed

<u>Issue</u>	<u>Rank</u>	<u>Group</u>
Centralization of information	Public	44/75
Long-term ramifications, who maintains, funded how	Public	47/75
Erosion during high water	Public	48/75
Shoreline erosion caused by raising of the lake	Public	49/75
Structural damage, wear and tear on docks, special docks required	Public	50/75
Bio-engineering, rip rap, erosion control	Public	51/75
Stehekin aesthetics regarding the mud flats	Public	56/75
Navigation on Stehekin River	Public	59/75
Aesthetics - drawdowns ugly	Public	62/75
Land development control	Public	65/75
Must be economically viable to PUD	Public	68/75

Information Needs

- Update shoreline erosion inventory
- Inventory docks, piers, buoys, water intakes, etc. Global Satellite Positioning (GPS) locations will be identified for each land use category.
- Review current Project permit status

Level of Analysis

- Data collected will be entered into a GIS based mapping of land uses with appropriate information logged by site (including digital photographs where appropriate).
- Review applicable federal, state, and local land management plans to determine compatibility of Chelan PUD’s land management assessment with regard to environmental, aesthetic, and recreational considerations.
- Evaluate aesthetics of all potential flow releases.

**CHELAN PUBLIC UTILITY DISTRICT
LAKE CHELAN HYDROELECTRIC PROJECT NO. 637
STUDY PLAN OUTLINE**

LAKE LEVEL INVESTIGATION

Study Goals

- Chelan PUD is currently evaluating changes in lake levels with its operations model. Future changes will be discussed with the relicensing collaborative team.

Issues Being Addressed

<u>Issue</u>	<u>Group</u>	<u>Rank</u>
Timing of the drawdowns: no bath tub ring during high visit season (and 11, 30, 41, 64, 79, 80, 81, 98, 115 /149)	LARC	10/149
Use of recreational facilities	LARC	15/149
Operation flexibility in recreational use seasons	LARC	21/149
Lake shore erosion	LARC	22/149
Public access areas	LARC	23/149
Impacts on fisheries, flows attract Columbia River fish	LARC	24/149
Economics: must be economically viable to PUD	LARC	31/149
Impact on Riparian Habitat	LARC	34/149
Recreation uplake from dam: lake access including low-water areas	LARC	47/149
Recreation uplake from dam: year-round launch need	LARC	48/149
Economics: impact of pool changes on fishing (tourism)	LARC	59/149
Higher lake levels increase flooding risks	LARC	60/149
Wear and tear on docks, special docks required	LARC	71/149
Large woody debris fish habitat	LARC	72/149
More Water Quality: reservoir changes impact enforcement	LARC	73/149
Disruption of aesthetics	LARC	83/149
Recreation uplake from dam: marina not useable during low water	LARC	85/149
Facilities designed for historic drawdowns	LARC	89/149
Aesthetics: drawdowns ugly	LARC	92/149
Shoreline structures that trap debris	LARC	99/149
Maximum drawdown not allowed	LARC	100/149
Docks designed for ferries	LARC	103/149
Silt deposits from river	LARC	104/149
Higher lake level reduces dock and seawall maintenance	LARC	108/149

Exposure to vandalism; Cultural resources	LARC	116/149
Lake Level Fluctuation: increased use causes safety concerns at powerhouse and the switchyard	LARC	118/149
Drawdown exposes mud flats	LARC	124/149
Flat ground is at premium	LARC	125/149
Proposed increase in drawdowns	LARC	128/149
Commercial Impacts: commercial boating	LARC	133/149
Impact on private property owners	LARC	134/149
Debris boat safety	LARC	135/149
Property values	LARC	136/149
Tributary Access (migration into and up)	Fish	7/119
Impact on habitat due to high lake levels	Fish	12/119
Impacts on habitat	Fish	13/119
Fluctuations	Fish	16/119
Spawning (tributaries and along lake)	Fish	17/119
Lake level control	Fish	23/119
Stehekin flow effects: channel morphology	Fish	28/119
Loss of habitat	Fish	29/119
Stehekin flow effects	Fish	30/119
Riparian habitat (historic habitat)	Fish	34/119
Nesting birds: loss of habitat at head of lake	Fish	35/119
Water fluctuation equals failed nests	Fish	39/119
Fish effects: spawning	Fish	40/119
Impact at Stehekin	Fish	49/119
Habitat loss	Fish	50/119
Stehekin flow effects: all tributaries	Fish	51/119
Loss of habitat for song birds	Fish	52/119
Analysis of barriers	Fish	75/119
Loss of habitat from increased level	Fish	78/119
Loss of habitat from water rising	Fish	79/119
Habitat loss	Fish	88/119
Milfoil	Fish	90/119
Impact on docks	Fish	94/119
Temperature changes due to potential changes in lake levels	Fish	117/119
Impact on recreational facilities	Public	1/75
Timing of drawdowns: no bath tub ring during high visit season	Public	4/75
Lake levels higher May through September	Public	6/75
Lake fluctuation: including earlier and longer or up a month earlier	Public	7/75
Stehekin maximum lake levels	Public	20/75
Fish stranding (adult) during spill events	Public	24/75
Lake level fluctuations: Riparian habitat (historic/pre-dam habitat)	Public	34/75
Nesting water birds:	Public	36/75
Stehekin mud flats	Public	37/75

Erosion during high water	Public	48/75
Shoreline erosion caused by raising of the lake	Public	49/75
Structural damage, wear and tear on docks, special docks required	Public	50/75
Sand drifting and impact of drawdown	Public	53/75
Improved snowpack forecasting	Public	54/75
Stehekin aesthetics regarding mud flats	Public	56/75
Aesthetics – drawdown ugly	Public	62/75
Erosion during high water periods	Public	67/75
Must be economically viable to PUD	Public	68/75
Flooding: higher lake levels increase flooding risk at Stehekin	Public	72/75
Stehekin mud flats – dust	Public	75/75

Information Needs

- Historical hydrology in basin
- Estimate historical inflows
- Collect and compile historical aerial photos and maps
- Existing bathymetry (underwater topography, if available)

Level of Analysis

- Develop computer simulation model that determines the feasibility and impact of changes to Project operations (including changes to target water levels, minimum flows, base flows and ramping rates).
- Collect and compile existing aerial photos and maps and determine feasibility of including these photos and maps in GIS system
- Impacts of water level fluctuations on recreational facilities, wetlands, riparian habitat and wildlife will be included in other study plan outlines.

***APPENDIX C: MAP LOCATING PROJECT AND RECREATIONAL
SITES***
