EXECUTIVE SUMMARY
APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT

Klamath Hydroelectric Project
(FERC Project No. 2082)

PacifiCorp
Portland, Oregon

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ES1.0 PROJECT DESCRIPTION

This section provides a description of both the existing Klamath Hydroelectric Project (Project) and the proposed Project. Under the original license, the existing Project includes three developments that PacifiCorp does not intend to include as part of the proposed Project under the new license. Specifically, PacifiCorp proposes to decommission the East Side and West Side Developments and proposes to exclude the Keno Development because it is not subject to the Federal Energy Regulatory Commission's (FERC) mandatory licensing jurisdiction.

ES1.1 PHYSICAL DESCRIPTION OF EXISTING PROJECT

The Project currently consists of seven mainstem hydroelectric developments on the Upper Klamath River and one tributary hydroelectric development. PacifiCorp owns and operates the Project under a single license issued in 1956 by the FERC. The 50-year license (FERC Project No. 2082) expires on March 1, 2006.

The Project is located on the Upper Klamath River in Klamath County, south-central Oregon, and Siskiyou County, north-central California (see Figure ES1.1-1).

The Project consists of six generating developments along the mainstem of the Upper Klamath River, between river mile (RM) 190 and RM 254, a re-regulation dam with no generation facilities, and one generating development on Fall Creek, a tributary to the Klamath River at about RM 196. (See Figure ES1.1-2 for a schematic representation of the relative locations and layout of Project facilities.)

Link River dam and the associated East Side (3.2-megawatt [MW]) and West Side (0.6-MW) powerhouses are the most upstream facilities, located near RM 254 within the city limits of Klamath Falls, Oregon. The U.S. Bureau of Reclamation (USBR) owns the Link River dam and PacifiCorp operates it under USBR's directive. Therefore, the dam is not considered part of the licensed Project. The dam was built to supply water to both USBR's Klamath Irrigation Project and PacifiCorp's East Side and West Side powerhouses.

Keno dam, a re-regulating facility with no generation capability, is the next facility, 20 miles downstream at RM 233. Keno reservoir buffers inflow and outflow of the Klamath Irrigation Project.

The next facility is J.C. Boyle (80 MW). The dam is at RM 224.7 and the powerhouse is several miles downstream at RM 220.4. As the river continues into California, it enters Copco reservoir, which supplies Copco No. 1 (20 MW) and No. 2 (27 MW) hydroelectric facilities, at RM 198.6 and RM 196.8, respectively.

The Iron Gate facility (18 MW) is farthest downstream at RM 190. Fall Creek, a tributary, flows through a small powerhouse (2.2 MW) and then into the upper end of Iron Gate reservoir.

ES1.2 PHYSICAL DESCRIPTION OF PROPOSED PROJECT

The proposed Project is located on the Upper Klamath River in Klamath County and on Spring Creek in Jackson County, south-central Oregon, and Siskiyou County, north-central California. The nearest principal cities are Klamath Falls, Oregon, located at the northern end of the Project

area; Medford, Oregon, 45 miles northwest of the downstream end of the Project; and Yreka, California, 20 miles southwest of the downstream end of the Project (Figure ES1.1-1).

The Project will consist of four generating developments along the mainstem of the Upper Klamath River, between RM 228 and RM 254, and one generating development on Fall Creek, a tributary to the Klamath River at about RM 196. (See Figure ES1.1-3 for a schematic representation of the relative locations and layout of Project facilities.) The existing Spring Creek diversion is proposed for inclusion with the Fall Creek Development. The East Side, West Side, and Keno Developments are not included in the proposed Project.

PacifiCorp is proposing to remove the East Side and West Side Developments, the Keno Development, and associated FERC boundaries from service. For the East Side and West Side Developments, this would include modifications at the Link River dam face, removal/ reconfiguration of the water conveyance system, and removal of all electrical, chemical, and other potential public hazards that exist related to power generation. The powerhouse structures will not be removed, but will be disabled, with all electrical components removed and secured from public access. The Keno Development will continue to operate under existing conditions.

ES1.2.1 East Side Development

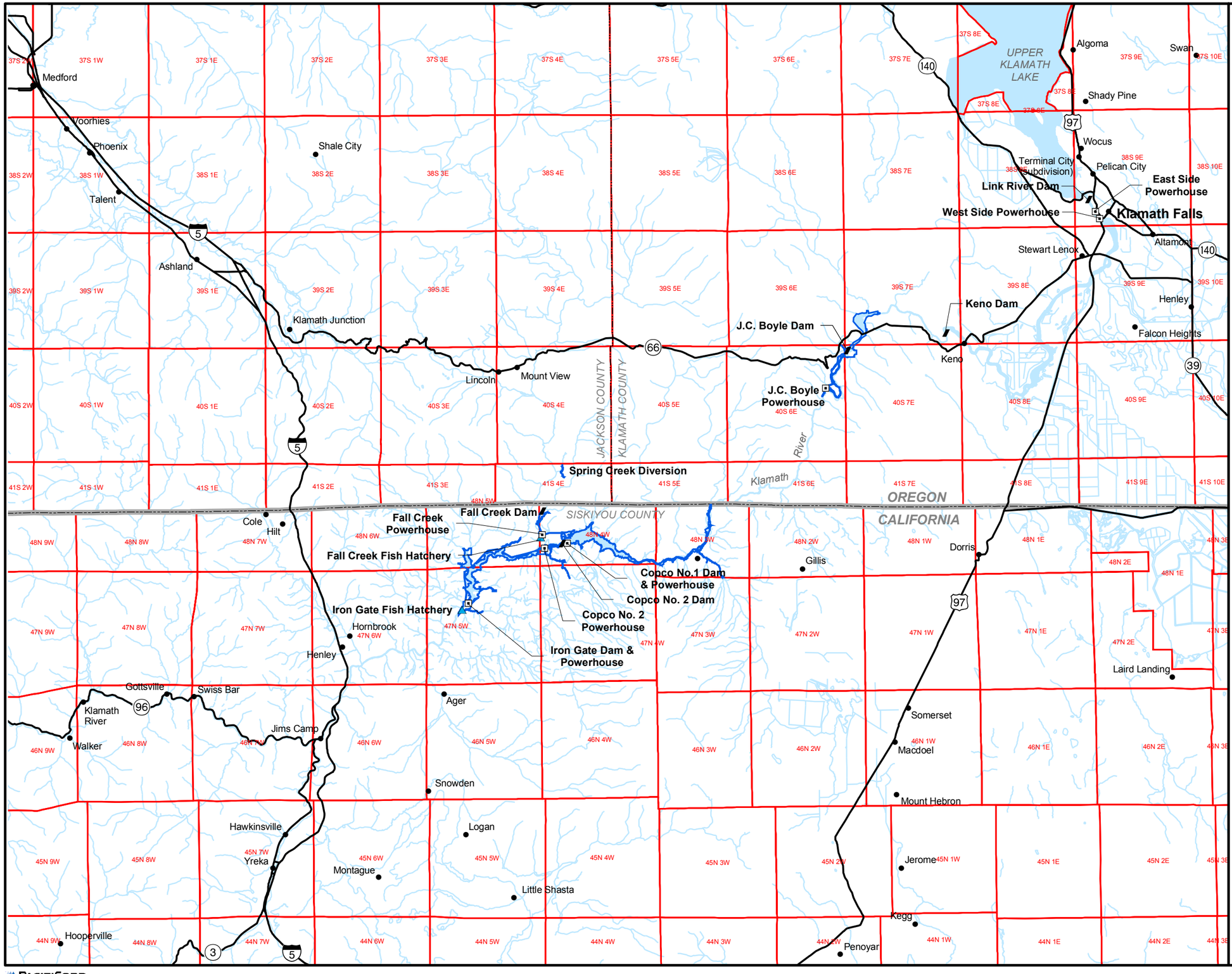
The seven intake slide gates that currently supply water from Link River dam to the East Side forebay will be anchored in place and rendered inoperable by removing the individual gate lifting devices. Downstream of each gate, concrete watertight bulkheads will be constructed.

The concrete and stone cobble forebay walls will be broken up and used as subgrade-fill material to re-contour the area west of the fish ladder. Above the cobble fill soil, native vegetation will be distributed and hydroseeded.

The entire length of the 12-foot-diameter flowline, composed of 1,730 feet of woodstave pipe and 1,443 feet of steel pipe, will be dismantled and removed from the site along with the associated support structures. The alignment of the flowline will be recontoured and all disturbed areas will be hydroseeded. The steel surge tank along with the concrete support pedestal also will be removed and regraded.

Powerhouse components associated with power generation that contain chemical or hazardous materials will be removed from the site, including transformers, batteries, tanks, and asbestos-based products. All windows and doors will be sealed to prevent public access. The incoming potable water line will be disconnected. The penstock to the turbine and the draft tube discharge will be sealed ensuring that access is prevented.

The transmission line (No. 56-8) from East Side powerhouse to a tap-point on transmission Line 11 also will be removed.



Klamath Hydroelectric Project

Figure ES1.1-1
Klamath Hydroelectric Project Location

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Figure ES1.1-1

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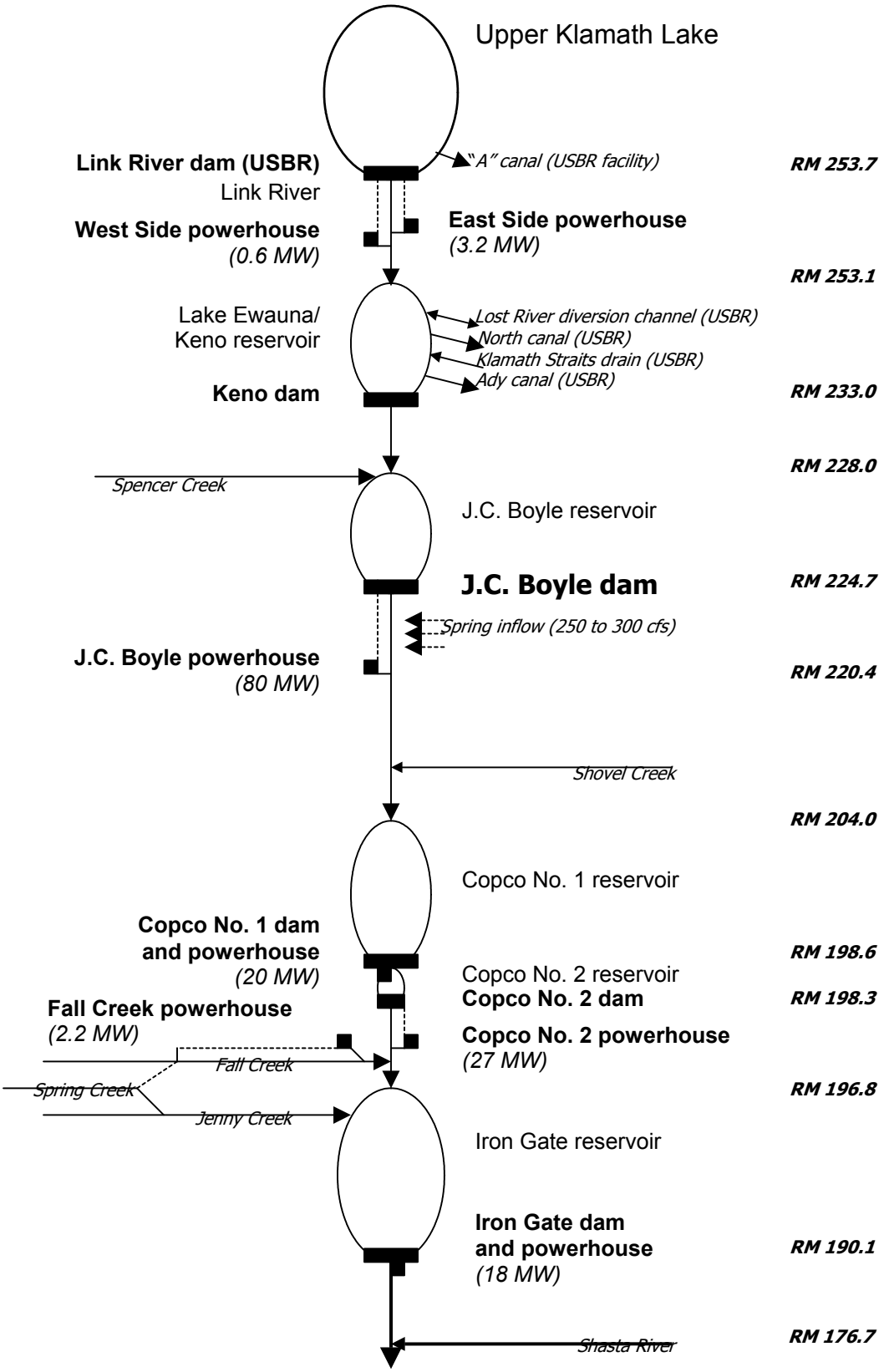


Figure ES1.1-2. PacifiCorp existing Project developments.

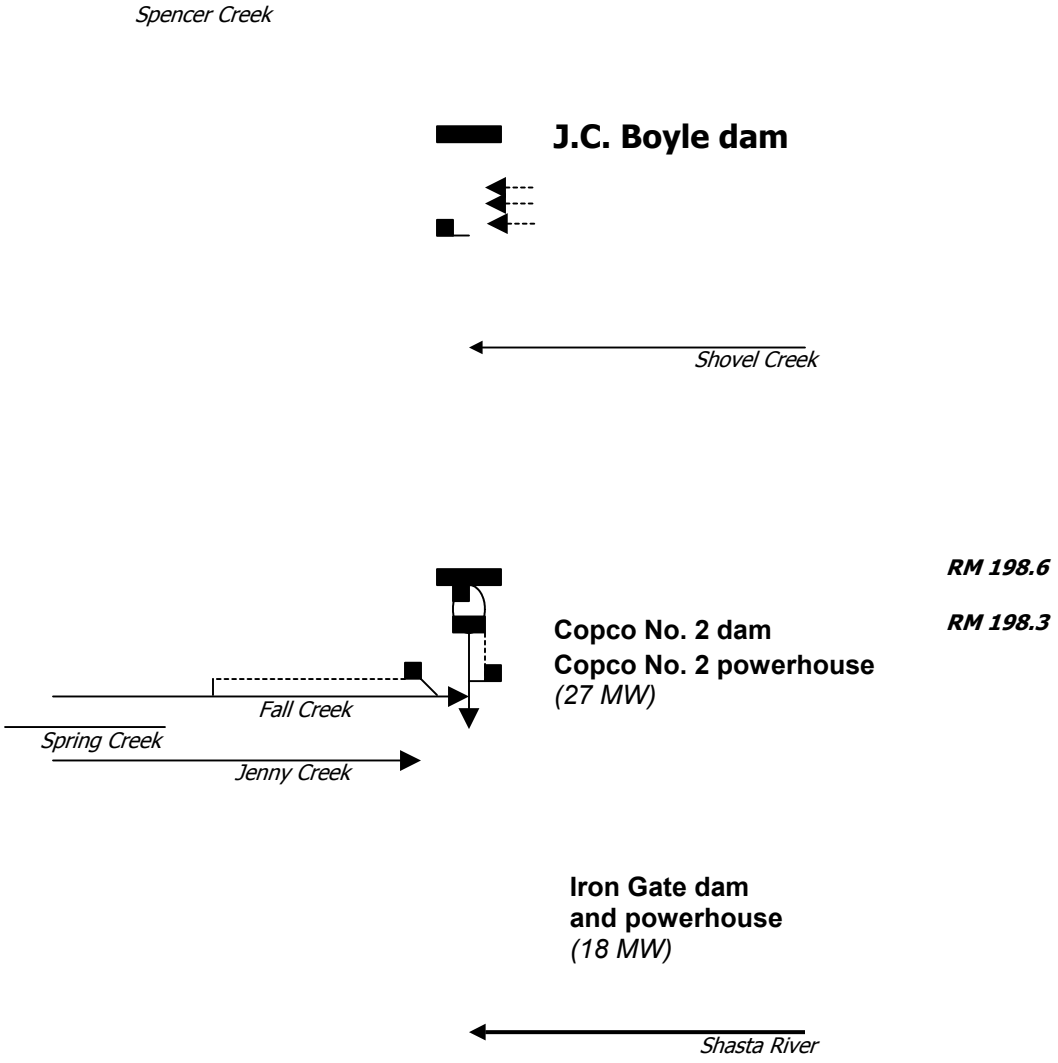


Figure ES1.1-3. PacifiCorp proposed Project developments.

ES1.2.2 West Side Development

Four of the six steel slide gates that control flow at the West Side intake at Link River dam will be made inoperable by welding the gates in place and removing the lifting devices. Downstream of each of the gates new watertight concrete bulkheads will be constructed. The area below the new bulkheads and the 5,575 feet of unlined earthen canal leading to the powerhouse intake will be recontoured using native materials. The concrete spillway structure (400 cubic yards) and the concrete intake structure (180 cubic yards) will be removed, and these areas will be regraded. The 140-foot penstock and support structures also will be removed. All areas that have been disturbed will be hydroseeded.

At the powerhouse, any components associated with power generation that contain chemical or hazardous materials—including transformers, batteries, tanks, and asbestos-based products—will be removed from the site. All windows and doors will be sealed to prevent public access. The incoming potable water line will be disconnected, and the septic system will be disconnected and backfilled. The penstock to the turbine and the draft tube discharge will be sealed ensuring that access is prevented.

The small powerhouse-related substation and transmission lines leading to the larger nearby substation will be removed. The West Side substation will remain in place; it is not associated with the West Side hydroelectric development.

ES1.2.3 Keno Development

PacifiCorp is excluding the Keno Development from the relicensed Project because the development is no longer subject to FERC jurisdiction. In the original license, the FERC exercised jurisdiction over the Keno Development because it was anticipated that the development would include generation. See Pacific Power & Light Co., 34 FPC 1387 (1965). However, PacifiCorp has not installed generation at the development and does not intend to do so. Moreover, PacifiCorp's operation of the Keno Development does not substantially benefit generation at PacifiCorp's downstream Project facilities. As a result, there is no longer any basis upon which to conclude that the Keno Development is subject to FERC jurisdiction.

With the removal of the East Side, West Side, and Keno Developments, PacifiCorp proposes that the J.C. Boyle reservoir will become the most upstream feature of the Project to be contained within the new Project boundary.

ES1.2.4 Proposed Project Developments

The 80-MW J.C. Boyle Development will be the most upstream generating facility in the proposed Project. The dam is at RM 224.7 of the Klamath River, and the powerhouse is several miles downstream at RM 220.4. As the river continues into California, it enters Copco reservoir, which supplies Copco No. 1 (20 MW) and No. 2 (27 MW) hydroelectric facilities, at RM 198.6 and RM 196.8, respectively. The Iron Gate Development (18 MW) is farthest downstream at RM 190. The Fall Creek Development is on Fall Creek, a tributary to Iron Gate reservoir. This development is supplied water from both Spring Creek and Fall Creek. The Spring Creek diversion dam diverts water into Fall Creek above the Fall Creek dam. From the dam, water flows through a small powerhouse (2.2 MW) and then into the upper end of Iron Gate reservoir.

ES2.0 CONSULTATION EFFORTS

On December 13, 2000, PacifiCorp submitted to the FERC a Notice of Intent (NOI) to file an application for a new license for the Klamath Hydroelectric Project (see Appendix E1-A, PacifiCorp Consultation Record for Relicensing the Klamath Hydroelectric Project). The FERC acknowledged PacifiCorp's intent on February 7, 2001, when the commission issued a public notice that the NOI had been filed with the FERC and was available for public inspection. This NOI and subsequent submission of a First Stage Consultation Document (FSCD) to interested parties initiated the first stage of the three-part FERC Traditional Licensing Process (TLP).

In the second stage of the licensing process, PacifiCorp engaged in extensive collaboration with stakeholders on study plan development and (to the extent possible) analysis on study results and data interpretation. These collaborative efforts are reviewed below. On June 24, 2003, PacifiCorp distributed the Klamath Hydroelectric Project draft license application to interested parties for comment. Following the 90-day comment period, PacifiCorp received a total of 58 letters from various tribes, government agencies, and non-governmental organizations. In response to comments, PacifiCorp conducted a 2-day Joint Agency Meeting on November 5 and 6, 2003. At the meeting, PacifiCorp shared its preliminary operational modifications and resource enhancement measures to be included in the final license application to the FERC. Time was allowed for stakeholders to provide comments on Project impacts, studies, and PacifiCorp's proposed measures. Additional stakeholder meetings were conducted in November and December 2003 and January 2004 to discuss ongoing studies and study results, and to continue to develop and review fish passage modeling results.

PacifiCorp is providing this final license application to resource agencies, Native American tribes, and other interested parties (see Appendix ES-2A). A copy of the license application and associated documents is available on PacifiCorp's website at www.pacificorp.com or by contacting:

Mr. Todd Olson
Relicensing Manager
PacifiCorp
825 N.E. Multnomah, Suite 1500
Portland, Oregon 97232
Telephone (505) 813-6657

ES2.1 APPLICATION CONTENTS AND AVAILABILITY

PacifiCorp's license application is organized into ten sections, including this executive summary, an Initial Statement, and eight exhibits (A through H). Each lettered exhibit presents specific information, maps, and drawings about the Project, as required by FERC regulations. The organization and subject content of the application exhibits are described below:

- Exhibit A: Description of the Project. This exhibit presents information describing the physical facilities of both the existing and proposed Project.

- Exhibit B: Project Operation and Resource Utilization. This exhibit discusses historic, current, and proposed operation of the Project.

- Exhibit C: Construction History. This exhibit presents a chronology for the construction of Project structures and facilities, the commencement of commercial operation, and additions or modifications to the Project. It also describes proposed future modifications (facility upgrades or removals) for the Project.

- Exhibit D: Statement of Cost and Financing. This exhibit presents operations and maintenance costs for the Project and any proposed modifications, financial information estimating the Project's net worth, and estimates of the value of the Project power. Also included is a discussion of alternative/replacement sources for Project power.

- Exhibit E: Environmental Report. This exhibit presents a detailed description of the existing non-power or natural resources in the Project vicinity, and a discussion of environmental studies and inventories. Potential Project impacts are described and protection, mitigation, and enhancement (PM&E) measures are presented. Final Technical Reports (FTRs) associated with the disciplines in the exhibit are provided as separate reports that accompany the license application.

- Exhibit F*: General Design Drawings. This exhibit provides schematic drawings of the general arrangement and design of the Project facilities. In accordance with FERC Order No. 630, this material is considered critical energy infrastructure information and is filed with the FERC as confidential information pursuant to 18 CFR § 388.112. The related supporting design report is submitted separately with the FERC at the same time.

- Exhibit G*: Maps of the Project. This exhibit contains maps of the location of the hydroelectric facilities and the proposed Project boundary. In accordance with FERC Order No. 630, this material is considered critical energy infrastructure information and is filed with the FERC as confidential information pursuant to 18 CFR § 388.112.

- Exhibit H: General Information. This exhibit contains information describing PacifiCorp's qualifications to operate the Project, the implications of license denial, and historical records pertaining to Project operations.

ES2.2 PACIFICORP'S CONSULTATION EFFORTS

PacifiCorp elected to pursue a TLP in relicensing its Klamath Hydroelectric Project. The TLP is a three-stage consultation process that involves the public in developing a license application for an existing hydroelectric project. First stage includes initial review of the project and any proposed modifications, and the determination of necessary studies. Second stage involves completing the studies agreed to during the first stage, deciding on appropriate PM&E measures, and preparing and reviewing a draft license application. Third stage is initiated when the final license application, incorporating information from the first and second stages, is submitted to the FERC. After the submittal of the final license application, the FERC initiates an independent environmental review of the project and the involved stakeholders provide comments,

*Note: The FERC issued Order No. 630 on February 21, 2003. That order provides that the material prepared for Exhibits F and G is critical energy infrastructure information and should be filed with the FERC as confidential information pursuant to 18 CFR § 388.112. Exhibits F and G are provided in separate volumes of the application filed with the FERC. Parties having a need for such information should provide a written request for the volumes. Such requests should be made to Todd Olson, Licensing Project Manager (see above address).

recommendations, and mandatory terms and conditions through the National Environmental Policy Act (NEPA) process.

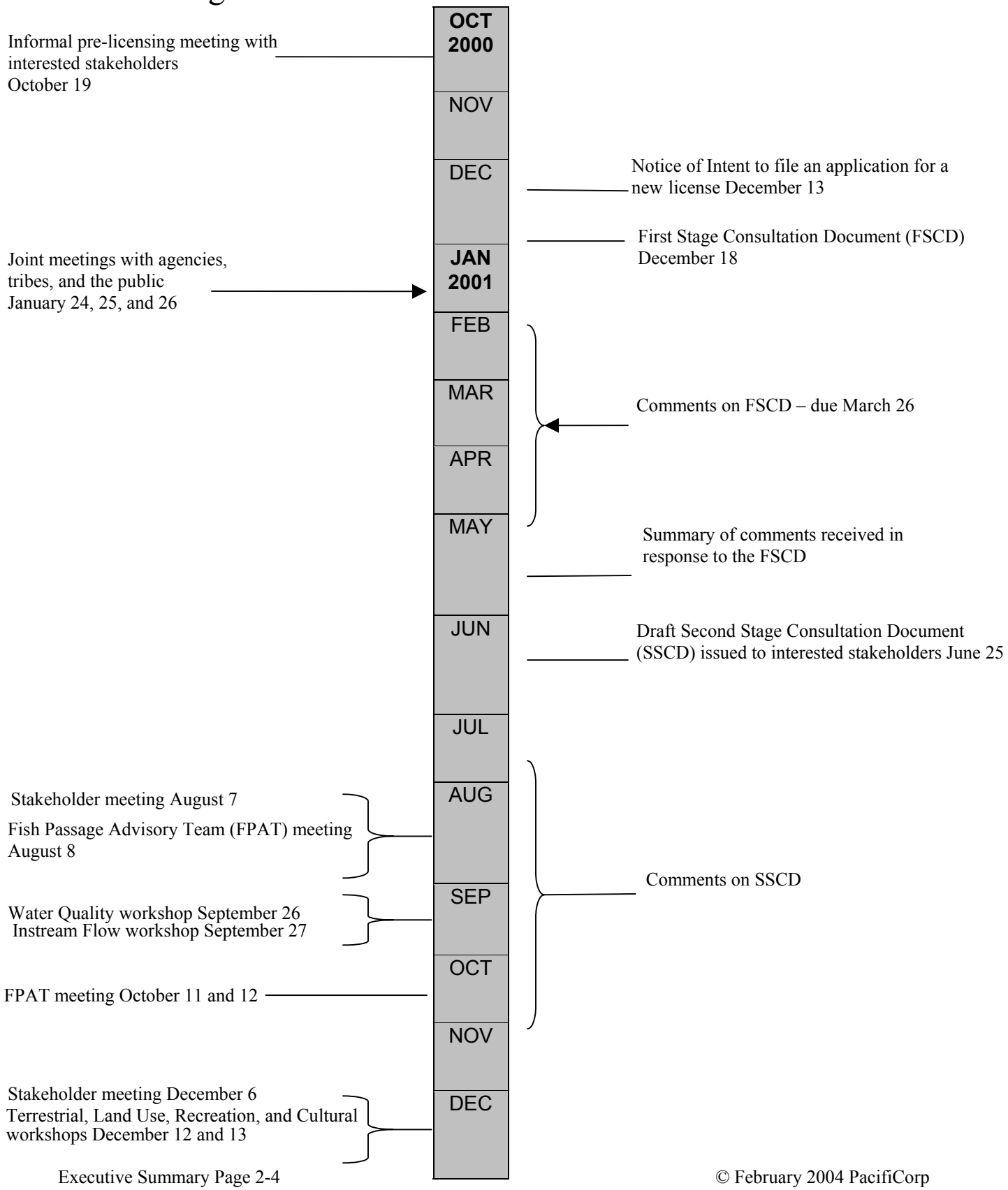
PacifiCorp began its relicensing effort in 2000 using the basic approach established by the TLP. In response to strong stakeholder interest and concerns, however, the process evolved into a collaborative effort with more than 40 stakeholders engaged monthly in week-long facilitated meetings with PacifiCorp to develop study plans and review study results. See Table ES2.2-1 for a list of active stakeholders and Appendix ES-2A for a complete consultation list. The relicensing process timeline is shown in Figure ES2.2-1.

Table ES2.2-1. List of Klamath relicensing active stakeholders (in alphabetical order).

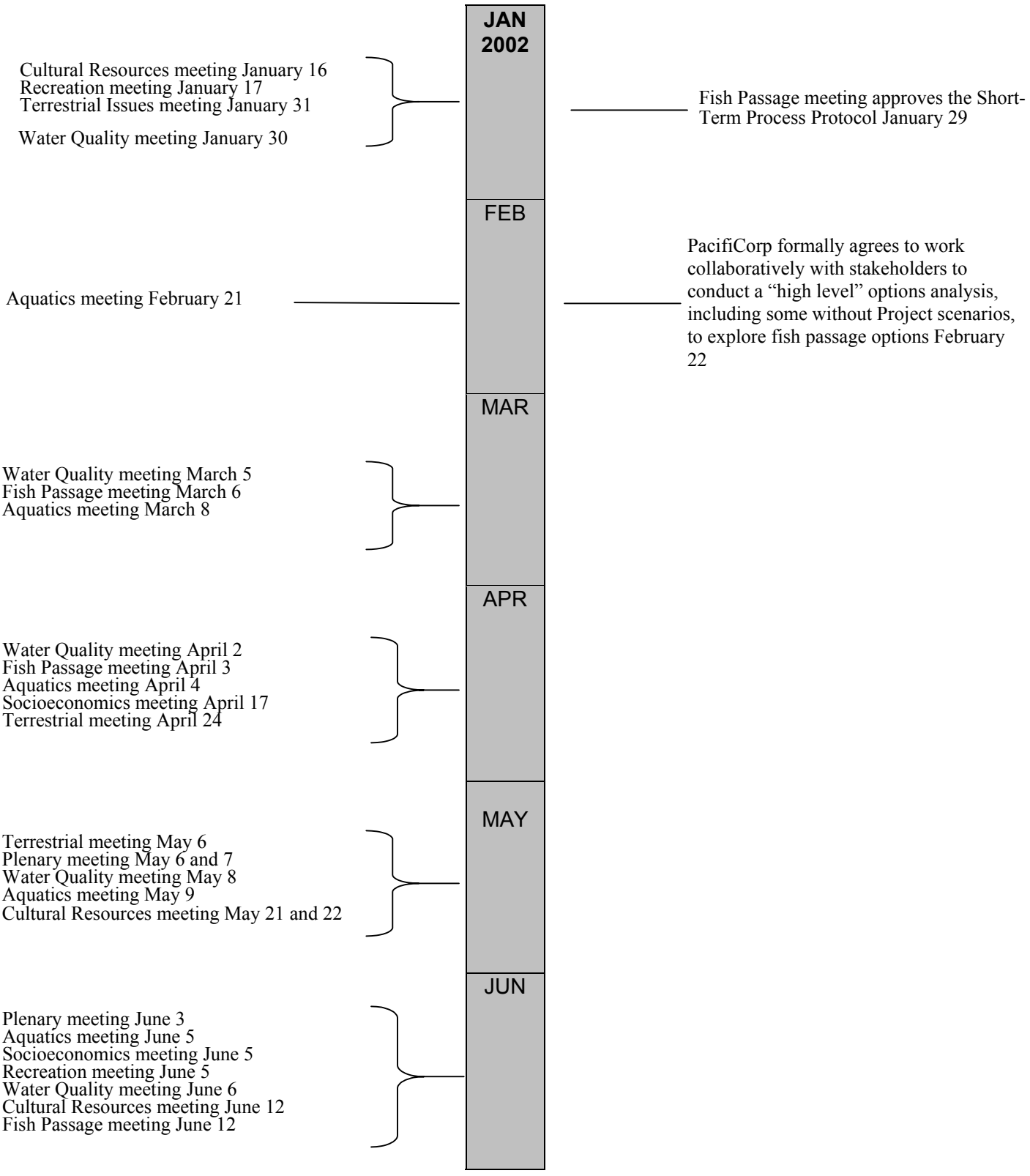
American Rivers	Oregon Department of Parks and Recreation
American Whitewater Association	Oregon Department of Water Resources
California Department of Fish and Game	Oregon State Historic Preservation Office
California State Water Resources Control Board	Pacific Coast Federation of Fisherman's Associations
California Trout	Shasta Nation
Copco Sportsman's Club	Shasta Tribes
Friends of the River	Siskiyou County
Karuk Tribe of California	Trout Unlimited
Klamath Drainage District	U.S. Bureau of Indian Affairs
Klamath Forest Alliance	U.S. Bureau of Land Management
Klamath River Inter-Tribal Fish and Water Commission	U.S. Bureau of Reclamation
Klamath Tribes	U.S. Fish and Wildlife Service
National Oceanic and Atmospheric Administration (NOAA Fisheries)	U.S. Forest Service
National Park Service	Upper Klamath Rafters Association
Oregon Department of Environmental Quality	World Wildlife Federation
Oregon Department of Fish and Wildlife	Yurok Tribe

The relicensing consultation process was initiated in December 2000 by the distribution of the FSCD. The formal comments of stakeholders to the FSCD produced more than 175 letters and conveyed broad-ranging concerns with the adequacy of the proposed study plans; PacifiCorp's decision not to study dam decommissioning; and the level of collaboration in developing study plans. In response to these comments, PacifiCorp revised study plans and redistributed them in the form of a draft Second Stage Consultation Document. Stakeholder response was vigorous and reiterated the concerns expressed in the first round of comments.

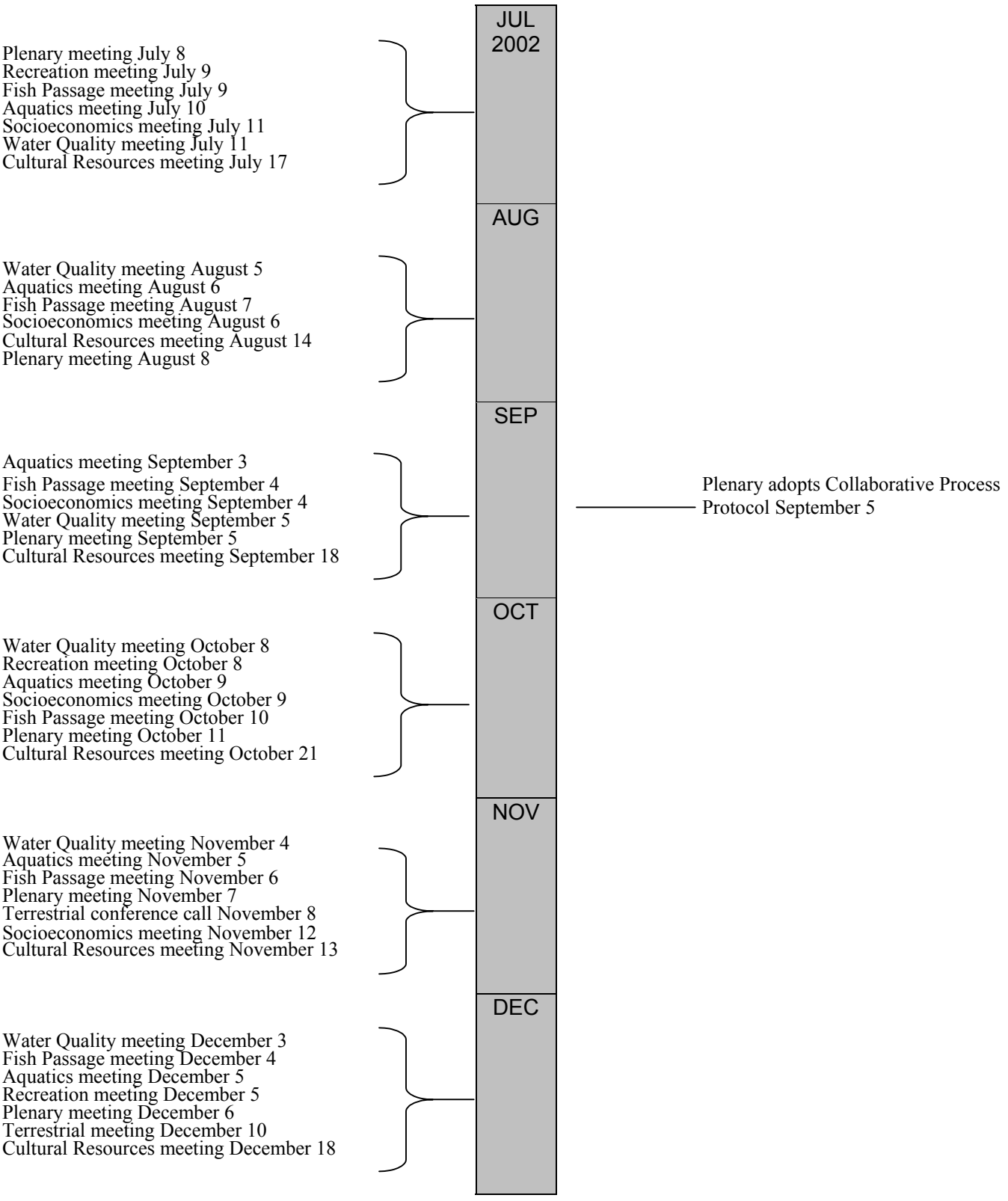
PacifiCorp Relicensing Process Timeline



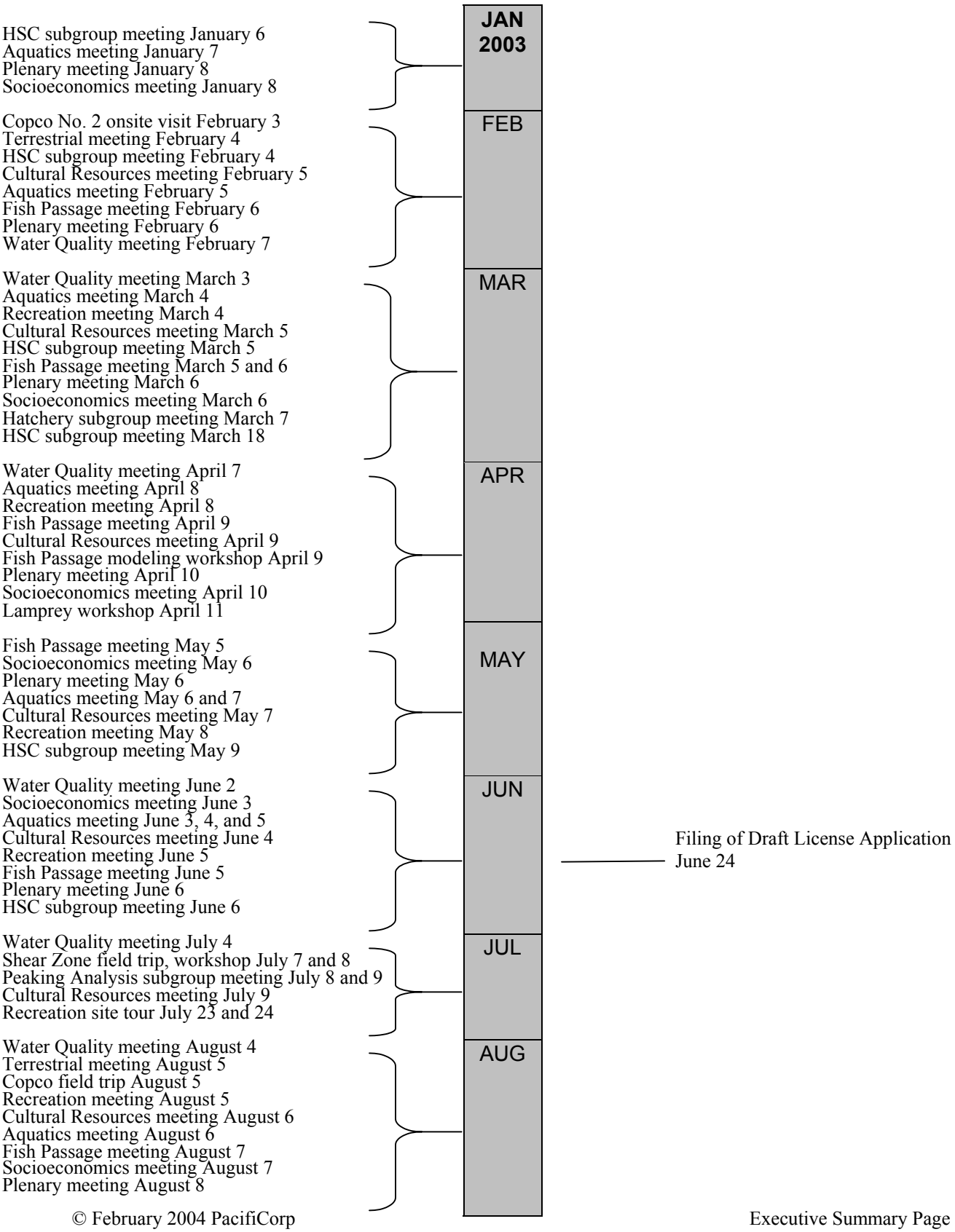
PacifiCorp Relicensing Process Timeline



PacifiCorp Relicensing Process Timeline



PacifiCorp Relicensing Process Timeline



PacifiCorp Relicensing Process Timeline

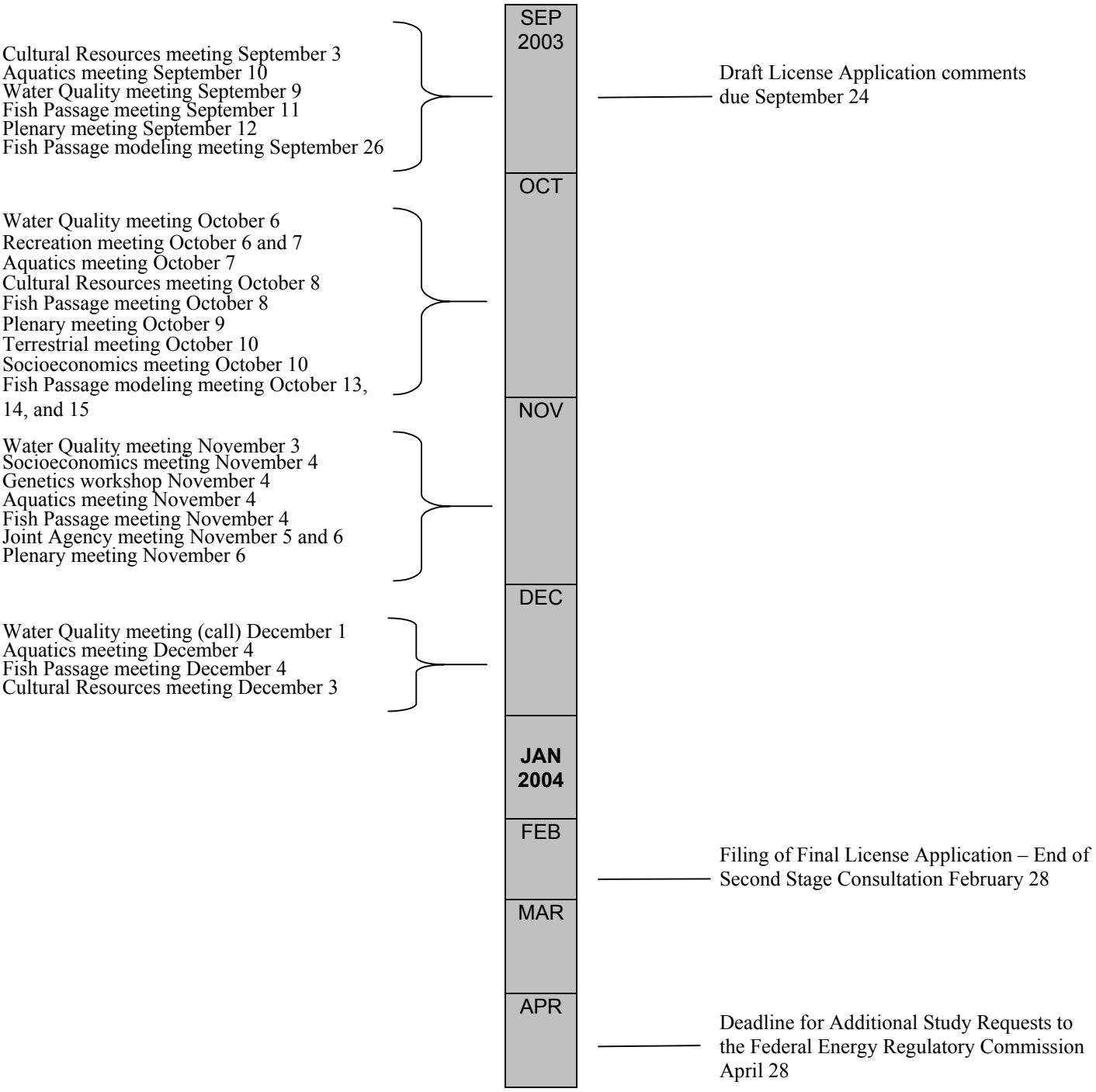


Figure ES2.1-1. PacifiCorp relicensing process timeline.

Following a series of meetings, PacifiCorp, in response to stakeholder requests, committed, in February 2001, to a "high level" assessment of fish passage alternatives including potential dam-out scenarios. With this commitment, stakeholders agreed to engage in a long-term collaborative effort to develop and approve study plans, review and interpret results, and strive for agreement on PM&E measures. The California State Water Resources Control Board (CSWRCB) is not a member of, or party to, the collaborative effort**.**

Stakeholders (including PacifiCorp) developed a process protocol to guide the collaborative effort that resulted in the implementation of a new process structure comprised of a plenary group (all interested stakeholders) and seven technical working groups that convened each month for facilitated meetings. The focus of these meetings has been to develop and approve a final study package. Recognizing growing time constraints, however, the collaborative group endorsed the need to implement elements of studies not yet approved. The group, therefore, also has been reviewing study results.

As of December 2003, 38 study plans have been approved. The collaborative group was unable to reconcile some outstanding issues in nine remaining study plans.

ES2.3 SUMMARY OF PROPOSED COLLABORATIVE PROCESS TO FOLLOW FINAL LICENSE APPLICATION

PacifiCorp, tribes, agencies, and non-governmental organizations have been working intensely together through a plenary group, several work groups, and topic-specific subgroups to develop study plans, to review study results and model development progress, and, in some cases, to discuss potential PM&E measures. The intense schedule of monthly meetings progressed through December 2003.

PacifiCorp would like to sustain a collaborative exchange with stakeholders. Work groups will continue to meet through to the time of filing the final license application in February 2004. The plenary group and work group participants agree that scheduling work group and subgroup meetings should be based on the need for substantive exchange to address ongoing model development, and to review study results as they become available. As likely drivers of solutions for this licensing, the fish passage, aquatics, and water quality resource areas will continue to receive attention from the respective work groups and subgroups.

PacifiCorp would like a collaborative process to extend after filing the final license application. This could include ongoing review of study results, and potentially could include collaboratively developing proposed PM&E measures or a potential settlement agreement. PacifiCorp expects to assess interest and plans for ongoing collaboration and potential settlement through its own assessment and discussions with stakeholders in early 2004. These discussions will lead to plans for future interactions and collaboration in 2004.

ES3.0 WATER USE AND QUALITY

ES3.1 GEOGRAPHICAL EXTENT OF STUDY AREA

The study area for water use and water quality studies extended from Upper Klamath Lake just above Link River dam (Fremont Bridge, RM 254.3) to the confluence of the Shasta and Klamath rivers (at RM 176), except for water quality modeling, which extended from Link River dam to near the mouth of the Klamath River at Turwar (RM 6). PacifiCorp conducted a number of voluntary, FERC-required, and stakeholder requested studies to identify existing water use and water quality within the study area and potential Project effects. Studies conducted include the following:

- Compilation and Assessment of Existing Water Quality Data
- Monitoring of Water Temperature and Water Quality Conditions in the Project Area
- Water Quality Analysis and Modeling Process
- Analysis of Project Effects on Hydrology
- Analysis of Project Effects on Sediment Transport and River Geomorphology
- Monitoring and Analysis of Water Quality During Project Maintenance Operations
- Fall 2002 Macroinvertebrate Study
- Determination of Sediment Oxygen Demand in Selected Project Reservoirs
- Screening Level Determination of Chemical Contaminants in Fish Tissue in Selected Project Reservoirs
- Investigation of Klamath River Freshwater Bivalves in the J.C. Boyle Peaking Reach and Downstream of Iron Gate Dam
- Spring 2003 Macroinvertebrates Study
- Analysis of Potential Project Effects on Water Quality Aesthetics

ES3.2 SUMMARY OF INFORMATION

ES3.2.1 Flow Availability and Water Use in the Project Vicinity

The drainage basin area upstream of Iron Gate dam covers 4,630 square miles extending throughout Klamath County, Oregon, and Siskiyou County, California. The drainage basin areas upstream of the J.C. Boyle powerhouse and Keno dam cover about 4,080 and 3,920 square miles, respectively, in Klamath County. The outflow from Upper Klamath Lake is the dominant source to the Klamath River and the PacifiCorp Hydroelectric Project. Upper Klamath Lake, controlled by Link River dam, provides about 98 percent of the active storage volume on the Klamath River upstream of Iron Gate dam. Operation of Link River dam using the lake's large active storage volume largely dictates the annual and seasonal hydrograph and magnitude of flows through the

Project area. Operation of Link River dam is also the predominant means of providing stable instream flows downstream of Iron Gate dam.

The USBR is responsible for operation of the Klamath Irrigation Project and has management control of Upper Klamath Lake elevations and Iron Gate dam releases. Since about 1992, the USBR has modified Link River dam operations to benefit the shortnose sucker (*Chasmistes brevirostris*) and the Lost River sucker (*Deltistes luxatus*), two Klamath River basin fish listed in 1988 as endangered under the Endangered Species Act (ESA). To protect these fish, the U.S. Fish and Wildlife Service (USFWS) required that water levels in Upper Klamath Lake be managed within specific elevation limits. In 1999, in response to ESA listing of coho salmon (*Oncorhynchus kisutch*), the National Oceanic and Atmospheric Administration (NOAA Fisheries) provided a biological opinion (BO) and an associated Incidental Take Statement to the USBR containing terms and conditions that require the USBR to release specific instream flows at Iron Gate dam and PacifiCorp to operate the dam to provide those specified instream flows and identified ramping rates. The USBR now defines Klamath Irrigation Project operations through annual operations plans in consultation with the NOAA Fisheries and USFWS, and currently is operating from the Klamath Project 2003 Operations Plan (dated April 10, 2003). The plan specifies how Upper Klamath Lake elevation and discharge at Iron Gate dam are to be regulated based on hydrological conditions.

In late winter and spring, particularly for average or wetter years, the PacifiCorp Project reservoirs are typically full, resulting in run-of-the-river operations through the Project reach. In summer and fall or when average discharge is below the capacity of the turbines, PacifiCorp will manage flows within the Project to maximize power generation using load following or "peaking" operations at the J.C. Boyle, Copco No.1, and Copco No. 2 Developments. Daily peaking is accomplished by regulating daily inflow to operate turbine-generators at high loads near peak efficiency. One or both of the turbine-generators typically are started in the morning to early afternoon and ramped up to best efficiency or full load output. The unit(s) are maintained at near-constant load, ramped back down later in the day, and shut off at night. Because the capacity of the turbines at the J.C. Boyle Development is 2,850 cubic feet per second (cfs), and Copco No. 1 and Copco No. 2 Developments are 3,200 cfs, any larger flows would not be subject to this peaking action.

ES3.2.2 Water Quality Conditions in the Project Area

ES3.2.2.1 Upper Klamath Lake

Although Upper Klamath Lake is not part of the Klamath Hydroelectric Project area, the lake's water quality dictates water quality conditions entering the Project area. Upper Klamath Lake is a large (235.4 km^2), shallow (mean depth about 2 meters) lake that is geologically old and classified as "hypereutrophic" (highly enriched with nutrients and supporting high abundance of suspended algae). Upper Klamath Lake has been a productive lake, with high nutrient concentrations and high levels of primary production, for hundreds of years. However, mobilization of phosphorus from agriculture and other nonpoint sources during the past several decades appear to have pushed the lake into its current hypereutrophic state.

Large blooms of cyanobacteria (blue-green algae) species (*Aphanizomenon flos-aquae*), with chlorophyll a concentrations exceeding 200 micrograms/liter (µg/l), frequently are observed in

the summer months. Algal blooms are accompanied by water quality that does not meet Oregon's standards for dissolved oxygen, pH, and un-ionized ammonia. Summertime pH values typically exceed 9.5 and periodically exceed 10.0. Water temperatures in the lake can approach 30ºC near the surface and temperatures of 22ºC to 24ºC are common in the upper 1 to 2 meters of water. At the same time, dissolved oxygen concentrations often are supersaturated in the upper part of the water column during daylight hours, but concentrations of less than 2.0 milligrams per liter (mg/L) can occur near the bottom.

The Oregon Department of Environmental Quality (ODEQ) included Upper Klamath Lake on its 1998 Clean Water Act (CWA) 303(d) list of waterbodies that do not meet water quality standards because of the lake's dissolved oxygen, chlorophyll a, and pH levels. In May 2002, the ODEQ established a total maximum daily load (TMDL) that identified pollutant sources and load reductions needed to achieve water quality standards. The U.S. Environmental Protection Agency (EPA) approved the TMDL in August 2002. Implementation of the TMDL, however, will require many years, and some portions, such as those that involve habitat restoration, will require decades.

ES3.2.2.2 Link River

The Link River reach includes the 1.2-mile reach of the Klamath River from Link River dam (RM 254) to the inlet to Lake Ewauna (upper portion of Keno reservoir) at about RM 253. Link River dam is located at the outlet from Upper Klamath Lake. Concentrations of total phosphorus, nitrate nitrogen, and chlorophyll a measured in the Link River reflect conditions in Upper Klamath Lake. In general, total phosphorus concentrations are higher in the summer and fall than in the winter and spring, whereas nitrate concentrations are lower during the summer than during the winter. Water temperatures in Link River vary from about zeroºC in the winter to about 25ºC in the summer.

ES3.2.2.3 Lake Ewauna/Keno Reservoir

The reach of the Klamath River that includes Lake Ewauna and Keno reservoir is formed by Keno dam at approximately RM 233. Lake Ewauna proper is a wide, shallow body of water, formerly a natural lake, from about RM 251 to RM 253, while Keno reservoir is a narrower reach between RM 233 and RM 251. Inflows to Lake Ewauna and Keno reservoir reach are dominated by releases from Upper Klamath Lake, but also include municipal wastewater discharges, industrial discharges, and agricultural return flow, as well as natural inflow from adjacent areas. Agricultural returns occur at two primary locations: the Lost River diversion canal (RM 249.7) and the Klamath Straits drain (RM 240.2). Principal diversions include the Lost River diversion canal, North canal, and ADY canal.

Lake Ewauna is included by the ODEQ on the CWA 303(d) list for chlorophyll a (summer), pH (summer), and water temperature (summer). Keno reservoir is listed for chlorophyll a (summer), pH (summer), water temperature (summer), dissolved oxygen (spring, summer, and fall), and un-ionized ammonia (summer and winter). Nuisance phytoplankton and high pH, along with high nutrient concentrations, indicate that algal photosynthesis and respiration processes are key factors affecting water quality conditions in Lake Ewauna and Keno reservoir. During much of the year, water entering Lake Ewauna and Keno reservoir from Upper Klamath Lake via Link River carries a high load of organic nitrogen and other organic matter. In addition, water entering

Keno reservoir from the Klamath Straits drain and Lost River diversion channel has high concentrations of nitrogen, phosphorus, low dissolved oxygen, and biochemical oxygen demand (BOD). Other inputs from municipal wastewater treatment facilities and industrial facilities add to the nutrient and organic load.

The high nutrient concentrations promote abundant summertime algal growth with mean chlorophyll a concentrations ranging between 20 and 40 µg/L and peaking near 300 µg/L. As a result of high primary production, pH values in these moderately buffered waters frequently exceed 9 during the summer. The respiration demands of such abundant algal production combine with the BOD to consume much of the oxygen in the water. There is sufficient oxygen demand in the water to result in complete anoxia during certain periods. Dissolved oxygen measurements fluctuate greatly in the Lake Ewauna/Keno reservoir reach, including diurnal variations on the order of 10 mg/L per day during the late spring and early summer. In the middle section of the reservoir near Miller Island, dissolved oxygen drops to near zero by about late June and can stay depressed for several weeks.

Water temperatures in the reservoir reach show diurnal as well as short-term (days to weeks) response to meteorological conditions imposed on a seasonal warming and cooling trend. The reservoir is shallow and exposed to the effects of wind, and, therefore, stable thermal stratification does not occur, although periods of calm during warm weather may result in short-term, weak stratification.

ES3.2.2.4 Keno Reach of the Klamath River

The Keno reach includes the 5-mile river reach from Keno dam (RM 233) to the upper end of J.C. Boyle reservoir at about RM 228. The flow in the Keno reach consists predominately of releases from Keno dam. Because of its small active storage, Keno reservoir has little capacity to modify the hydrograph of reservoir inflows. Therefore, Keno dam is operated as a run-of-river facility such that inflows to Keno reservoir are passed through Keno dam with little alteration.

From Keno dam to J.C. Boyle reservoir, the river is steep and fast-flowing, providing mixing and mechanical aeration. As a result, water quality conditions are generally improved from those upstream. The water temperatures in the Keno reach range from 1ºC in winter to 25ºC in late July or early August. Changes in nutrient concentrations suggest that decomposition of organic matter and nitrification of ammonia nitrogen are actively occurring in the Keno reach. Although nutrient concentrations remain high, this does not appear to be reflected in the abundance of phytoplankton because the chlorophyll a concentration decreases markedly below Keno dam. This apparent decrease in chlorophyll could represent a shift from the free-living phytoplankton dominant in the upstream reservoir to attached forms of periphytic algae in the river.

ES3.2.2.5 J.C. Boyle Reservoir

The J.C. Boyle reservoir includes the portion of the mainstem Klamath River from J.C. Boyle dam (RM 224.7) to the upper end of the J.C. Boyle reservoir (RM 228) near the mouth of Spencer Creek. Because of small active storage, J.C. Boyle reservoir has a modest effect on the general shape and trend of the Klamath River's annual hydrograph. The short residence time and shallow depth of J.C. Boyle reservoir are more characteristic of a deep, slow-moving river reach than a reservoir.

J.C. Boyle reservoir is included on the CWA 303(d) list by ODEQ for temperature (summer). Water temperatures in J.C. Boyle reservoir are lowest in January, and highest in late July or early August. Because of short water residence time, J.C. Boyle reservoir has weak, intermittent thermal stratification.

Values for pH in J.C. Boyle reservoir range from 6.4 to 8.4, and appear to vary mostly with depth. Dissolved oxygen concentrations in J.C. Boyle reservoir range from about 4 to 12 mg/L. Concentrations are relatively high, near saturation, during the winter months, with little variability. During the summer, dissolved oxygen near the surface tends to be higher than at depth.

ES3.2.2.6 Klamath River Between J.C. Boyle Reservoir and Copco No. 1 Reservoir

The J.C. Boyle bypass reach is the 4.3-mile-long reach of the Klamath River from J.C. Boyle dam (RM 224.7) to the J.C. Boyle powerhouse at RM 220.4. No major tributaries occur in this reach. However, natural springs contribute an estimated 200 to 270 cfs (mean of 225 cfs) to the river channel in the bypass reach. The J.C. Boyle powerhouse usually is scheduled and operated in a peaking mode when river flows are less than the rated hydraulic turbine capacity of 2,850 cfs. This typically occurs throughout the year other than during the spring months when flows are highest. When river flows are less than 2,850 cfs, flows in the bypass reach are 100 cfs just below the dam. Accretion from springs results in a flow of about 325 cfs at the bottom end of the bypass reach. The additional flow to the bypass reach is discharged over the dam spillway when river flows are more than 2,850 cfs.

Throughout the J.C. Boyle bypass reach, the Klamath River is steep and fast-flowing, providing mixing and mechanical aeration. In addition, the inflow of groundwater in the bypass reach enhances water quality, notably by cooling the river and moderating diurnal temperature variation. As a result, water quality conditions in this reach are the best found in the entire Project area.

The J.C. Boyle peaking reach is the 16.4-mile-long reach of the Klamath River from the J.C. Boyle powerhouse (RM 220.4) to the upper end of Copco reservoir at about RM 204. Several small tributaries occur in this reach, but they contribute only a minor amount to the overall flow of the Klamath River.

Because of peaking operations, water quality conditions in the J.C. Boyle peaking reach can vary considerably. During peaking operation when the powerhouse is shut down, water quality in the reach reflects the higher-quality groundwater-dominated waters (i.e., spring flow) from the bypass reach. When the powerhouse is operating, water quality in the reach is similar to the lesser-quality waters bypassed to the powerhouse from J.C. Boyle reservoir. The Klamath River from the J.C. Boyle powerhouse to the Oregon border is included on the CWA 303(d) list by ODEQ for temperature (summer). The J.C. Boyle reach from the Oregon-California border to Copco reservoir is included on the CWA 303(d) list by the State of California for water temperature, organic enrichment/low dissolved oxygen, and nutrients.

ES3.2.2.7 Copco No. 2 Bypass Reach of the Klamath River

The Copco No. 2 bypass reach of the Klamath River is 1.5 miles of the Klamath River from Copco No. 2 dam (at about RM 198.3) to Copco No. 2 powerhouse (at about RM 196.8). No major tributaries occur in this reach. The Copco No. 2 powerhouse usually is scheduled and operated in a peaking mode when river flows are less than the hydraulic turbine capacity of 3,200 cfs. When river flows are less than about 3,200 cfs, flows in the bypass reach are 5 to 10 cfs.

Bypass reach flows are dominated by outflow from Copco reservoir (via the small Copco No. 2 impoundment). Water quality in the Copco No. 2 bypass reach, therefore, reflects the water quality coming through the Copco No. 1 powerhouse or in some cases water spilled over the dam. The Copco No. 2 bypass reach is part of the reach of the Klamath River from the Oregon-California border to Iron Gate dam that is included on the CWA 303(d) list by the State of California for nutrients, water temperature, and organic enrichment/low dissolved oxygen.

ES3.2.2.8 Fall Creek

The Fall Creek Development is located on Fall Creek, a small tributary to Iron Gate reservoir (at about RM 196.5). Estimated monthly median flow values for Fall Creek vary from about 30 to 50 cfs. Largely spring-fed at its source, Fall Creek has good water quality and is not included on the CWA 303(d) list by the State of California for any known water quality problems.

ES3.2.2.9 Copco and Iron Gate Reservoirs

The Copco reservoir includes the portion of the mainstem Klamath River from Copco No. 1 dam (RM 198.6) to the upper end of the Copco reservoir at about RM 204. The Iron Gate reservoir includes the portion of the mainstem Klamath River from Iron Gate dam (RM 190) to the upper end of the Iron Gate reservoir at about RM 196.8. Water quality processes in Copco and Iron Gate reservoirs are dominated by the thermal stratification that occurs annually in both reservoirs. Although these two reservoirs differ in shape, size, and mode of operation, the pattern of stratification in each is similar. In the spring, as the surface waters warm, a density gradient with depth is established. When wind energy is no longer sufficient to overcome this gradient, the temperature of the surface water diverges from the deeper water, and thermal stratification occurs. This stratification usually begins in March or April. The surface waters continue to warm until reaching a maximum, usually in mid-August, at which time they begin to cool. As the surface waters cool, the density gradient lessens and wind energy is sufficient to mix the water to deeper depths until the reservoir mixes completely and becomes isothermal. Mixing usually occurs by early October in Copco reservoir and by early-November in Iron Gate reservoir.

Both Copco and Iron Gate reservoirs exhibit the characteristics of productive, stratified lakes: temperature in the deep water (hypolimnion) is lower than at the surface (epilimnion), dissolved oxygen concentration in the hypolimnion is lower than in the epilimnion, the pH is lower in the hypolimnion than the epilimnion, and chlorophyll a concentration is much higher in the epilimnion than in the hypolimnion. However, Copco reservoir has higher concentrations of nutrients in the hypolimnion than in the epilimnion, while in Iron Gate reservoir the concentrations of nutrients are generally similar in both the epilimnion and the hypolimnion, or lower in the hypolimnion. The hypolimnion of Copco reservoir is also warmer than Iron Gate

reservoir, with typical summer bottom temperatures of 12ºC to 15ºC, compared to Iron Gate reservoir summer bottom temperatures of approximately 8ºC.

The hypolimnion of Copco reservoir has low dissolved oxygen content (dissolved oxygen less than 2 mg/L) beginning in mid-May most years and extending until mid-October, while the hypolimnion in Iron Gate reservoir does not reach that condition until June or even July. Copco reservoir is also the first in line of the two large reservoirs, and, as such, may serve to effectively trap particulate matter transported in the Klamath River. Copco and Iron Gate reservoirs are included on the CWA 303(d) list by the State of California for water temperature, organic enrichment/low dissolved oxygen, and nutrients.

ES3.2.2.10 Klamath River Downstream of Iron Gate Dam

This reach includes the Klamath River downstream of Iron Gate dam. Iron Gate reservoir, dam, and powerhouse operate for control of flows for power generation, and to provide stable flows in the Klamath River downstream of Iron Gate dam. Iron Gate dam usually is operated in a constant generation mode. Spill occurs when river flows exceed the powerhouse hydraulic capacity of 1,735 cfs, typically during the winter and spring months.

Water quality in the Klamath River immediately below Iron Gate dam is similar to water quality in the epilimnion of Iron Gate reservoir. As water progresses downstream, water quality conditions change. A few miles downstream of Iron Gate dam, water temperature increases, chlorophyll a decreases (probably the result of a shift from planktonic to attached periphytic algal forms), and dissolved oxygen increases. Just upstream of the confluence with the Shasta River, the water temperature continues to increase and average daily dissolved oxygen is near saturation, but many other constituents are at values similar to the epilimnion of Iron Gate reservoir. The Klamath River reach from Iron Gate dam to the Scott River is included on the CWA 303(d) list by the State of California for water temperature, organic enrichment/low dissolved oxygen, and nutrients.

ES3.3 ASSESSMENT OF PROJECT IMPACTS

During the new license period, PacifiCorp will continue to operate its currently licensed facilities, except for the East Side and West Site Developments at Link River, and Keno dam. The East Side and West Side Developments will be decommissioned. As a result, Project flow diversions from Link River and resulting water quality effects, if any, will no longer occur. PacifiCorp is excluding the Keno Development from the relicensed Project because it does not generate electricity and does not substantially benefit generation at PacifiCorp's downstream hydroelectric facilities.

Operations will continue at the J.C. Boyle Development, including load following (peaking) operations. Diversion of flows up to 2,850 cfs from the J.C. Boyle bypass reach (except for a minimum instream flow release of 100 cfs from J.C. Boyle dam) will continue to allow 225 cfs of high-quality spring inflow to dominate and enhance water quality conditions in the reach. Peaking operations at the J.C. Boyle powerhouse will continue to occur when flows are less than 2,850 cfs, causing daily flow fluctuations in the peaking reach. These flow fluctuations will continue to cause the presence of the relatively less productive varial zone along the margin of the river's channel, and to cause a larger daily range of water temperatures than would occur

without the Project. However, implementation of instream flow and ramping rate enhancement measures as proposed will reduce the magnitude of the flow fluctuations and concomitant effects on water use and water quality (see Sections ES3.4).

Operations will continue at the Copco No. 1 and Copco No. 2 Developments, including load following (peaking) operations. Diversion of flows up to 3,200 cfs from the Copco No. 2 bypass reach will continue (except for a minimum instream flow release of 10 cfs from Copco No. 2 dam). The bypass reach is relatively short (1.4 miles), and is comprised of a relatively high gradient, confined channel. Transit time of water through the reach is short. As a result, little change is expected to occur in water quality conditions released to the reach from Copco reservoir.

The existing Project reservoirs included in this new Project license application–J.C. Boyle, Copco, and Iron Gate–will have continuing effects on water quality. These reservoirs differ markedly from the river reaches in their water quality character, mainly because of the longer hydraulic residence time in the reservoirs. These reservoirs are more effective than the Klamath River in retaining organic matter, especially particulate forms, and nutrients delivered from Upper Klamath Lake and the Klamath Irrigation Project. Retention of organic matter and nutrients in the reservoirs results in periodic seasonal blooms of planktonic algae and contributes to low dissolved oxygen below the thermocline. This results in a net decrease in organic matter and nutrients that otherwise would continue downstream and contribute to increased algae growth in the Lower Klamath River.

J.C. Boyle reservoir is relatively small, with short residence time and limited, weak thermal stratification. Copco and Iron Gate reservoirs are larger, deeper reservoirs, with water quality characteristics that include stable seasonal thermal stratification. As a consequence of thermal stratification in Iron Gate reservoir and the biological processes occurring in the reservoir, the hypolimnetic water is deficient in oxygen by early summer, and might be detrimental to aquatic life in the river if released below the Iron Gate dam. PacifiCorp proposes to install an oxygenation or aeration system (see Section ES3.4) to prevent any adverse effects that might occur as a result of the oxygen-deficient condition of the released water. The specific system to be installed will be determined on the basis of further consultation with the ODEQ and CSWRCB during the CWA Section 401 water quality certification process for the Project.

Water temperature in the Klamath River below Iron Gate dam is slightly cooler in spring and early summer, and warmer in the late summer and fall than it would be in the absence of the Project. This is a consequence of the presence of Iron Gate reservoir (i.e., the mass of the reservoir that is available to store thermal energy), the reservoir's thermal stratification, and the near-surface location of the generator penstock intake. During stratification, some cool wintertime water is retained in the hypolimnion of the reservoir throughout the summer. A potential measure being considered by PacifiCorp is implementation of a low-level release of cooler hypolimnetic water from Iron Gate reservoir during summer to provide some cooling of the Klamath River below Iron Gate dam (see Section ES3.4). However, the volume of this cool water is limited. As a result, the potential benefit from releases of this cool water for downstream temperature reduction also is limited. Before determining whether to propose this measure, PacifiCorp will consult further with the ODEQ and CSWRCB during the CWA Section 401 water quality certification process for the Project.

Iron Gate dam will continue to be operated in a modified run-of-river generation mode under the schedule for instream flow releases and ramping rates at Iron Gate dam that is dictated by USBR's Klamath Project Operations Plans (consistent with BOs issued by the USFWS and NOAA Fisheries). Any increase in discharge from Iron Gate dam would require additional flow from upstream of the Project. This instream flow schedule, along with potential water temperature management and hypolimnetic oxygenation measures (see Section ES3.4), will help to maintain and improve current water quality conditions in the river below Iron Gate dam.

The Fall Creek Development will continue to operate in run-of-river generation mode. Under current Project operations, water quality in Fall Creek is spring-flow dominated and considered excellent. Proposed higher minimum instream flows (see Section ES3.4) will protect this water quality.

ES3.4 PROPOSED ENHANCEMENT MEASURES

PacifiCorp proposes to implement the following enhancement measures for water use and water quality on the Project:

- The East Side and West Side facilities will be decommissioned. Current East Side and West Side flow diversions from Link River will no longer occur, and any effect on water quality will be eliminated. This decommissioning will be conducted so as to properly dispose of any chemical or hazardous materials. Areas disturbed during decommissioning activities will be regraded and hydroseeded to prevent erosion.

- Instream flow and ramping rate measures will be implemented in Project reaches to protect and/or enhance various flow-dependent resources, including water quality (see Section ES.4.0). In addition, peaking operations at the J.C. Boyle powerhouse will be modified to reduce the magnitude of flow fluctuations in the J.C. Boyle peaking reach. PacifiCorp is continuing to analyze and discuss with stakeholders instream flow needs for aquatic resources. Based on these discussions, PacifiCorp may choose to formally modify its proposed flow and ramping rate measures.

- A potential measure being considered by PacifiCorp is implementation of a low-level release of cooler hypolimnetic water from Iron Gate reservoir during summer to provide some cooling of the Klamath River below the Project. However, cool water volume in Iron Gate reservoir is limited, so the potential benefit from releases of this cool water for downstream temperature reduction likewise is limited. Before committing to this measure, PacifiCorp will further consult with the CSWRCB during the CWA Section 401 water quality certification process for the Project.

- PacifiCorp proposes to install an oxygenation or reaeration system at the Iron Gate Development as needed to prevent adverse downstream effects caused by low levels of dissolved oxygen in the hypolimnetic water. Two alternative systems are being considered: (1) a system to oxygenate the hypolimnion of Iron Gate reservoir using hypolimnetic oxygen diffuser technology, or (2) a system to oxygenate or reaerate low-level (hypolimnetic) waters released from the dam using a reaeration valve or oxygen injection. Before selecting the specific system, PacifiCorp will consult further with the CSWRCB during the CWA Section 401 water quality certification process for the Project.

- PacifiCorp will consult and coordinate with appropriate agencies on the annual scheduled outages for Project maintenance events where flows in Project reaches are required to be outside the normal operations. This will ensure that times are selected to complete maintenance activities that do not adversely affect sensitive life stages of fish or water quality.

ES4.0 FISH RESOURCES

4.1 GEOGRAPHICAL EXTENT OF STUDY AREA

The geographic scope of the fisheries investigations included the Link River, the Klamath River from Keno dam to Iron Gate reservoir, Fall Creek, and the four primary Project reservoirs (Keno, J.C. Boyle, Copco, and Iron Gate). Literature reviews were conducted for several Project area tributaries and for major tributaries to the Klamath River downstream of Iron Gate dam. Fisheries studies included:

- Standard fish sampling efforts (electrofishing, angling, etc.) in all Klamath River reaches and Fall Creek and Keno reservoir (to supplement recent Oregon State University sampling in Iron Gate, Copco No.1, and J.C. Boyle reservoirs)
- Hydroacoustic sampling in Copco and Iron Gate reservoirs
- Traditional PHABSIM-based instream flow studies in the Link River, J.C. Boyle bypass and peaking reaches, Copco No. 2 bypass reach, and Fall Creek
- Two-dimensional instream flow analysis in the J.C. Boyle peaking reach
- Assessment of fish passage facilities at the J.C. Boyle, Copco No. 1 and 2, and Iron Gate developments.
- Fry stranding observations in the J.C. Boyle peaking reach
- Literature review of resident fish entrainment and turbine mortality
- Trout fry distribution and relative abundance studies in J.C. Boyle bypass and peaking reaches
- Radio-tracking of fish in the J.C. Boyle bypass and peaking reaches
- Evaluation of Iron Gate fish hatchery operations
- Assessment of potential anadromous fish re-introduction to the Upper Klamath River (above Iron Gate) and basin (above Upper Klamath Lake). This assessment included potential production modeling, stock-genetics assessment, and potential disease evaluation.

Additional analysis is being done for instream flow modeling (including bioenergetics) and anadromous fish production modeling. Field work is continuing for hydroacoustic surveys in Copco and Iron Gate reservoirs, smolt survival through Project reservoirs, and *Ceratomyxa shasta* in the Project area.

4.2 SUMMARY OF INFORMATION

The following sections present a summary of the fisheries resources and description of pertinent Project features (e.g., fish ladders) for the proposed Project river reaches and reservoirs. This information is a summary of the information gathered from PacifiCorp's relicensing studies and/or past information.

4.1.1 J.C. Boyle Bypass Reach

The J.C. Boyle bypass reach of the Klamath River is 4.3 miles long. It extends from the 68-foot-high J.C. Boyle dam at RM 224.7 to the discharge from the 80-MW J.C. Boyle powerhouse at RM 220.4. The dam has a 569-foot-long fish ladder, plus a juvenile fish bypass system at the powerhouse canal intake

This reach of the Klamath River has a relatively steep gradient of about 2 percent. The river channel is narrow (approximately 100 feet wide) and consists primarily of rapids, runs, and pools among large boulders with some large cobble interspersed. Gravel is scarce in the bypass reach, with its recruitment limited by the presence of J.C. Boyle dam and only a few upstream tributaries. During non-spill periods, riffles and runs with a few pools are the predominant habitat in the bypass reach. When spill from the dam is substantial, habitat in the bypass reach consists of a series of rapids and fast runs.

Water discharged from J.C. Boyle dam to the bypass reach during summer is quite warm (exceeds 70°F), highly productive, and often degraded—the same as noted for upstream reservoirs on the Klamath River during summer (ODFW, 1997). Springs within the bypass reach begin entering the river about 0.5 mile downstream of J.C. Boyle dam and contribute an estimated 220 to 250 cfs of cool (about 48°F) water.

Fourteen species of fish were captured during PacifiCorp's 2001 and 2002 sampling events; about half were native and half were non-native. The most abundant species were sculpins (Cottidae**)**, speckled dace (*Rhinichthys osculus*), and redband trout[1]. Species with special status collected, along with redband trout (*Oncorhynchus mykiss gairdneri*), included shortnose sucker, and lamprey (*Lampetra sp.*). Spawning redband trout and fry have been observed in this reach.

4.1.2 J.C. Boyle Peaking Reach

The J.C. Boyle peaking reach of the Klamath River is 17.3 miles long. It extends from the J.C. Boyle powerhouse discharge at RM 220.4 to the upper end of Copco reservoir at RM 203.1. The Oregon/California state line is at RM 209.3. The upstream 11.1 miles of this river reach are in Oregon and have been federally designated as a Wild and Scenic River. The downstream 6.2 miles are in California. Key tributaries to this river reach are Rock Creek at RM 213.9 and Shovel Creek at RM 206.5. Only Shovel Creek is large enough to support trout spawning. Apparently, there is little or no spawning habitat for trout in the peaking reach. Gravel accumulation in this reach is limited because J.C. Boyle dam blocks gravel recruitment, there are few tributary streams to contribute gravel, and the steep gradient limits accumulation.

In the Oregon segment of the peaking reach, habitat includes cascades, deep and shallow rapids, runs, riffles, and occasionally deep pools, with the proportions of each varying according to river gradient and width at a particular river location. Substrate in the Oregon portion is heavily armored with boulders and large cobbles and contains a few small pockets of tightly embedded gravel behind boulders. Riparian bank cover in the Oregon portion is generally good, but reflects some cattle grazing effects. Many large boulders provide good instream cover for fish.

[1] This fish is referred to as redband trout in Oregon and rainbow trout in California. To accommodate stakeholders' comments, we have attempted to keep references to this fish relevant to the state in which it was found.

The California segment of the peaking reach is wider and less steep than the Oregon segment, contains fewer cascades but more riffles and runs, and infrequently exhibits pools and quiet water. The substrate is primarily bedrock, boulders, and cobbles, with a few gravel pockets occurring below boulders downstream of Shovel Creek. The California portion exhibits good bank cover (riparian) and good instream cover (boulders, rooted aquatic plants, undercut banks) for fish. Some cattle grazing effects also are prevalent in the segment.

Daily river flow fluctuations have affected aquatic resources in the peaking reach by modifying physical habitat and water quality, but they also have allowed for commercial and recreational rafting opportunities during the summer from the J.C. Boyle powerhouse to Copco reservoir. Daily flow fluctuations during the warmer months of the year regularly expose the river channel shoreline, thereby likely limiting aquatic insects and other benthic invertebrate populations. During power generation, water entering the peaking reach consists primarily of highly productive warm water. When power generation ceases, water entering the peaking reach consists primarily of the cooler, but less productive spring water from the bypass reach.

Native fish species known or suspected to occur in the peaking reach include redband/rainbow trout; Klamath smallscale (*Catostomus rimiculus*), Klamath largescale (*Catostomus snyderi*), shortnose, and Lost River suckers; Tui chub (*Gila bicolor*) and blue chub (*Gila coerulea*); lampreys (perhaps Klamath and Klamath-Pit brook); sculpins; and speckled dace. Sampling by PacifiCorp in 2001 and 2002 found nine species of fish in the peaking reach with the most abundant being sculpins and chubs. The only gamefish sampled was redband/rainbow trout. Other sampled species of special interest were shortnose suckers and lamprey.

4.1.3 Copco No. 2 Bypass Reach

The Copco No. 2 bypass reach of the Klamath River is 1.4 miles long. It extends from the 38-foot-high Copco No. 2 dam at RM 198.3 to the Copco No. 2 powerhouse at RM 196.9. The powerhouse discharges directly into Iron Gate reservoir. The Copco No. 2 bypass reach is in a deep, narrow canyon with a steep gradient similar to that of upstream Klamath River reaches. The channel consists of bedrock, boulders, large rocks, and occasionally pool habitat. The riparian zone is well developed, but clearly has been influenced by the altered flow regime. PacifiCorp discharges a non-regulatory minimum flow of approximately 5 to 10 cfs from Copco No. 2 dam to the bypass reach.

Water quality in both Copco reservoirs during summer generally is degraded because of warm surface water temperatures and blooms of blue-green algae. Water quality in the Copco No. 2 bypass reach during summer is probably similar to that in the larger Copco reservoir. The base flow (approximately 10 cfs) and proximity to Copco No. 1 and No. 2 reservoirs and upper Iron Gate reservoir undoubtedly influence the fish community in this reach.

Before 2001, no fisheries studies had been conducted in the Copco No. 2 bypass reach. Sampling in 2001 and 2002 found five native species (sculpin, speckled dace, chubs, suckers, and redband trout), and three non-native species (yellow perch [*Perca flavescens*], largemouth bass [*Micropterus salmoides*], and crappie [*Pomoxis sp.*]). Based on sampling results, it appears that trout would primarily move into this reach in the fall, which is when water conditions would be most favorable.

4.1.4 Below Iron Gate Dam

Iron Gate dam, located at RM 190.1, is the downstream-most hydroelectric facility of the Klamath Hydroelectric Project and the downstream-most dam on the Klamath River. There are no upstream fish passage facilities past Iron Gate dam. The reach of the Klamath River between the dam to the confluence with the Shasta River is 13.5 miles long and is where most anadromous fish spawning occurs in the mainstem Klamath River. Bottom substrate contains a wide range of sizes, is relatively loosely packed, and is easily excavated by spawning fish.

Water quality in the Klamath River likely limits all runs of anadromous fish at some point in their life cycle, especially during the summer. Water from upstream during low-flow periods can have water quality-related effects including elevated water temperatures.

Anadromous species historical use of the Klamath River basin extended from the mouth of the Klamath River upstream past Upper Klamath Lake/Agency Lake to the Sprague and Williamson rivers. The primary anadromous species historically using the upper Klamath basin were most likely Chinook salmon (*Oncorhynchus tshawytscha*)(probably spring-run and fall-run fish) and steelhead (*Oncorhynchus mykiss*), which migrated at least as far up as Spencer Creek. Coho salmon also may have occurred historically in the tributaries upstream of Iron Gate dam. Pacific lamprey historically were afforded access throughout the Klamath River, extending to Upper Klamath Lake. Upstream migrations by anadromous species into the upper Klamath basin were blocked by the completion of Copco No. 1 dam in 1918 and Iron Gate dam in 1962.

4.1.5 Spencer Creek

Spencer Creek plays a critical role in sustaining redband trout populations in the Keno reach of the Klamath River upstream of J.C. Boyle reservoir and also provides spawning habitat for trout below J.C. Boyle dam. No suitable spawning habitat other than in Spencer Creek is known to exist upstream of J.C. Boyle dam to Keno dam. Spencer Creek has approximately 15 miles of available habitat.

4.1.6 Shovel Creek

Shovel Creek, located in California between J. C. Boyle dam and Copco No. 1 dam, is an important spawning tributary for rainbow trout occurring in the J.C. Boyle peaking reach, particularly the California segment. Shovel Creek enters the Klamath River from the south/southeast at RM 206.5, approximately 3 miles downstream of the Oregon/California border. J. C. Boyle dam is approximately 18 miles upstream and Copco No. 1 dam approximately 8 miles downstream of the mouth of Shovel Creek.

Surveys of Shovel Creek by the CDFG indicate that the rainbow trout population is good, instream cover for fish (boulders, woody debris) is excellent, and invertebrate production and aquatic vegetation also are excellent. However, a natural barrier falls approximately 2 miles above the mouth of Shovel Creek blocks upstream spawning migrations and insufficient spawning gravel in the lower portion may be limiting trout production.

4.1.7 Fall Creek

Fall Creek is a tributary to Iron Gate reservoir. It enters at RM 196.3, approximately 0.6 mile downstream of the Copco No. 2 powerhouse discharge. Fall Creek contains a natural fish barrier (falls) located about 1.3 miles upstream from its confluence with the Klamath River (Iron Gate reservoir). The bypass reach of Fall Creek is about 1 mile long, located above the falls. The diversion dam that provides water to the power canal is not screened and has no upstream fish passage facilities.

Previous fisheries investigations for lower Fall Creek are absent, however, it is likely that some of the native, riverine species of fish discussed previously for the Klamath River, including rainbow, speckled dace, and marbled sculpin, use the lower portions of Fall Creek. Other species originating in Iron Gate reservoir also occasionally may be found in the creek. Sampling by PacifiCorp in the bypass reach and power canal in 2001 and fall 2002 found only rainbow trout.

4.1.8 J.C. Boyle Reservoir

J.C. Boyle reservoir (420 surface acres) is wide and shallow and is surrounded by a low-gradient sloping shoreline in the upper reservoir near the inflow. Below the Highway 66 bridge, the reservoir begins to deepen as the canyon narrows. The upper end of the reservoir contains a large amount of aquatic vegetation during the summer and there are several large shoreline wetland areas. Similar to upstream conditions, water quality can be poor on a seasonal basis. There is a fish screen on the water intakes for the powerhouse, however, water velocities approaching the screen are faster than current design criteria.

Recent studies showed that, among adult fish collected in J. C. Boyle reservoir, approximately 55 percent of the total was native species and Tui chub was the most abundant native species. Redband trout are present in the reservoir, however, their numbers are considerably lower than other native fishes. The most abundant non-native species were bullhead. Results of previous fisheries studies in J. C. Boyle reservoir generally indicate the fish community has not changed greatly during the past 15 years, except perhaps in the increased abundance of several popular warm water game species (largemouth bass and white crappie) that now support a popular recreational fishery (ODFW, 1997).

The endangered shortnose and Lost River suckers only accounted for about 1.5 percent of the native fish captured during recent sampling and may represent individuals or their progeny that originated in Upper Klamath Lake (PacifiCorp, 2000). Shortnose suckers were much more abundant in the catch than Lost River suckers. In addition, J. C. Boyle reservoir was the only reservoir studied in the Project area where all life stages of suckers (adults, juveniles, larvae) were found. This may reflect the effects of several factors. These include J. C. Boyle reservoir serving as a downstream sink for larvae and juvenile suckers dispersed from upstream spawning in Upper Klamath Lake. In addition, the presence of juveniles and younger adults suggests that there is sufficient habitat in the reservoir to support these life stages. Also, fewer numbers of introduced, dominant predators, such as yellow perch, crappie, and largemouth bass, in J.C. Boyle Reservoir compared to downstream reservoirs may contribute to higher sucker survival.

4.1.9 Copco Reservoir

Copco reservoir (about 1,000 surface acres) is deeper than J.C. Boyle reservoir. It is located in a relatively steep canyon and contains several coves with more gradual slopes. The reservoir has large areas of thick aquatic vegetation in shallow areas, and nearshore riparian habitat is generally lacking because of the cliff-like nature of shorelines. Only small, isolated pockets of wetland vegetation exist. Water quality in the reservoir during the summer is generally poor. Copco No. 1 powerhouse discharges directly in to Copco No. 2 reservoir; therefore, there is essentially no river habitat downstream of Copco No. 1 dam.

Copco reservoir contains a diverse fishery, including both warm water and cold water species, although warm water fish are the most abundant. According to recent studies, more than 60 percent of the fish in the reservoir are non-native species, with bullheads and yellow perch being the most abundant non-native species. Suckers are a relatively abundant native species, but few redband trout were sampled in the reservoir. Copco reservoir provides a popular sport fishery for primarily warm water species. It also is the site of several largemouth bass tournaments during the summer.

The fish species found in Copco No.2 reservoir would be similar to Copco reservoir. Because Copco No. 2 reservoir is short (less than a ¼-mile long), with limited access, no specific fish studies were done in this area. There is no access to Copco No. 2 reservoir.

4.1.10 Iron Gate Reservoir

Iron Gate reservoir (944 surface acres) is similar to Copco reservoir in that it is in a deep and relatively steep canyon. However, there are fewer coves and low-slope shore areas than at Copco reservoir. As with the upstream areas, Iron Gate reservoir water quality can be poor on a seasonal basis. The fishery consists mostly of large numbers of non-native fish, mostly yellow perch, minnow species, crappie, and bullheads. Non-native fish comprise about 80 percent or so of the adult fish population as indicated by recent sampling. Iron Gate reservoir provides a popular fishery for yellow perch and is also the site of largemouth bass tournaments in the summer.

The endangered shortnose and Lost River suckers made up only about 1 percent of the total adult catch in Iron Gate reservoir during recent sampling. All endangered suckers collected during the study were either adults or larvae. The lack of sucker juveniles in Iron Gate reservoir suggests little recruitment is occurring. This may reflect the presence of predators (for example, yellow perch, largemouth bass, and crappie) and the reservoir's lack of rearing habitat for larval and juvenile suckers.

4.3 ASSESSMENT OF PROJECT IMPACTS

Factors associated with the current Project facilities and operations that affect fish resources occur in both the river and reservoir habitats. For riverine areas, the factors affecting fish are categorized into (1) instream flows, (2) flow fluctuations, and (3) resident fish passage. For Project reservoirs, the factors are categorized into (1) reservoir level fluctuations and (2) resident fish entrainment and mortality. Anadromous fish are addressed through (1) fish passage, and (2) Iron Gate fish hatchery operations. The following is a summary of these effects.

4.3.1 River Fisheries

4.3.1.1 Instream Flows

The study of Project instream flows has received much attention from PacifiCorp and the relicensing stakeholders. Many meetings have been conducted by the Aquatic Work Group (AWG) and the AWG's Instream Flow subgroup. The subgroup was formed to work through technical issues and work toward agreed upon instream flow input, analysis, and recommendations. PacifiCorp recognizes, and requests that the FERC also recognize, that additional collaboration, refinement of model input variables, and analysis are needed to provide a good technical basis for instream flow recommendations. This includes such items as working collaboratively to develop and produce agreed upon modeling input, and consequently, modeling results and recommendations.

PacifiCorp constructed its own rainbow trout envelope curves that were used for the instream flow analysis. However, these curves have not been reviewed or approved by the Instream Flow subgroup. As such, stakeholders have technical uncertainty surrounding the insteam flow analysis presented in this application. PacifiCorp and the stakeholders will continue to develop Klamath River habitat suitability curves (HSC).

To address the instream flow analysis tasks, PacifiCorp and relicensing stakeholders will continue to meet to work on the following:

- Approve rainbow trout and sucker HSC
- Develop a habitat time series
- Complete bioenergetics modeling efforts
- Conduct peaking analysis
- Discuss modeling results as they relate to fisheries and other interrelated studies (e.g., recreation, geomorphology, etc)
- Develop river flow regime recommendations for aquatic resources

It is anticipated that the above tasks will be completed by the end of May 2004. At the conclusion of these tasks, a final instream flow report will be distributed to the FERC and interested stakeholders by the end of June 2004. At that time, PacifiCorp will review this additional information and revise as appropriate the Project operations and PM&E measures included in this license application.

The following summarizes the preliminary results of the instream flow analysis using site-specific and envelope HSC criteria for rainbow trout and several sources for suckers.

J.C. Boyle Bypass Reach

Habitat index simulation for rainbow trout fry, juvenile, and adult life stages in the J.C. Boyle bypass based on envelope or site-specific HSC follow similar patterns, varying only in amplitude, a function of the range in depth and velocity suitability. Both fry and juvenile weighted useable area (WUA) decline over the range of flows simulated and flatten out at higher flows. The relatively flat WUA values with increasing flow is the result of suitability being maintained in margin areas while the majority of the channel becomes unsuitable as a result of

increasing velocities. The adult trout WUA curves increase slightly in the lower flow ranges and show maximum habitat at 200 to 400 cfs before tapering off over the range of flows. Sucker WUA curves in the J.C. Boyle bypass generally follow the same trends as rainbow trout**.**

J.C. Boyle Peaking Reach

Habitat index simulation for rainbow trout fry, juvenile, and adult life stages in the J.C. Boyle peaking reach showed that fish habitat responded similarly to those in the bypass reach. However, juvenile and adult WUA show a steeper decline over the middle range of simulation flows. This is most likely a function of the larger channel size, resulting in more area in the main channel becoming unsuitable at higher flows as a result of high velocities. Adult trout WUA was highest at flows of 300 to 600 cfs. Juvenile sucker WUA in the J.C. Boyle peaking reach decline from low flow before flattening out over the higher simulation flow range. Adult sucker WUA increase sharply, level off between 500 and 900 cfs, then decrease over the higher flow range.

Copco No. 2 Bypass Reach

Habitat index simulations for rainbow trout fry, juvenile, and adult life stages in the Copco No. 2 bypass reach are reflective of the channel shape in the reach. Because of riparian encroachment, the main channel has narrowed, leaving large, relatively flat cobble/boulder bars over portions of the reach. As water is added to the channel, velocities of up to 200 cfs quickly become unsuitable for rainbow trout fry and juveniles. As flows continue to increase, water spills onto the large cobble/boulder bars producing the increase in WUA. Rainbow trout adults show an increase in WUA as flows increase up to 200 cfs, in part caused by suitability for higher velocities and deeper water. Sucker WUA in the Copco bypass shows similar patterns to rainbow trout.

Fall Creek Bypass Reach

Habitat index simulation for rainbow trout juvenile, and adult life stages in Fall Creek used "small stream" HSC instead of envelope curves used in other reaches. Juvenile WUA shows an abrupt increase up to 5 cfs followed by a relatively flat curve. Adults, on the other hand, show a continuous increase over the range of simulation flows. Because suckers are not known to inhabit Fall Creek, they were not modeled.

4.3.1.2 Flow Fluctuations/Ramping

Hydroelectric facilities typically have the capability of increasing and decreasing flow levels downstream of the facilities. In general, the rate at which these changes occur is called the "ramp rate" or "ramping." From a fisheries perspective, ramping down the river flow has the potential to strand fish in areas of the channel that are relatively low-gradient, or where pockets or side channels exist in the river channel. In terms of fisheries/aquatic affects, there is a major difference between a non-peaking project, such as Iron Gate, that occasionally changes flow (ramps) in response to natural hydrologic or minimum flow changes, and a peaking project, such as J.C. Boyle, that typically ramps rapidly, frequently, and through a wide flow range. For non-peaking facilities the only potential ramping issue is fish stranding (if rates are too fast), and this usually is not a significant issue because typically there is little economic cost associated with ramping at such projects (thus conservative rates are acceptable). Peaking projects, on the other

hand, create several other impacts on fish resources, directly and indirectly, as a result of the "rapidly varying flows" and creation of a varial zone on the streambed.

J.C. Boyle Bypass Reach

Because down ramping at J.C. Boyle dam occurs rarely and mostly just during high flow events, the potential effects of down-ramping on fish resources in this reach has not been considered by PacifiCorp to be a major issue. However, it is possible that some stranding of small fish could occur at the current down-ramp rates under certain flow conditions and times of the year. When flows are dropping from about 1,000 cfs to the minimum of 100 cfs, dewatering of streambed areas and a few side channels can pose a risk of stranding to small fish. However, the steep gradient and spring accretion in this reach help minimize the stranding potential. This reach is a trout spawning area and trout fry occur along the stream margins from early June and through the summer.

J.C. Boyle Peaking Reach

Potential flow fluctuations caused by peaking operations at the J.C. Boyle powerhouse can affect fish resources in various ways and processes, both directly and indirectly. In an effort to identify effects of peaking on fish resources and potential mechanisms leading to these effects, several lines of evidence were explored. Specific studies and data analysis were performed to provide quantitative information, to the extent practical, on peaking-related factors potentially affecting or indicating effects on fish in the J.C. Boyle peaking reach. Some of the analysis compares fisheries information between the peaking reach and the Keno reach, which does not have flow fluctuations associated with hydropower peaking.

The factors evaluated included:

- Streambed dewatering
- Fish community comparisons
- Trout spawning distribution
- Trout fry distribution and movement
- Adult Trout Movement
- Juvenile Fish Stranding
- Trout Growth and Condition

The following are summaries of the conclusions for each the above factors regarding how they relate to the peaking operations at the J.C. Boyle powerhouse.

- Streambed Dewatering. Compared to run-of-river (ROR) in the summer (assumed flow of 700 cfs), a typical one-unit peaking cycle (base flow of 350 cfs) reduces the wetted streambed area by 11.4 percent. In riffle areas, the reduction is 16.3 percent. Greater reductions occur when ROR flows are higher. These reductions in wetted streambed undoubtedly reduce the abundance of macroinvertebrates, which are the primary food source for fish. Fish growth could be affected if food availability is limited.

- Fish Community. Electrofishing catch rate data do not indicate any major differences in fish communities between the non-peaking Keno reach and the J.C. Boyle peaking reach that

cannot be attributed to other non-peaking factors (chub and minnow recruitment from Keno reservoir, and trout recruitment from tributaries). The similarities between reaches is especially apparent for the primary native riverine species, speckled dace and marbled sculpin.

- Trout Spawning. Spawning of redband trout is not known to occur in the J.C. Boyle peaking reach, most likely because of the lack of streambed areas containing suitable-sized spawning gravel. Trout spawning that contributes to recruitment of juveniles to the peaking reach is known to occur in Spencer Creek, the J.C. Boyle bypass reach, and Shovel Creek. None of these areas is affected by peaking flows in the main stem. Therefore, the current peaking operations do not affect any known trout spawning areas (or subsequent egg incubation and fry emergence) in the peaking reach.

- Fry Distribution and Movement. Few trout fry have been observed in the peaking reach, with most fry located near known spawning locations; downstream of Shovel Creek and just downstream of the bypass/tailrace confluence. Results of studies of trout fry movement in the peaking reach indicated little if any downstream dispersal of fry associated with flow fluctuations.

- Adult Trout Movement. Results of a radio-telemetry study of adult trout movement found that no movement occurred in 75 percent of the observations made during a peaking cycle. For those fish that did shift position during the peaking cycle, movements generally were not extensive (10 to 210 feet) and usually occurred either upstream or downstream within the same habitat unit. Migrating trout that encountered the J.C. Boyle powerhouse tailrace during peaking discharges were not delayed or deterred from passing through the area.

- Juvenile Fish Stranding. Results of stranding observation tests, while demonstrating some very limited stranding of non-trout species, provided no indication that trout fry were being stranded by the current down-ramping in the peaking reach.

- Trout Growth. Compared to trout in the non-peaking Keno reach upstream of J.C. Boyle reservoir, trout in the peaking reach grow significantly faster through age 2 (approximately 200 mm length), grow at a similar rate between ages 2 and 3 (approximately 250 mm length), and then grow slower after age 3. The exact mechanism for this difference in relative growth pattern is not known. However, bioenergetic factors associated with flow fluctuations are possibly responsible. Differences in the size or types of available prey organisms may explain the different growth patterns. PacifiCorp is doing a bioenergetics study and the results will be filed with the FERC in the spring of 2004. This study may provide some explanation for the differences in trout growth pattern observed in the Keno and peaking reaches.

- Trout Condition. The average condition factor (length-weight relationship) of trout larger that 50 mm in the peaking reach was 1.20. This is similar to trout in the Keno reach (1.18). Condition factors greater that 1.0 for trout are considered indicative of healthy fish.

Of the various lines of potential evidence examined to assess the effects of peaking on rainbow trout, the only one that is possibly revealing is the difference in growth patterns for trout in the peaking reach compared to those in the non-peaking Keno reach. This growth pattern difference

is curious because peaking reach trout grow faster than Keno reach trout until they are about 200 mm. At larger sizes, the Keno reach trout then grow faster. Such a result would not suggest a difference in overall prey abundance, but rather a difference in prey size or prey species available to the two populations. A bioenergetics modeling study, which will be completed in early 2004, may provide more insight to this finding regarding growth patterns.

Copco No. 2 Bypass Reach

Although fish use of this reach is limited, the occasional down-ramping that occurs when Copco No. 1 is coming off spill, and during other maintenance events may cause stranding of small fish.

Below Iron Gate Dam

PacifiCorp currently operates the Iron Gate facilities in accordance with the NOAA Fisheries 2002 Biological Opinion (BO), which stipulates down-ramp rates of 50 cfs/2 hours at river flows less than 1,750 cfs and 150 cfs/4 hours at flows greater than 1,750 cfs. These rates are approximately equivalent to a rate of stage decline of only 0.4 inch/hour at the USGS Iron Gate gauge. The ramp rates stipulated in the BO are six to eight times more restrictive (slower) than those recommended in the Biological Assessment, upon which the BO presumably was based. These BO down-ramp rates are conservative compared not only to other systems, but compared to unregulated streams supporting similar fish species.

Fall Creek Bypass Reach

Fall Creek has an extremely stable flow originating from springs. Even large storm events have little influence on the stream at the point of its diversion to the Fall Creek powerhouse. Therefore, water diversion into the power canal runs nearly continuously and at a constant flow rate. When the powerhouse is shut down for maintenance purposes, flow is usually still diverted into the canal and routed around the powerhouse through bypass valves.

4.3.1.3 Resident Fish Passage

J.C. Boyle Dam

The upstream fishway at J.C. Boyle dam is a pool and weir type ladder with submerged orifices and an auxiliary water supply system to help attract fish to the ladder's entrance. It was designed and constructed in 1958 in accordance with criteria prescribed by the state of Oregon at that time. It is doubtful that reconstructing the fish ladder in accordance with contemporary design criteria would noticeably improve fish passage efficiency. Tagging studies indicate that few fish from below the dam actually use the facilities, and those that do, appear to move through the ladder quickly after they enter the facility. It is unlikely that the non-contemporary design of the existing fish ladder could explain the decline in its use over the years. To argue such would require the assumption that the fish ladder efficiency became progressively worse through the years, yet the fish ladder has remained unchanged.

The existing fish screens at the J.C. Boyle Development (for downstream fish passage) met existing design criteria when constructed in 1957. The facilities appear to be in good condition and are maintained to meet the original design criteria. However, the facility does not meet

current fish passage criteria for the state and federal fisheries resource agencies as related to resident and anadromous fish.

Copco No. 1 and Copco No. 2 Dams

Copco No.1 or No. 2 dams were not constructed with upstream fish passage facilities, therefore, upstream migration of resident fish species is not possible. However, most of the species, except for maybe a few redband trout, tend not to be migratory and would not benefit from upstream fish passage facilities. In addition, intake facilities at both facilities are not screened to prevent fish from being entrained into the powerhouses.

Iron Gate Dam

Iron Gate dam was not constructed with upstream fish passage facilities. Therefore, upstream migration of resident fish species is not possible. Anadromous fish in the Klamath River also are blocked by Iron Gate dam. The intake facilities to the Iron Gate powerhouse are not screened.

Fall Creek Diversion Dam

The original construction of the Fall Creek Development did not include fish screens on either the Fall Creek or Spring Creek diversions. Fish ladders were not included over either dam. There is a natural barrier (waterfall) located on Fall Creek, approximately 1.3 miles from the mouth.

4.3.2 Reservoir Fisheries

There are two main issues related to the operation of the Project with respect to reservoir fisheries that have the potential to adversely affect the reservoir fish populations. These are (1) fluctuating reservoir levels that may adversely affect the use of littoral zone habitat by fish or directly affect the fish themselves, such as in stranding, and (2) the potential for reservoir fish to be entrained into hydroelectric facilities, which can result in turbine-induced mortality.

4.3.2.1 Reservoir Level Fluctuations

Project reservoir fluctuations can consist of short-term (e.g., daily) and long-term (e.g., seasonal) fluctuations that may affect the fish communities in those reservoirs.

J.C. Boyle Reservoir

Peaking operations at the J.C. Boyle powerhouse cause water level fluctuations in the reservoir, typically about 2 feet per day.

The issue of the potential effect of reservoir fluctuations on Lost River and shortnose suckers was addressed in the 1996 BO (USFWS, 1996). In that document, the USFWS concluded that there would be only low levels of impact in the Klamath River and reservoirs because of changes in reservoir elevations. In addition, as a condition of its 1996 Incidental Take Statement, PacifiCorp was required to document the distribution and abundance, age class structure, recruitment success, and habitat use by different life stages of shortnose and Lost River suckers in J.C. Boyle, Copco, and Iron Gate reservoirs. Based on extrapolation from the literature, it was speculated that water level fluctuations in J.C. Boyle reservoir would have a negative effect on

larval and juvenile suckers, compared to Copco and Iron Gate reservoirs, which have much less fluctuation. However, the results of the study revealed that J.C. Boyle had the greatest number of juvenile suckers and that there appeared to be sufficient habitat to support these early life stages. Juvenile recruitment appears to be from upstream sources rather than from spawning in J.C. Boyle reservoir.

Copco Reservoir

Copco reservoir has a surface area of approximately 1,000 acres and a maximum depth of about 90 feet. Copco reservoir is maintained at near maximum pool elevations during the summer, but often is drawn down several feet in the autumn. Power generation causes daily water level fluctuations of about 0.5 foot. Because of the concern of local sportsman, PacifiCorp tries to minimize weekly reservoir fluctuations in the spring during the bass spawning period.

Iron Gate Reservoir

Iron Gate reservoir has a surface area of 944 acres and a maximum depth of about 160 feet. Much of the reservoir is deeper than 35 feet, with steeply sloped banks. Iron Gate acts as a re-regulation reservoir for variable inflow from Copco No. 2 powerhouse. Reservoir elevations can vary daily by about 1 foot, as a result of load-factoring inflow from Copco No. 2. This degree of fluctuation is not likely to adversely affect fish resources in such a large reservoir.

4.3.2.2 Resident Fish Entrainment and Turbine-Induced Mortality

PacifiCorp has addressed the issue of entrainment and turbine mortality at its facilities by reviewing existing fisheries information for the Project reservoirs and tailwaters, coupled with other entrainment and mortality studies at projects with similar fisheries and environments. This information was used in conjunction with other fisheries information for the Project area to determine if entrainment potentially could be adversely affecting fish populations in Project reservoirs.

A common understanding is that fish residing in hydroelectric reservoirs can become entrained through powerhouses and that a portion of them is killed as they pass through the turbines. The median number of fish entrained annually at the 26 FERC-reviewed projects reviewed by PacifiCorp was approximately 83,000 fish. However, it is likely that the J.C. Boyle and Copco powerhouse intakes entrain fewer fish than observed at the other reviewed projects because of the frequent shut down of these powerhouses at night (for load following) when most native species appear to move downstream (based on Link River observations). Also, the shallow intakes at the deep-water dam faces at Copco and Iron Gate may further reduce the likelihood of bottom dwelling species such as suckers and bullheads from becoming entrained. However, even considering these possible minimizing factors, it is likely that annual entrainment still is several tens of thousands of fish at each of the Projects. Yellow perch, sunfishes, and chubs are likely to be the most commonly entrained species. Even though entrainment may be less at the Project dams than observed at other sites, the rate of mortality associated with turbine passage is probably greater because of their relatively higher head (and thus greater turbine runner velocity).

Results of a literature-based review coupled with site-specific fisheries data (mostly non-native fish, popular fishery, etc.) suggest that fish entrainment and associated turbine mortality are not likely to be causing significant adverse affects on resident fish populations in Project reservoirs.

4.3.3 Anadromous Fish

4.3.3.1 Anadromous Fish Passage

A major fisheries issue identified by the fisheries resource agencies, affected tribes, and NGOs (stakeholders) during the relicensing process was the lack of fish passage facilities at several Project structures. Effective upstream and downstream fish passage facilities are needed to meet the agencies long-term goal of re-establishing anadromous fish runs upstream of Iron Gate dam. To determine how best to achieve this goal, the stakeholders requested that PacifiCorp evaluate methods for re-establishing anadromous fish to the basin above Iron Gate dam.

The issue of run sustainability is an important one from the PacifiCorp's perspective. It is PacifiCorp's view that given the costs of constructing the facilities, impacts on other resource areas, and risks to existing native fish populations, it must be demonstrated that the reintroduction effort will produce healthy, viable anadromous fish populations. Otherwise, the reintroduction program becomes a long-term supplementation effort requiring large and continuing releases of hatchery fish into the Upper Klamath River basin, providing little benefit to the species of interest. If the runs were not sustainable without hatchery supplementation, continuing the Iron Gate fish hatchery program would return more adult fish to the basin, thereby, better achieving PacifiCorp's mitigation obligation for Project impacts to anadromous fish species.

PacifiCorp's current skepticism as to the success of the reintroduction effort is based on a host of factors, all presented in great detail in three previous agency reviews of this issue (Fortune et al. 1966; Klamath River Basin Fisheries Task Force, 1992; ODFW, 1997). All of these reviews advised against introducing salmon and steelhead trout to the Upper Klamath River basin because of multiple factors, such as poor water quality; disease; predation; mortality through fish passage facilities, lakes and reservoirs; and nonsuitable stock genetics that in combination would make sustainable recovery infeasible and pose unacceptable risks to native resident fish. Studies conducted during relicensing have shown that all of the issues identified as part of the three previous reviews of anadromous fish reintroduction continue to exist in the basin today.

The Habitat Modeling Group (HMG) continues to meet on a monthly basis to evaluate the anadromous fish reintroduction and fish passage issue. The group is using two separate modeling approaches to address information needs regarding the effectiveness of fish passage systems: KlamRAS, and Ecosystem Diagnosis and Treatment (EDT). A discussion of each model's purpose and modeling progress to date is presented below.

KlamRAS

KlamRAS is being used to focus on dam/reservoir passage efficiencies so that passage options (operations, facilities) can be assessed. The KlamRAS model incorporates both habitat data and fish passage survival through Project structures to estimate fish production in user-identified reaches or areas of the basin. The model allows the user to vary a wide range of input variables

to explore how different assumptions affect model results. Thus, this model is being used primarily as a "gaming" tool to assess the effects various fish passage options have on fish production.

The HMG is in the process of parameterizing the KlamRAS model. After completing the parameterization process, the HMG will be examining five different Project configurations to estimate impacts on anadromous fish production and survival. The alternatives include scenarios involving dam removal, volitional passage through fish ladders and screens, and trap-and-haul systems located at various locations in the Project area. The outputs of these model runs also will be used to identify those critical uncertainties that drive model results. One major uncertainty that already has been identified by the HMG and stakeholders is juvenile survival through Project reservoirs. If survival is high, anadromous fish production may be sustainable upstream of Iron Gate Dam, if not, then reintroduction efforts are likely to fail. To address this issue, PacifiCorp will be implementing a salmon smolt reservoir survival study in 2004. The study will be conducted at Copco No. 1 and Iron Gate reservoirs.

PacifiCorp estimates that KlamRAS modeling will continue through the completion of the reservoir survival study in 2004. The data from this study will be incorporated into the KlamRAS alternatives modeling exercise, at which time the results will be summarized and sent to the stakeholders for review and comment.

EDT

The second model being used to explore the anadromous fish reintroduction issue is EDT. This model provides a tool to incorporate habitat features and biological productivity into the analysis of fish passage options. It provides a comprehensive habitat-based tool to address the success of restoring anadromous fish runs to the Upper Klamath River basin above Iron Gate dam. This model is being used to assess existing and potential habitat capacity and productivity in the Upper Klamath River basin by reach and tributary that may occur with reintroduction of anadromous fish. The habitat quantity and quality outputs from the EDT model are being used as inputs into the KlamRAS model.

Initial and preliminary EDT model runs show that even when passage survival through reservoirs and dams is assumed high, resulting fall Chinook salmon production is still quite low and probably not sustainable. The EDT model estimates of adult fall Chinook salmon returns to the spawning grounds under three scenarios were as follows:

- 487 adults: Adult returns to the spawning grounds with 100 percent dam survival, model predicted reservoir survival, and current ocean and freshwater harvest rates (see below)

- 1,356 adults: Adult returns to the spawning grounds with 100 percent dam survival, model predicted reservoir survival, and no harvest

- 4,500 adults: Adult returns to the spawning grounds with 100 percent dam and reservoir survival, and no harvest

Besides the dam-related assumptions presented for each scenario, other factors responsible for the model results include the quality of the free-flowing habitat available in the Project area, high

water temperatures, disease, predation from introduced fish species, and harvest. These results point out the importance of including habitat in the Upper Klamath River basin in future model runs to determine if an increase in habitat quality and quantity can increase fall Chinook salmon production to sustainable levels, based on modeling.

The HMG will continue working in 2004 to develop an approach for reintroducing anadromous salmonids to the Upper Klamath River basin. The tasks to be completed in 2004 deal with modeling issues and finding solutions to the problems identified in previous reviews regarding reintroduction. A description of the tasks and a time frame for completing each is presented in Exhibit E4.6.2. PacifiCorp will be submitting the results of HMG efforts to the stakeholders for review and comment as they are completed. PacifiCorp expects to use the work performed by the HMG to better define PacifiCorp's role in any proposed anadromous fish reintroduction effort. As various tasks are completed, PacifiCorp will review this additional information, and revise as appropriate the Project operations and PM&E measures included in this license application.

4.3.3.2 Iron Gate Hatchery

To mitigate for anadromous fish habitat lost as a result of the construction of Iron Gate dam, PacifiCorp was required to build and fund the Iron Gate salmon and steelhead fish hatchery. The adult salmon ladder, trap, and spawning facility was built at the base of the dam and was put into operation in February 1962. The Iron Gate fish hatchery is operated by the CDFG. By agreement, PacifiCorp funds 80 percent of the total operating costs of the hatchery to satisfy its annual mitigation goals for fall Chinook fingerlings, coho yearlings, and steelhead yearlings.

The current production goals include 6 million fall Chinook salmon (4.92 sub-yearling smolts and 1.08 million yearling smolts), 75,000 yearling coho salmon smolts, and 200,000 yearling steelhead trout smolts. Production goals for Chinook and coho salmon have been met most years, especially since 1985. Steelhead production goals generally were met until 1992, after which poor adult returns to the fish hatchery did not provide sufficient eggs to meet goals. Steelhead runs have increased, however, starting in 2001 and egg take goals were achieved in 2003.

For all species cultured at Iron Gate fish hatchery, only fish volitionally entering the hatchery are used as broodstock. Stocks from other drainages or other Klamath River tributaries are not spawned or cultured at the hatchery. This has generally been the practice since the hatchery began operation. The annual egg allotments for all species are distributed throughout the duration of the spawning run in proportion to the instantaneous magnitude of the run. Maintaining genetic diversity by distributing egg allotment throughout the spawning run takes precedence over meeting numeric production goals.

Returns of adult salmon and steelhead to the Iron Gate fish hatchery from 1964 to 2002 have been variable. Chinook salmon returns to the hatchery have ranged from 954 in 1969 to 71,151 in 2000. Chinook returns have exceeded 10,000 annually since 1993. Coho salmon returns have ranged from zero to 3,546 , averaging 830. Steelhead trout returns have ranged from 12 to 4,411, averaging 1,403.

A Hatchery subgroup of the larger Fish Passage Work Group (FPWG) reviewed the Iron Gate fish hatchery facilities and operations, and identified four specific investigations related to potential future operations at the hatchery: (1) heating water for egg incubation, (2) increasing

the tagging and marking rate for Chinook salmon smolts, (3) producing spring Chinook salmon, and (4) expanding the production of Chinook salmon yearlings. The heating of egg incubation water was not found to be advisable for salmon for several biological reasons. However, it was concluded that heating incubation water could be useful for steelhead trout as a means to accelerate the start of rearing thus producing larger smolts. The heating of water for steelhead trout eggs will be pursued through the hatchery's annual operation and maintenance program. The increased tagging and marking of Chinook smolts from 5 percent to 25 percent was recommended. Spring Chinook salmon production and expanded fall Chinook yearling production were found to pose biological concerns and feasibility issues, and, therefore, were not recommended.

4.4 PROPOSED ENAHANCEMENT MEASURES

PacifiCorp proposes to implement the following enhancement measures for fisheries resources at each Project development.

East Side and West Side Developments

- The East Side and West Side facilities will be decommissioned. This will eliminate any fish entrainment and associated turbine-induced mortality that currently occurs at these facilities. In addition, this will eliminate any take of listed sucker species, which is expected to benefit their recovery. Decommissioning also may result in higher flows in the Link River, depending on the specific operation by the USBR, and may benefit the upstream movement of listed suckers as well as redband trout through the fish passage facilities at Link River dam.

J.C. Boyle Development

- A minimum flow of 100 cfs will be released from J.C. Boyle dam at all times to enhance usable fish habitat while maintaining high water quality in the J.C. Boyle bypass reach. This release will result in a minimum instream flow of roughly 320 to 350 cfs at the lower end of the bypass reach because of the input of approximately 220 to 250 cfs of spring flow within this reach. This minimum flow would provide near maximum habitat conditions for adult trout and suckers based on the preliminary instream flow study results and slightly less habitat (compared to a no-flow release) for juvenile trout and fry.

- A minimum flow of 100 cfs will be released at J.C. Boyle powerhouse or an additional 100 cfs will be released at J.C. Boyle dam. Coupled with the minimum flow from J.C. Boyle dam (100 cfs) and the spring water accretion flow (about 220 cfs) that occurs in the bypass reach, a minimum flow of about 420 cfs would be maintained in the 17-mile-long peaking reach. This is an increase of 100 cfs compared to current minimum flow conditions. PacifiCorp's results of the instream flow study analysis for rainbow trout indicate that this new base flow would nearly maximize the instream habitat for adult trout. The increased minimum flow would slightly reduce the WUA for rainbow trout juveniles and fry. The habitat response to the increased minimum flow for suckers would be similar to that for trout. This new base flow also would increase the area of the streambed that is continually wetted and correspondingly, reduce the amount of the streambed that would subjected to watering-dewatering events (the varial zone) during periods of flow fluctuations.

- Flow down-ramp rates will not exceed 150 cfs per hour in the J.C. Boyle bypass reach, except for flow conditions beyond the Project's control (e.g., inflows to J.C. Boyle reservoir that change at rates greater than above ramp rate). This rate is primarily applicable to spill and planned maintenance events and represents a flow reduction rate about 5-fold less than compared to the current licensed rate. To the extent possible, flow changes will occur during the night to reduce the risk of potential fish stranding associated with river spill events, especially in the cold winter months.

- Flow up-ramp rates will not exceed 9 inches (in water level) per hour in the J.C Boyle peaking reach. Flow down-ramp rates will not exceed 9 inches per hour for flows exceeding 1,000 cfs, and will not exceed 4 inches per hour for flows less than 1,000 cfs (as measured at USGS gauge No. 11510700 downstream of the J.C. Boyle powerhouse). Peaking operations will continue at the powerhouse. However, the daily Project-controlled flow change (i.e., the difference between lowest and highest flow in 24-hour period) during peaking operations will not exceed 1,400 cfs (as measured at USGS gauge No. 11510700 downstream of the J.C. Boyle powerhouse). The limit of flow change to 1,400 cfs per daily period will preclude no load to full two-unit peaking events during low to medium river flow periods. This will provide greater flow stability for aquatic resources, but continue to provide a balance of whitewater boating and angling opportunities (periods of optimal wading-based fishing and standard whitewater boating flows) because one unit can provide raftable flows. Low flow periods will have limited one-unit peaking time "windows" for standard whitewater boating (which relies on flows of 1,500 to 1,800 cfs). Conversely, anglers will have larger time "windows" for angling opportunities.

- PacifiCorp will install synchronized bypass valves on each of the two J.C. Boyle powerhouse units. The valves will maintain the river levels in the event that a unit trips off-line (unscheduled outage). The two bypass valves also should eliminate use of the canal spillway because water would not be backed up in the canal in the event of a unit trip.

- A surface collection system (gulper) is proposed for the J.C. Boyle reservoir to exclude fish from the power intake and to facilitate downstream fish passage. Collected fish will be conveyed past the dam via a 24-inch-diameter bypass pipe with a flow of approximately 20 cfs. The system will allow actively downstream migrating fish a safe passage alternative to the attraction flows created at the powerhouse canal intakes.

- The existing bar spacing on the fishway exit pool trashrack at the J.C. Boyle fish ladder will be increased to facilitate the passage of adult fish. An additional weir will be added to the fishway entrance pool to decrease the height of the existing step. The increase in bar spacing on the exit pool trash rack will allow adult fish to pass through more easily and the additional weir will lower the height of the entrance, effectively increasing the ability of fish to enter the ladder system.

- The gravity-fed water diversions from Shovel Creek and its tributary, Negro Creek (located adjacent to the Klamath River in the California segment of the J.C. Boyle peaking reach), would be eliminated to prevent trout fry from being entrained and lost in the various ditches on PacifiCorp's Copco Ranch (a non-hydro related property). Additional riparian area enhancements associated with minimizing grazing impacts would be implemented along these two creeks. Also, the gravity diversions on the mainstem Klamath River at Copco

Ranch would be replaced with screened pumps, and the current flood-irrigation practices would be changed to a pressurized sprinkler system.

- Approximately 100 to 200 cubic yards of spawnable gravel initially would be placed in the upper end of the J.C. Boyle bypass reach. The volume and frequencies of recurring gravel augmentation in this reach would be based on monitoring of the initial gravel placements. The gravel augmentation would provide a more favorable substrate composition for trout (and possibly other species) spawning in the bypass reach than currently exists. This PM&E measure takes advantage of the changed hydrology and improved water quality in this river reach following construction of J.C. Boyle dam.

Copco No. 2 Development

- PacifiCorp is proposing to maintain a minimum flow of 10 cfs in the Copco No. 2 bypass reach. This is similar to the current minimum flow. With the exception of speckled dace and marbled sculpin, most of the fish in the reach likely originate from downstream movement of fish out of Copco reservoir or from upstream movement of fish out of Iron Gate reservoir. There are no known fish spawning areas in the reach, most likely because of the low abundance of small-sized substrate.

- Flow down-ramp rates will not exceed 125 cfs per hour (equivalent to less than 2 inches per hour in most of the expected flow ranges), except for flow conditions beyond the Project's control (e.g., inflows to the reservoir that change at rates greater than above ramp rate). This rate is primarily applicable to spill and planned maintenance events and to the extent possible, flow changes will occur during the night. This rate would reduce the risk of potential fish stranding associated with river spill events, and the night-only stipulation would further minimize the potential for fish stranding, especially during the winter when fish tend to be more closely associated with the bottom substrate during the daytime.

Fall Creek and Spring Creek

- A minimum flow of 5 cfs will be released into the Fall Creek bypass reach, and a minimum flow of 15 cfs minimum flow will be released downstream of the bypass confluence. Flow release control structures associated with the proposed fish passage facilities at the dam will be constructed to maintain the continuous 5 cfs release at the dam. Minimum flow releases have yet to be determined for the Spring Creek bypass reach and the downstream Jenny Creek. A suitable minimum flow will be identified in consultation with appropriate federal and state agencies.

- Canal screens and fish ladders are proposed for both the Fall Creek and Spring Creek diversions. Currently, there are no upstream fish passage or screening facilities on either Fall Creek or Spring Creek. The fish ladders proposed for each diversion will greatly increase the ability of redband trout to access any upstream spawning and rearing habitat and the downstream screening facilities will minimize to the extent practicable the number of fish entrained into the power canals of each development.

Below Iron Gate Dam

- The instream flow schedule and ramp rates below Iron Gate dam will be maintained according to USBR's Klamath Project Operations Plans consistent with BOs issued by the

USFWS and NOAA Fisheries. The current down-ramp rates are much slower than the rates stipulated in the current FERC license. Although the FERC rates are similar to those generally regarded as safe in other salmonid streams under most conditions, such rates have been associated with limited fish stranding under some extreme or unique site-specific conditions. Therefore, the conservative down-ramping rates proposed for Iron Gate under all conditions will ensure that fish stranding attributable to Project operations will be avoided.

- Approximately 1,800 to 3,500 cubic yards of spawnable gravel initially would be placed below Iron Gate dam between the dam and the Shasta River confluence. Approximately 75 percent of this total volume would be placed just downstream of Iron Gate dam where access is easy and bed coarsening was documented. The remaining volume should be split into three similar sized placements located between Bogus Creek and the Shasta River confluence. The volumes and frequencies of recurring gravel augmentation in this reach would be based on monitoring of the initial gravel placements. An assessment of bed mobilizing flow recurrence intervals in this reach suggests that gravel may have to be replaced every 3 years. Operations and maintenance assumes that 50 percent of the initial placement volume will be required at that frequency.

Iron Gate Hatchery

- PacifiCorp proposes to maintain its current obligation of funding for production and operation of Iron Gate fish hatchery. The fish hatchery has been successful at meeting production goals in nearly all years because the number of adult returns have been considered good. PacifiCorp will continue to work with the CDFG in its efforts to improve production efficiency and effectiveness, and minimize conflicts between hatchery-reared and naturally produced salmon and steelhead.

- PacifiCorp will purchase and construct mass-marking facilities for use at the fish hatchery. The purpose of the mass-marking facilities would be to increase the proportion of fall Chinook salmon smolts that are tagged and marked from 5 percent (current) to 25 percent. The increased tagging rate will facilitate improved harvest management as well as research efforts.

General Maintenance Scheduling

- PacifiCorp will consult with appropriate agencies on the annual scheduled outages for Project maintenance events where flows in Project reaches are required to be outside the normal operations. Consultation and coordination with agencies will ensure that times are selected to complete maintenance activities that do not affect sensitive life stages of fish.

ES5.0 WILDLIFE AND BOTANICAL RESOURCES

ES5.1 GEOGRAPHICAL EXTENT OF STUDY AREA

The study area for the terrestrial resources studies extended from Link River dam to the confluence of the Shasta and Klamath rivers. PacifiCorp conducted a number of FERC-required and agency-requested studies to identify existing terrestrial resources within the study area and potential Project effects. Studies conducted include the following:

- Vegetation Cover Type/Wildlife Habitat Inventory and Mapping
- Wetland and Riparian Plant Community Characterization
- Amphibian and Reptile Inventory
- Threatened, Endangered, and Sensitive (TES) Species Inventory
- Wildlife Movement/Connectivity Assessment
- Wildlife Habitat Association Assessment and Synthesis of Existing Wildlife Information
- Noxious Weed Inventory
- Grazing Analysis
- Spring-Associated Mollusk Inventory

ES5.2 SUMMARY OF INFORMATION

The following sections summarize the information for each of the terrestrial studies.

ES5.2.1 Vegetation Cover Type/Wildlife Habitat Inventory and Mapping

Vegetation cover type mapping was completed for 40,724 acres between J.C. Boyle reservoir and the Shasta River. Mapping also was conducted from J.C. Boyle reservoir to Upper Klamath Lake, but this area is no longer included in the proposed FERC Project area. Approximately 64 percent or 26,176 acres of the J.C. Boyle reservoir to Shasta River area was mapped as one of the upland tree habitat types. Other common cover type groups include upland shrub cover types, which occupy 4,087 acres; upland herbaceous (4,766 acres); agricultural (1,057 acres); and aquatic habitats (2,816 acres). The least abundant cover type groups are riparian communities (543 acres), wetlands (367 acres), and barren habitats (914 acres).

Habitats of special concern found in the study area include riparian and wetland habitats; late-successional conifer forest; snag and coarse wood rich habitats; and caves, cliffs, and talus.

The relative and absolute cover of wetlands is greatest around J.C. Boyle reservoir with 5.5 percent or 105 acres of wetland habitat. The relative cover of wetland cover types in the other Project sections ranges from less than 0.01 percent (0.6 acre) between Iron Gate dam and the Shasta River to 1.5 percent (13.5 acres) at Fall Creek.

Late-successional conifer forests are considered to be highly important as wildlife habitat for a number of species. In the study area, only 13 acres of forest were classified as having large-diameter (diameter at breast height [dbh] greater than 24 inches) trees. Many cover types were found to provide snags in sufficient densities and size classes to provide habitat for wildlife species dependent on these habitats. Large logs (greater than 16 inches in diameter) occur in densities greater than 120 linear feet per acre in the Klamath mixed conifer cover type and, to

some extent, in the oak-conifer and riparian deciduous cover types. Other cover types have lower amounts.

Because of their microhabitat characteristics, caves, cliffs, and talus often support unique plant and wildlife species. There are 355 acres of cliff/exposed rock and 559 acres of talus slope cover types in the study area, many of which contain caves, fissures, and ledges.

ES5.2.2 Threatened, Endangered, and Sensitive Species

Queries of federal and state databases and consultations with agency biologists indicated that 65 vascular plants, three bryophytes, and ten lichens with TES status potentially occur in the study area. Two of the potentially occurring species—Applegate's milkvetch (*Astragalus applegatei*) and slender orcutt grass (*Orcuttia tenuis*)—are federally listed as endangered and threatened, respectively. The review indicated that 107 vertebrate and 22 invertebrate TES wildlife species potentially occur in the Project vicinity.

Seventy-nine occurrences of 14 species of TES plants were documented between Link River and the Shasta River either during 2002 surveys or previously by the U.S. Bureau of Land Management (BLM), Oregon Natural Heritage Program (ONHP), or California Natural Diversity Database (CNDDB). No federally listed species were documented in the proposed FERC Project area; Applegate's milkvetch, federally listed as endangered, was found near Keno reservoir, which PacifiCorp proposes to not include in the new license.

Of the TES species of wildlife that potentially occur in the study area, five species—the bald eagle (*Haliaeetus leucocephalus*), western snowy plover (*Charadrius alexandrinus nivosus*), northern spotted owl (*Strix occidentalis caurina*), Canada lynx (*Lynx canadensis*), and gray wolf (*Canis lupus*)—are federally listed as threatened or endangered. Surveys conducted during 2002 and 2003 by PacifiCorp documented 48 of the 107 vertebrate TES species, including one amphibian, five reptiles, 40 birds, and two mammals. The only federally listed TES wildlife species observed were the bald eagle and northern spotted owl. The western toad (*Bufo boreas*) was the only TES amphibian species that was detected during field studies. All five TES reptile species potentially occurring were detected either by PacifiCorp or by the BLM in the study area. Pond turtles were documented at scattered locations along all reservoirs and river reaches except Fall Creek, Copco No. 2 bypass, and J.C. Boyle bypass. Thirty-seven of the 67 avian TES species identified as potentially occurring in the study area were detected during relicensing field studies with a total of more than 2,000 detections. Most avian TES detections were recorded in association with wetland, riparian, or open water habitats. The areas with the highest avian relative abundance were the Link River and Keno reservoir reaches, both of which are not included in the proposed FERC boundary.

Of the 23 TES mammal species originally identified as potentially occurring in the study area, three were documented: the western gray squirrel (*Sciurus griseus*), western big-eared bat (*Corynorhinus townsendii townsendii*), and the Yuma myotis bat (*Myotis yumanensis*); the Yuma myotis uses Project buildings for roosting.

ES5.2.3 Amphibians and Reptiles

A combination of existing databases and literature and surveys of potential pond-breeding, stream, and terrestrial habitats conducted in 2002, along with spotted frog (*Rana pretiosa*) and foothill yellow-legged frog (*Rana boylii*) surveys conducted in 2003, documented five species of amphibians and 16 species of reptiles in the study area. Pond-breeding amphibians in the study area include long-toed salamander (*Ambystoma macrodactylum*), Pacific treefrog (*Hyla regilla*), western toad, and bullfrog (*Rana catesbeiana*). The only riverine amphibian species found was the Pacific giant salamander (*Dicamptodon tenebrosus*).

The 16 species of reptiles documented in the study area were one turtle, four lizards, and 11 snakes. Overall, the western fence lizard (*Sceloporus occidentalis*) was by far the most abundant reptile species encountered in the wildlife survey plots, representing 59 percent of the detections. Fence lizards were detected in all Project segments except the Link River. The next most abundant species found during the terrestrial plot surveys was the common garter snake (*Thamnophis sirtalis*).

ES5.2.4 Riparian and Wetland Characterization

During 2002-2003, PacifiCorp's plant ecologists sampled riparian/wetland vegetation plots along Project river reaches and reservoirs to investigate the relationships among Project flows, fluvial geomorphic processes, and riparian vegetation. Wetland habitat occupies 367 acres and riparian habitats occupy 543 acres between J.C. Boyle reservoir and the Shasta River. The study documented that each reach or reservoir has as many as 11 different riparian/wetland communities, many of which separate along an elevation gradient. Information on reed canarygrass (*Phalaris arundinacea*) and coyote willow (*Salix exigua*) occurrence was specifically analyzed to determine the conditions under which the two species grow.

ES5.2.5 Wildlife Movement/Connectivity Assessment

From a regional perspective, the canyon and mid-elevation hillsides and plateaus between the J.C. Boyle powerhouse and Iron Gate dam are considered critical deer winter range. Within the study area, south-facing lower canyon walls and hillsides are some of the most critical habitat for the wintering migratory Pokegama black-tailed deer (*Odocoileus hemionus*) herd and resident deer. The South Cascades deer study (Jackson and Kilbane, 1996) documented movement from the wintering range on the Horseshoe Ranch to the Cascade Mountains north and south of the Project. This study showed at least some movement across the Klamath River either across or near Iron Gate reservoir. Elk telemetry data from the CDFG showed a single individual with a long-range migration pattern between the Shasta Valley in California and the forests to the west of Upper Klamath Lake in Oregon. Another telemetry study showed that elk used summer ranges in the upper portions of the Long Prairie Creek and Jenny Creek areas as well as several areas at higher elevations north of the Klamath River (BLM, 1996).

Surveys conducted in 2003 documented several species of small mammal and reptiles near J.C. Boyle and Fall Creek canals. Approximately 4 percent of the J.C. Boyle canal and the entire Fall Creek canal are accessible to wildlife based on canal height and terrain. Mortality of medium-sized and large mammals has been rare at J.C. Boyle canal and non-existent at Fall Creek canal based on penstock trash rack cleanings, which occur on a regular basis.

ES5.2.6 Wildlife Habitat Association and Synthesis

Compilation and analysis of wildlife habitat association data included a systematic review of relevant literature coupled with an analysis of data on wildlife occurrence, distribution, and abundance. An analysis of habitat suitability in each Project section was conducted on the basis of existing habitat stability index models for three riparian focal species (RFS). All ten designated RFS, including northwestern pond turtles (*Clemmys marmorata marmorata*) and all four aquatic fur-bearing mammals, were detected in the study area during relicensing field studies. Avian RFS generally were found to be abundant across the study area; the Lewis' woodpecker (*Melanerpes lewis*), yellow warbler (*Dendroica petechia*), and song sparrow (*Melospiza melodia*) were detected in each of the Project sections.

Of the 20 habitats where wildlife observations were recorded in the study area, riparian/wetland shrub and riparian/wetland forests supported the most wildlife species, with 87 and 106 species, respectively. Project reservoirs also provide habitat for many species; lacustrine habitat was found to support 62 species, with each reservoir having a slightly different assemblage of species.

ES5.2.7 Noxious Weeds

Seventeen of the 39 target weed species were found during surveys conducted between the Link River and the Shasta River. A total of 14 noxious weed species and 112 infestations covered more than 558 acres in the entire area from the Link River to the Shasta River, although 186 acres were associated with the portions of the survey area that are not included in the proposed FERC Project area. The distributions of three widespread species were not mapped, but only recorded for their general distribution in plot data collected as part of the riparian/wetland characterization study and upland habitats. Noxious weeds were found in 74 percent of the general vegetation characterization plots and 14 percent of the riparian/wetland vegetation plots.

ES5.2.8 Grazing Assessment

Mixed chaparral habitats in the study area had above average incidences of heavy grazing. Overgrazing in these habitats can lead to species composition changes and the reduction of deer forage (Belsky and Gelbard, 2000). Evidence of grazing was found in 33 percent of vegetation characterization plots; the greatest percentages were in the Iron Gate reservoir and Fall Creek segments. Approximately 37 percent of sampled riparian plots had evidence of grazing; heavy grazing was recorded in 11.6 percent of all riparian plots. Sections of the study area where riparian grazing observations were above average included the Iron Gate-Shasta, Iron Gate reservoir, Fall Creek, and J.C. Boyle peaking reaches (mostly in California).

ES5.2.9 Spring-Associated Mollusk Inventory

A combination of mapped information obtained from the USGS, BLM, and Frest and Johannes (1998), along with observations in the field during 2002-2003, indicate that there are approximately 180 sites in the study area that have spring or seep habitat (which includes several sections of intermittent tributary stream channels that were surveyed by the BLM). Of these, 53 (29 percent) were visited at least once during 2002 relicensing surveys for amphibians/reptiles, TES wildlife, or vegetation. Approximately 107 of the springs in the study area are located in the

J.C. Boyle peaking reach. There are few springs between the J.C. Boyle bypass reach and Keno reservoir (Lake Ewauna), but 18 sites occur near Link River or along the outlet of Upper Klamath Lake.

ES5.3 ASSESSMENT OF PROJECT IMPACTS

Each Project section has wetland and riparian habitats that differ in composition and function in response to the hydrological patterns created by a combination of Project operation, other water storage and diversion practices upstream, and adjacent land uses. Reed canarygrass, an undesirable species, was found to dominate some sections of the river varial zone between J.C. Boyle powerhouse and Copco Lake, as well as the J.C. Boyle bypass. Woody riparian vegetation has encroached into the Copco No. 2 bypass in response to the reduced instream flow. Willow establishment along the river may be related to the periodic scouring flows and gradually declining water levels during the May-June seed dispersal/germination period.

Entrainment data collected at Fall Creek and J.C. Boyle canal trash racks indicate that medium-sized and large mammals are not entrained in any Project canals with regularity. The Fall Creek canal does not appear to represent significant entrapment hazards to big game or most other wildlife because its water velocity is low and the canal banks are earthen construction that allows animals to escape. The J.C. Boyle canal is likely the only Project structure that affects wildlife movement in a significant manner. There have been only a few documented cases of deer mortality in the J.C. Boyle canal and one anecdotal report of a deer falling through the ice on J.C. Boyle reservoir. The sometimes wide gaps in riparian habitat connectivity along Project reservoirs may affect wildlife movement.

The FERC transmission lines associated with the Project do not appear to present a problem for avian collisions or electrocutions. Based on the location of the FERC transmission lines, few segments appear to have characteristics that would cause a high risk of avian collision. Several poles along the transmission line south of Copco No. 2 bypass have configurations that are not "raptor-safe."

Project maintenance and recreation, as well as vehicular traffic on Project roads, may contribute to the spread of weeds in the area. Vegetation management along Project facilities results in a minor loss of vegetation. However, the hydrological operation of the Project probably has minimal effect on the spread of the noxious weeds in the area.

ES5.4 PROPOSED ENHANCEMENT MEASURES

PacifiCorp will implement a vegetation resource management plan and a wildlife resource management plan. Collectively, these two plans will include the following PM&E measures: (1) roadside and powerline right-of-way (ROW) management activities, (2) noxious weed control, (3) restoration of Project-disturbed sites, (4) protection of TES plant populations, (5) riparian habitat restoration, (6) installation of wildlife crossing structures on the J.C. Boyle canal, (7) deer winter range management, (8) monitoring powerlines and retrofitting poles to decrease electrocution risk, (9) development of amphibian breeding habitat along Iron Gate reservoir, (10) support of aerial bald eagle surveys and protection of bald eagle and osprey (*Pandion haliaetus*) habitat, (11) selective road closures, (12) installation of turtle basking structures, (13) installation

of bat roosting structures, (14) surveys for TES species in areas to be affected by new recreation development, and (15) long-term monitoring of PM&E measures.

In addition to the above measures, the proposed changes in instream flow and ramping rates will improve conditions for wetland and riparian vegetation in the J.C. Boyle bypass and J.C. Boyle peaking reaches.

ES6.0 CULTURAL RESOURCES

The Project area is rich in American Indian history and archaeological sites. Before the inception of pedestrian surveys in 2002, many archaeological sites were known to exist on PacifiCorp property both inside and outside the Project FERC boundary. All of these sites have significance to local tribes and many are thought to be National Register of Historic Places (NRHP)-eligible. Tribes with an interest in the Project area include the Klamath Tribes, Shasta Tribe and Shasta Nation, Quartz Valley Tribes (Karuk and Shasta), Yurok Tribe, Hoopa Tribe, Karuk Tribe of California, and the Resighini Rancheria.

Five cultural resource tasks (Context Statement; Cultural Resources Pedestrian Survey and Inventory, Evaluation and Impact Analysis; Traditional Cultural Properties/Sensitive Cultural Resources Study; Historic Project Structures Evaluation; and development of the Historic Properties Management Plan [HPMP]) were completed to ensure compliance with applicable regulatory requirements. These tasks were outlined in Study Plans 6.1 through 6.5. Study Plan 6.5 was dropped by the Cultural Resources Working Group (CRWG) because it discusses the development of the HPMP rather than a more conventional "study." PacifiCorp and its consultants, Project-affected Tribes, and Project stakeholders (resource agencies) participated in monthly meetings of the CRWG. A confidential Cultural Resources FTR has been prepared that integrates the results of the technical studies completed through December 2003.

ES6.1 GEOGRAPHICAL EXTENT OF STUDY AREA

Cultural resource studies typically start by determining the area where the proposed Project has the potential to affect cultural resources or area of potential effect (APE). Because of uncertainties regarding how far Project effects to archaeological resources extend, the APE was not delineated before archaeological pedestrian surveys began. A field inventory corridor (FIC) was delineated and surveys were conducted within the FIC in 2002-2003. The APE includes all Project hydropower facilities, recreation sites, and proposed wildlife enhancement lands. The criteria used to define the APE consist of all lands within the current FERC Project boundary under the existing license, all lands within the PacifiCorp-proposed FERC boundary for the new license, and river reaches below each Project development.

The CRWG defined the FIC to encompass the currently expiring license FERC Project boundary, riparian and hydrologically connected areas along Project-affected reaches, and culturally sensitive lands within the Klamath River Canyon from ridgetop to ridgetop (rim to rim). The study area for the investigation of the feasibility of nominating the Klamath River corridor as a traditional cultural riverscape included a broad geography from Upper Klamath Lake to the mouth of the river at the Pacific Ocean.

ES6.2 SUMMARY OF ALL INFORMATION

Located at seven "nodes" of activity related to the generation of hydroelectricity along the Klamath River, the Klamath Hydroelectric Project contains 110 resources. Of these, 60 (55 percent) were built between 1902 and 1958, the defined period of significance, and retain sufficient integrity to relate their association with the Project. Fifty resources (45 percent) were constructed after 1958 or have been so altered that they are no longer considered historic. Twenty-three of these non-historic resources are located at the Iron Gate complex, which was

added to the Project in 1962. Nearly 70 percent of the total resources were constructed during the period of significance (1902 to 1958) and retain integrity with the associations that make them significant under Criterion A for eligibility for listing in the NRHP.

PacifiCorp contracted with the Klamath River Inter-Tribal Fish and Water Commission to produce an integration report that will be based on the results of tribal ethnographic studies prepared by the Klamath, Shasta, Karuk, and Yurok tribes. The individual tribal studies documented the critical importance of the Klamath River and its salmon and other associated resources to their past culture and to the continuation of their present and future culture. The tribal reports urged recognition and documentation of an NRHP-eligible ethnographic riverscape. The forthcoming integration report will discuss common themes among the Klamath River basin tribes and provide a basinwide overview, evaluation, and assessment of broad tribal concerns about basinwide water management and its effects on historic properties. Management implications of possible designation of an NRHP-eligible riverscape will be explored in the integration report.

PacifiCorp's archaeological investigations for the Project included pedestrian survey of several hundred acres and resulted in the identification and documentation of 165 archaeological sites (both prehistoric and historic) and 158 isolated finds (also both prehistoric and historic) within a geographically broad FIC designated for investigation by the CRWG. The vast majority of the archaeological sites was evaluated as being potentially eligible for listing in the NRHP. PacifiCorp's archaeologists also gathered baseline data on archaeological site condition (integrity) to facilitate future monitoring of site conditions. Fewer sites and isolates lie within the geographically smaller APE and fewer still within the proposed Project boundary.

ES6.3 ASSESSMENT OF PROJECT IMPACTS

During the new license period, PacifiCorp will continue operations of its hydroelectric facilities with the exception of the East Side and West Site Developments at Link River (which PacifiCorp is proposing to decommission). Ongoing use of Project facilities will result in continuing maintenance and upkeep, and may result in the replacement of Project components, as demanded by continued operation. PacifiCorp will work with the Oregon and California State Historic Preservation Offices (SHPOs) during engineering activities and Project construction to comply with applicable regulations. The HPMP requires specific mitigation and management measures for the ongoing operation of Project facilities.

Currently, there are no known traditional cultural properties identified within the proposed Project boundary (though the tribal integration report in preparation may identify an NRHP-eligible ethnographic riverscape that includes lands within the Project boundary). Continued operation of the current hydroelectric facilities will continue to block upstream passage of salmon, inundate original (pre-dam/pre-reservoir) landforms and habitat, and will continue to affect tribal cultural resources in ways in which they currently are being affected. Specific mitigation and management measures regarding the ongoing operation of the Project facilities will be included in the HPMP as specific impacts are identified by the tribes and appropriate mitigation measures are discussed by the CRWG and submitted to PacifiCorp and the FERC for review and approval.

Within the proposed Project boundary, 61 archaeological sites are eligible, or potentially eligible, for listing in the NRHP. Continued operation of the facilities, which would remain in service during the new license period, will continue to inundate formerly terrestrial archaeological sites beneath the waters of Project reservoirs. Implementation of the provisions of the HPMP will eliminate or reduce ongoing adverse impacts on non-submerged archaeological sites.

ES6.4 PROPOSED ENHANCEMENT MEASURES

Enhancement measures for cultural resources are primarily embodied in the FERC-required HPMP. The HPMP (in preparation now) will address the following:

- Take into consideration the management actions prescribed in other plans required by the new license, such as recreation plans, wildlife management plans, or fisheries plans.

- Identify the nature and significance of historic properties that may be affected by Project maintenance and operation and any proposed improvements to Project facilities and public access.

- Identify goals for the preservation of historic properties, establish guidelines for routine maintenance and operation, and establish procedures for consulting with appropriate SHPOs, Tribal Heritage Preservation Officers, Indian tribes, historic preservation experts, and the interested public concerning effects to historic properties or contributing elements of a historic district.

PacifiCorp's HPMP will provide direction and guidelines for the management of historic properties within the new Project boundary as proposed in Exhibit G. Historic properties include Project facilities (dams, powerhouses, etc.); other kinds of buildings and structures; prehistoric and historic archaeological sites; and properties of traditional religious and cultural significance to Indian tribes. Managing historic properties involves both the long-term preservation of historic values of historic properties and consideration of the effects of PacifiCorp's actions on historic properties.

PacifiCorp will maintain the integrity of the Project's NRHP-eligible historic hydroelectric properties while maintaining the flexibility needed to manage the Project as required by law and operating conditions. PacifiCorp practices good preservation techniques by maintaining the existing facility and equipment through painting, retooling, and repairing existing equipment, and using in-kind materials when replacement is needed whenever practical. Although the Project's historic hydroelectric resources have been properly maintained over the years, the normal deterioration of materials may necessitate stabilization.

PacifiCorp will apply the Preservation Standards (The Secretary of the Interior's Standards for Historic Preservation Projects – Federal Register 48(190): Part IV) in a reasonable manner, taking into consideration economic and technical feasibility as well as requirements for overall management of the Project and its other resources. Application of the preservation standards ensures retention of the character-defining features of the Project's historic properties, while permitting the flexibility required to upgrade facilities and equipment for efficient and economical operation. The standards will guide future actions by PacifiCorp as long as PacifiCorp owns and operates the Project. The preservation standards apply to both the interior

and exterior of NRHP-eligible Project facilities, including powerhouses, dams and intakes, support buildings, and water conveyance systems.

Significant archaeological resources potentially affected by the Project will be protected and preserved. If such resources must be disturbed, mitigation measures will be implemented. Site protection PM&E measurers may include, but are not limited to, the following:

- Monitoring: Monitoring site conditions for changes from 2003 baseline conditions
- Capping: Capping sites with a protective layer of soil
- Site Concealment: Concealing sites using planted vegetation to obscure the site surface or to inhibit access by propagating thorny/spiny or densely growing native species or native species that cause contact dermatitis (poison oak, poison sumac, stinging nettle, etc.)
- Proactive Site Isolation: Proactively isolating or quarantining sites using fencing, boulders, or other physical barriers to deter vehicle and pedestrian access to sites
- Passive Site Isolation: Passively isolating sites by diverting vehicle and pedestrian access using hardening measures to discourage site access. Hardening measures that "channel" recreational uses into certain areas can help divert human activities away from sensitive sites. Misinformation signage ("Warning – Poisonous Snakes") also can be used to divert entrance into sensitive areas.
- Removing Incompatible Uses: Removing incompatible uses to protect sites by eliminating activities that disturb sites. These could include, among others:
  - Eliminating livestock grazing and/or livestock movement across site areas
  - Relocating or potentially eliminating recreation sites or specific facilities to remove vehicular and pedestrian activity or other disturbances from sensitive sites
  - Relocating campgrounds or individual/groups of campsite(s) to remove vehicular and pedestrian activity or other disturbances from sensitive sites
  - Relocating or removing/obliterating roads and trails that cross or closely skirt the edge of sensitive sites
- Law Enforcement: Enforcing laws that prohibit looting and vandalism of archaeological resources. Active enforcement of Oregon and California state laws and federal laws can be achieved through several means:
  - Hiring a full-time monitor and training the monitor in Archaeological Resources Protection Act (ARPA) and other applicable state and federal law enforcement. Also, the Oregon and California county law-enforcement authorities could "deputize" the monitor to make citizen's arrests, issue citations, and receive immediate formal law enforcement backup by uniformed officers who can arrest and/or cite looters.
  - Posting warning signs in critical areas outlining laws that prohibit collection and vandalism, state the penalties (misdemeanor, Class-C Felony, etc.), and state that the area

is under daily surveillance and patrol by plain-clothes deputized monitors with arrest authority.

- Erosion Control: Placing riprap or other stabilization measures at eroding site locations and armoring site deposits against water or terrestrial erosive forces

- Archaeological Data Recovery: In cases where PacifiCorp cannot protect certain areas from current and future degradation, archaeological sites could be mitigated through archaeological data recovery operations. However, it should be noted that tribes are strongly opposed to archaeological data recovery as enhancement measures.

At this time, there are no known traditional cultural properties or sensitive cultural resources within the proposed Project boundary. In consultation with tribes, agencies, and the FERC at upcoming meetings of the CRWG, if such resources or a potentially NRHP-eligible ethnographic riverscape are identified within the proposed Project boundary, appropriate enhancement measures will be developed.

ES7.0 RECREATION RESOURCES

The Project represents an important regional recreation resource, offering opportunities that include flatwater reservoir (such as boating, water skiing, and swimming) and whitewater river water-based activities (such as whitewater boating and fishing); as well as land-based activities associated with and enhanced by the presence of water (such as shoreline camping, picnicking, wildlife viewing, hiking, sightseeing, and resting/relaxing). Recreation opportunities are provided at developed sites, such as campgrounds and day use areas, and undeveloped use areas, such as dispersed shoreline sites with no developed infrastructure. In addition to PacifiCorp, recreation resources in the existing Project area and its surroundings also are managed by a variety of public agencies including the BLM, ODFW, California Department of Fish and Game (CDFG), and City of Klamath Falls.

During relicensing of the Project, PacifiCorp conducted various FERC-required and agency-requested recreation resource studies to define potential Project effects and to identify recreation needs during the term of the new license. Recreation resource studies conducted for relicensing included:

- Recreation Flow Analysis
- Visitor Surveys Analysis
- Regional Recreation Analysis
- Recreation Needs Analysis (including supply, demand, capacity, and needs component analyses)

A draft Recreation Resource Management Plan (RRMP) was developed as a component of relicensing and is included in the final license application as Appendix E7-A.

ES7.1 GEOGRAPHICAL EXTENT OF THE STUDY AREA

The recreation studies conducted for relicensing were focused in five primary resource areas of the existing Project area: (1) Link River/Lake Ewauna/Keno reservoir area, (2) J.C. Boyle reservoir area, (3) Upper Klamath River/Hell's Corner reach area, (4) Copco reservoir area, and (5) Iron Gate reservoir area. In addition, the recreation flow analysis studied the river reach below Iron Gate dam and the regional recreation analysis studied the surrounding region within several hours driving time of the Project. In total, 28 developed facilities and 27 undeveloped sites were identified in the five resource areas.

In the course of the relicensing studies and in the interim between the draft license application and the final license application, PacifiCorp made several changes to the proposed Project. The newly proposed Project begins at the J.C. Boyle Development and continues downstream to the Iron Gate Development. Recreation study results presented in the final license application are limited to this new proposed Project. Information on the entire recreation study area, including Link River, Lake Ewauna, Keno reservoir, and the river reach below Iron Gate dam still may be found in the Recreation Resources FTR.

ES7.2 SUMMARY OF ALL INFORMATION

The relicensing studies were conducted to characterize the regional and local supply of recreation resources, analyze and characterize whitewater boating and fishing flows, describe existing and future demand for recreation activities, determine the capacity of developed recreation sites and use areas, project future recreation visitation, and identify existing and future recreation needs in the proposed Project area. Selected results of these studies include the following:

- The proposed Project area provides a broad spectrum of developed and primitive recreation opportunities. These opportunities comprise both water-based activities typically found at reservoirs and lakes, as well as more primitive shoreline and whitewater river activities.

- Recreation use in the proposed Project area varies greatly according to weather, season, and environmental conditions. Higher levels of use occur during the peak recreation season (i.e., Memorial Day to Labor Day), primarily during June and July. Shoulder season use focuses on hunting, fishing, and snow-related activities.

- Many of the existing recreation facilities in the proposed Project area are fairly primitive and should be improved through facility-specific redesign and/or enhancements for resource protection, health and safety, and use area separation. Many sites are in need of upgrades for Americans with Disabilities Act (ADA) compliance, as amended over time.

- The condition of existing undeveloped dispersed shoreline sites in the proposed Project area is variable, although many of the most affected sites are affected more by non-recreational squatters and cattle grazing than recreation.

- Regional recreation demand for activities that are popular in the proposed Project area is anticipated to continue to increase in the future. The population of the counties of origin of visitors to the proposed Project area also is expected to increase. As a result, it is estimated that annual recreational use of the proposed Project area may increase by up to 44 percent by 2040 (from approximately 96,000 to about 138,000 recreation days).

- Recreation capacity is a concern at several developed recreation sites, especially at Iron Gate reservoir. Many of these sites exhibit multiple capacity concerns including observed ecological impacts, lack of site expansion potential, and lack of available camping and/or parking spaces.

ES7.3 ASSESSMENT OF PROJECT IMPACTS

In general, normal Project operations appear to have only minor effects on reservoir-related recreation opportunities in the proposed Project area (e.g., reservoir levels occasionally affect boating and boating-related facilities along the shoreline). Additionally, results from recreation visitor surveys indicate that reservoir pool level does not negatively affect enjoyment or safety for a majority of visitors (89 percent of survey respondents) to the proposed Project area.

Unlike reservoir-related recreation opportunities, river-related recreation activities (e.g., whitewater boating and fishing) are affected by Project operations below the J.C. Boyle dam and

powerhouse. The Recreation Flow Analysis (see Recreation Resources FTR, Section 2.0) identifies potential effects from continued Project operations. Summarized results for the J.C. Boyle bypass reach, Hell's Corner reach (peaking reach), Copco No. 2 bypass reach, and the river reach below Iron Gate dam include the following:

- J.C. Boyle bypass reach—Project-related effects generally have enhanced fishing in the reach by providing stable base flows most of the year; however, base flows are too low for quality whitewater boating opportunities. Under current flow regimes, whitewater boating is provided only during short-duration spills or unpredictable maintenance events, while flows better for wading-based fishing and general recreation are usually available year-round. With a regulated river, it may be possible to alter the frequency of these various opportunities to provide greater diversity or enhance particular opportunities and resource values.

- Hell's Corner reach—Flows in this reach are strongly influenced by Project-related effects. Daily peaking events have small effects on general recreation, but they largely determine the frequency and quality of whitewater boating and fishing. In general, existing peaking flows (1,500 to 1,700 cfs) provide high-quality whitewater boating, but preclude high-quality fishing. Off-peak base flows, in contrast, are not good for whitewater boating, but provide quality fishing opportunities.

- Copco No. 2 bypass reach—Recreation in this reach is substantially affected by Project operations. In general, existing base flows (10 cfs) provide acceptable general recreation opportunities only; whitewater boating and fishing cannot occur at these flow levels.

- Below Iron Gate dam reach—Project effects on this reach are fundamentally difficult to quantify because they are confounded by base flow requirements currently required by the USBR. In general, current flow regimes have not affected whitewater boating and fishing opportunities during wet periods or in most high-flow periods during average years. However, minimum flows can have substantial effects on whitewater boating and fishing in dry years or in drier periods during average years (which include the summer season).

ES7.4 PROPOSED ENHANCEMENT MEASURES

Based on results from the relicensing studies and agency consultation through monthly recreation work group meetings, relevant recreation needs for the proposed Project area were identified. These recreation needs and associated proposed measures are addressed and implemented in the draft RRMP (see Appendix E7-A). In general, these recreation proposals focus on improving existing recreation resources and providing new and enhanced recreation opportunities in suitable areas when the need is demonstrated through a monitoring program. Proposed facility improvements and increased management presence at selected recreation sites (primarily on Iron Gate reservoir) would allow for some increased use levels while minimizing visitor and resource conflicts during the term of the new license. Specific proposed recreation resource measures for the proposed Project area include the following:

- Providing increased resource protection and visitor management controls throughout the proposed Project area, working in cooperation with the BLM and others to resolve current impacts to sensitive resources

- Increasing the supply of camping and day use facilities to help meet current and future demand, principally at Iron Gate reservoir, by adding approximately 85 new campsites and 30 day use picnic sites by 2040, or when needed on the basis of monitoring results

- Providing increased management presence at developed and undeveloped recreation sites

- Addressing ADA compliance at all existing and new recreation facilities per ADA accessibility guidelines (ADAAG), as amended, including providing ADA-accessible fishing access sites

- Providing improved maintenance and repairing/replacing site-specific facilities at existing developed recreation sites, including boat launches, picnic sites, and campsites

- Developing a multi-resource interpretation and education program as part of the draft RRMP, including new signs, kiosks, brochures, and/or services

- Providing new and/or enhanced multi-use, non-motorized trail opportunities

- Providing designated wildlife viewing areas, such as watchable wildlife stations

- Maintaining current undeveloped open space lands on PacifiCorp-owned property for activities such as wildlife viewing, sightseeing, nature appreciation, photography, and other recreational activities that rely on adequate natural open space.

- Working with the BLM and Oregon Parks and Recreation Department (OPRD) to implement portions of the Upper Klamath River Management Plan when adopted, from Stateline Take-Out on the Klamath River to Fishing Access Site No. 1 on Copco reservoir

- Providing whitewater boating and fishing opportunities in the Upper Klamath River/Hell's Corner reach, in consideration of other resources.

All of these proposed measures are further detailed and addressed in the draft RRMP that was developed with agency, tribal, and stakeholder input during 2003 (see Appendix E7-A). After a new license is issued by the FERC, the draft RRMP will be finalized and implemented.

ES8.0 LAND MANAGEMENT AND AESTHETICS

ES8.1 GEOGRAPHIC EXTENT OF STUDY AREA

ES8.1.1 Land Use

The land use study area includes all lands within the existing FERC Project boundary generally and ¼ mile beyond it. As part of the study, all relevant federal, state, regional, and local plans applicable to these lands were reviewed. The roads portion of the study also included the few public and private roads required for operations access to Project facilities and to recreation facilities where the potential exists for water quality or fishery impacts.

ES8.1.2 Visual and Aesthetic Resources

The visual and aesthetic resources study area included PacifiCorp facilities and operations on the Klamath River from Link River to just below Iron Gate dam. In addition, by request of the U.S. Forest Service (USFS), conditions were documented at three locations below Iron Gate dam beyond the Project boundary. Project facilities include those used for hydroelectric production (dams and powerhouses) and transmission, and ancillary facilities (fish hatcheries, and river and reservoir recreation areas). Project operations include the effect of Project facilities on reservoir levels and river flows.

Conditions for facilities and operations were documented at key observation points (KOPs) representative of typical public viewing locations. The study area for reservoirs and river reaches is limited to riparian areas within the riverbanks or canyon walls. Non-Project transmission lines or other facilities are addressed only to the extent that they incidentally fall within the viewsheds or KOPs for the Project facilities.

ES8.2 SUMMARY OF ALL INFORMATION

ES8.2.1 Land Use

The land use study consists of a description of existing land ownership, management, and use and a review and summary of applicable local and regional land use and resource management plans, zoning regulations, or requirements, including wetland and floodplain regulations.

The published plans of federal, state, and local agencies in the Project area were inventoried and reviewed. The review includes the FERC list of approved comprehensive plans and many other relevant plans not on the FERC list. Agencies with applicable plans are listed in Table ES8.2-1. The review of land use and resource management plans did not identify any conflicts between plans and existing Project facilities (see further discussion below).

Table ES8.2-1. Agencies with jurisdiction over Project lands or Project-adjacent lands.

Level of Government	Agency with Land Use/Land Management Jurisdiction
Federal	U.S. Bureau of Land Management (Klamath Falls, Medford, and Redding Resource Areas) U.S. Bureau of Reclamation U.S. Forest Service (Klamath National Forest) National Park Service (Upper Klamath River)
State	Oregon Department of Agriculture (Lost-River sub-basin) Oregon Department of Land Conservation and Development (Statewide Planning Goals implemented by local jurisdictions) Oregon Parks and Recreation Department
County	Klamath County, Oregon (Planning and Zoning) Siskiyou County, California (Planning and Zoning)

ES8.2.2 Visual and Aesthetic Resources

The visual and aesthetic resource study documents the visual character of the Project facilities and evaluates the visual effect of Project features and operations within the context of the local landscape character and relevant visual resource management plans. This study evaluates whether specific Project facilities and operations (e.g., flow regimes) could conflict with (1) the existing visual character of the area, and (2) relevant visual or scenic resource management plans.

To document the visual character of Project facilities and operations, color photographs were taken of each of the key Project facilities as viewed from KOPs. The KOPs document both Project facilities (e.g., dams or powerhouses) that are not influenced by water levels and Project operations (e.g., river reaches or reservoirs) that are influenced by water levels. For KOPs with a view of the river reaches, photographs were taken during approximate high, medium, and low flow periods. For KOPs with a view of Project reservoirs, approximate high pool and low pool conditions were documented. The KOPs are listed in Table ES8.2-2.

Table ES8.2-2. Key observation points (KOPs).

KOP Number and Name	Project Facility (KOP is not influenced by water levels)	Project Operations (KOP is influenced by water levels)
J.C. Boyle Reservoir		
K5: J.C. Boyle Reservoir from Pioneer Park East	X	
K6: J.C. Boyle Reservoir from Pioneer Park West	X	
K7: J.C. Boyle Reservoir from Topsy Recreation Area	X	
J.C. Boyle Bypass Reach		
BB1: J.C. Boyle Dam from Dam Access Road	X	
BB2: Klamath River from Bridge Below J.C. Boyle Dam		X
BB3: Outflow from J.C. Boyle Dam from Access Road		X

Table ES8.2-2. Key observation points (KOPs).

KOP Number and Name	Project Facility (KOP is not influenced by water levels)	Project Operations (KOP is influenced by water levels)
BB4: J.C. Boyle Bypass Reach View #1 from Access Road		X
BB5: J.C. Boyle Bypass Reach View #2 from Access Road		X
BB6: J.C. Boyle Bypass Reach View #3 from Access Road		X
BB7: J.C. Boyle Bypass Reach View #4 from Access Road		X
BB8: J.C. Boyle Powerhouse and Penstocks	X	
BB9: J.C. Boyle Powerhouse and Transmission Line	X	
Hell's Corner Reach		
HC1: Klamath River from Boater Access Below J.C. Boyle Powerhouse		X
HC2: Topsy Grade Road Potential Overlook #1		X[2]
HC3: Topsy Grade Road Potential Overlook #2		X[2]
HC4: Topsy Grade Road Potential Overlook #3		X[2]
HC5: Klamath River from Frain Ranch Boater Access		X
HC6: Klamath River (Caldera Rapids) from Frain Ranch		X
HC7: Klamath River from Stateline Takeout		X
HC8: Klamath River from Fishing Access #5 (Ager-Beswick Road)		X
Copco Reach		
C1: Copco Reservoir from Mallard Cove Recreation Area		X
C2: Copco Reservoir from Copco Cove Recreation Area		X
C3: Copco No. 1 Dam and Powerhouse	X	
C4: Copco No. 2 Dam	X	
C5: Copco No. 2 Forebay from Copco No. 2 Dam		X[1]
C6: Copco No. 2 Powerhouse	X	
C7: Copco Transmission Line	X	
Fall Creek		
FC1: Fall Creek Recreation Area and Trail	X	
FC2: Fall Creek Fish Hatchery	X	
FC3: Fall Creek from Hatchery Trail		X[1]
FC4: Fall Creek Powerhouse	X	
FC5: Fall Creek Transmission Line	X	
Iron Gate Reach		
IG1: Jenny Creek from Jenny Creek Recreation Area		X[1]
IG2: Iron Gate Reservoir from Wanaka Springs Recreation Area		X
IG3: Iron Gate Reservoir from Camp Creek Recreation Area		X
IG4: Iron Gate Reservoir from Juniper Point Recreation Area		X
IG5: Iron Gate Reservoir from Mirror Cove Recreation Area		X

Table ES8.2-2. Key observation points (KOPs).

KOP Number and Name	Project Facility (KOP is not influenced by water levels)	Project Operations (KOP is influenced by water levels)
IG6: Iron Gate Reservoir from Overlook Point Recreation Area		X
IG7: Iron Gate Reservoir from Long Gulch Recreation Area		X
IG8: Iron Gate Transmission Line	X	
IG9: Iron Gate Dam and Powerhouse	X	
IG10: Iron Gate Fish Hatchery and Fish Ladder	X	
IG11: Bogus Creek from Viewpoint at Iron Gate Fish Hatchery		X[1]
IG12: Klamath River from Iron Gate Hatchery River Access		X
Below Iron Gate		
BG1: Klamath River from Access Below Klamathon Bridge		X
BG2: Klamath River from Collier Rest Area Overlook/Interpretive Area		X
BG3: Klamath River from Tree of Heaven River Access Boat Ramp		X

[1] While the views from these KOPs are not influenced by Project operations, they are discussed with KOPs of other water features, which are influenced by Project operations.

[2] Although this view potentially could be influenced by changes in water level or flows, field work indicated that its location is too distant from the river for such a change to be visible.

ES8.3 ASSESSMENT OF PROJECT IMPACTS

ES8.3.1 Land Use

With respect to existing land uses, the review of land use and resource management plans did not identify any conflicts between plans and existing Project facilities. Some Project facilities located in Oregon are consistent with current zoning whereas others are allowed as conditional uses. Most Project facilities located in California (which have been in place for many years) are consistent with current zoning. This is true throughout Siskiyou County. Any new Project facilities would need to be constructed and operated in compliance with applicable plans and policies.

Project facilities are consistent with agency resource management plans (e.g., BLM), primarily because no new facilities are proposed and the plans were developed with the understanding that the Project facilities already existed and would continue to operate. Several of the Project facilities help ensure consistency with plan provisions by providing areas for passive recreation (e.g., open space) or active recreation (e.g., reservoirs), land uses that are called for within the plans. The operation of the Project does not interfere with other land use activities, such as forestry or agriculture, that figure prominently in the goals of many of the applicable plans. A number of the federal plans reviewed did not apply directly to the Project. The main exception to this was the Northwest Forest Plan. The continued operation of Project facilities would not affect the preservation of late-successional and old growth forest ecosystems covered by this plan.

ES8.3.2 Project Roads Inventory Analysis and Roads Management

In 2002, PacifiCorp conducted an initial inventory of Project-related roads and collected information on their potential impacts on surrounding sensitive aquatic and terrestrial resources. These roadway inventory data and associated geographic information system (GIS) mapping currently are being reviewed, updated, and summarized by PacifiCorp. This task will be completed by mid-2004. When completed, the summary and analysis of the roads inventory data will include appropriate tables and GIS map sets. In addition, Project-related road management activities will be defined including road and bridge management activities, monitoring activities, and cost sharing responsibilities for Project-related transportation facilities. A summary of the roadway inventory data and road management activities will be presented in report format when completed (see Appendix E8-C for a proposed outline of this summary report). The results of the roadway inventory analysis and proposed roadway management actions and responsibilities will be reviewed in consultation with the BLM.

ES8.3.3 Visual and Aesthetic Resources

ES8.3.3.1 Project Facilities

Project facilities are characterized using the BLM Visual Resource Management (VRM) methods and compared to applicable VRM objectives. All of the facilities except three are located in areas that have been designated as a Class III area by a BLM Resource Management Plan (RMP) or have been classified as a Class III area because the area has not been given a specific VRM class by the BLM. In a VRM Class III area, management activities may attract attention, but they should not dominate the view of the casual observer.

The results of the impact analysis for Project facilities are as follows:

- Three facilities are located in Class II areas, where non-native elements should not attract the attention of the casual observer: J.C. Boyle dam, J.C. Boyle powerhouse and penstocks, and J.C. Boyle powerhouse and transmission lines. These facilities attract the attention of the casual observer as a result of their contrast with the natural setting.

- Four Project facilities located in Class III areas dominate the view of the casual observer: Copco No. 1 dam and powerhouse, Copco No. 2 powerhouse, Fall Creek powerhouse, and Iron Gate fish hatchery and fish ladder. These facilities dominate the view because of their size and prominence in relation to the position of the viewer; that is, the KOP is located quite close to the facility and is not necessarily representative of the prominence of the facility in the broader landscape setting.

- Eight KOPs were determined to be consistent with the VRM Class III objectives: Keno dam, Copco No. 2 dam, Copco transmission line, Fall Creek recreation area and trail, Fall Creek fish hatchery, Fall Creek transmission line, Iron Gate transmission line, and Iron Gate dam and powerhouse. Although they may attract the viewer's attention, in general these facilities blend with their surroundings.

- The Spring Creek diversion, located in Jackson, County, Oregon, has not been analyzed for visual impacts. Relevant analysis and other information will be provided in supplementary documents if needed.

ES8.3.3.2 Project Operations

Project operations are relevant to visual resources with respect to changes in river flows or reservoir elevations. These fluctuations depend on a number of factors, including operational issues and seasonal water flows. In general, Project operations result in changes to the visual character of the reservoirs and river reaches in terms of criteria such as the width of the wetted channel and the visibility of exposed shoreline.

River Reaches

The visual quality of each river reach was assessed and described at low, medium, and/or high flow conditions at about 15 KOPs. At low flows, rocks and vegetation are visible at the channel edges and hydraulic expression is limited mostly to areas where rocks extend above the water surface. As flows increase, fewer rocks and less vegetation are visible. At some locations, hydraulic expression increases as the flows increase. The visual quality of the KOPs varies with the flow levels.

Reservoirs

Visual characteristics of the reservoirs were documented at two different water levels: high pool and low pool. The J.C. Boyle and Copco reservoirs also were documented at low levels seen during maintenance drawdown events. The following are the visual characteristics of the reservoirs:

- J.C. Boyle: Although the differences between low and high pool levels are not great because of the relatively small change in water level, some differences are visible. At low pool, the reservoir views show an open expanse of relatively flat water with light green vegetation growing up from the lake bottom, but the characteristics of the shoreline vary. At high pool conditions, the light green vegetation is no longer apparent from any of the KOPs. During maintenance drawdown conditions, a large area of exposed lake bottom dominates the view.

- Copco: During high pool conditions, a small area of near-shore lake bottom is exposed. This area increases during low pool conditions. The visual quality is lower here during low pool conditions because of the increased exposure of the shoreline. During maintenance drawdown conditions, a large area of exposed lake bottom dominates the view.

- Iron Gate: The views from six recreation areas at the reservoir were documented. At high pool, little to none of the lake bottom is exposed along the shoreline at the recreation areas. At low pool, larger areas of lake bottom and other features are more exposed than at high pool. The visual quality of the reservoir is lowest when its elevation is at low pool.

ES8.3.3.3 Consistency with Plans

The Project is consistent with most relevant visual or scenic resource management plans or plan elements. Many of the plans reviewed have only general goals or policies that are not specific or relevant to the Project facilities or operations. Also, because the Project facilities pre-date the preparation and adoption of most of the plans, the facilities were already a part of the landscape when the plans were prepared and consistency is not a relevant consideration. Nevertheless, enhancement measures are proposed for the J.C. Boyle dam operations and maintenance building, powerhouse, and penstock. The measures would reduce the visual impact of these facilities and make them more consistent with the BLM Klamath Falls Resource Area RMP.

ES8.4 PROPOSED ENHANCEMENT MEASURES

ES8.4.1 Proposed Measures for Land Use and Management

No enhancement measures related to land use are proposed.

ES8.4.2 Proposed Measures for Aesthetic/Visual Resources

The following measures to enhance aesthetic/visual resources in the Project area are proposed. These measures are described in more detail in the draft RRMP (see Appendix E7-A) and are coordinated with the Vegetation Resources Management Plan.

ES8.4.2.1 J.C. Boyle

- Red Barn—The operations and maintenance building (known as the "red barn") is visible across the J.C. Boyle reservoir from Topsy Recreation Site (KOP K7) and presents a moderate degree of contrast. The visibility of the barn could be reduced through vegetative screening or painting it a more neutral color.

- Powerhouse Facilities—The J.C. Boyle power facilities present a high degree of contrast with the natural landscape. In particular, the penstock, surge tank, and powerhouse covers are painted a light tan color that is highly visible from nearby areas. The visual contrast of some or all of these facilities could be reduced through vegetative screening and/or painting a more neutral color. The substation also is visible from public use areas; visibility could be reduced through vegetative screening.

ES8.4.2.2 Iron Gate

- Powerhouse Facilities—The Iron Gate penstock is painted a light tan color that contrasts with the reddish iron color of the back of the Iron Gate dam. This contrast is observed down river from KOP IG12. The contrast could be reduced by painting the penstock and powerhouse covers a color that matches the color of the dam.

ES9.0 SOCIOECONOMICS

ES9.1 GEOGRAPHICAL EXTENT OF STUDY AREA

The geographic scope of the socioeconomic analysis is determined by the incremental Project's sphere of influence on the socioeconomic environment. The preliminary study area was defined before the proposed Project was developed and thus before any impacts on resources that could affect the socioeconomic condition were identified.

The study area for the description of the existing socioeconomic condition includes Klamath, Jackson, and Curry counties in Oregon and Siskiyou, Humboldt, and Del Norte counties in California. These counties contain the existing Project boundaries or their economies, local services, and human resources could be affected by increases in Klamath River and marine recreational, subsistence, and commercial salmon fishing opportunities.

Readily accessible socioeconomic data were collected and presented for two additional regions within the above mentioned state and county boundaries. The regions consist of two corridors extending from Link River dam down the Klamath River to the Pacific Ocean, at which point they spread along to the coast, terminating at the boundaries of the Klamath Management Zone (Humbug Mountain, Oregon, and Horse Mountain/Shelter Cove, California). One corridor extends 5 miles on each side of the Klamath River and 5 miles inland at the coast. The other region extends up to 50 miles each side of the river and up to 50 miles inland along the coast. The existing socioeconomic condition for these counties and subregions within the counties is described to provide a context for interpreting changes in the socioeconomic condition resulting from the proposed Project and PM&E measures.

This study area for the socioeconomic impacts assessment reflects two perspectives: regional and national. To best capture the regional perspective, the study area was subdivided into the Upper Klamath River area and the Lower Klamath River area. Klamath and Jackson counties in Oregon and Siskiyou County, California, make up the Upper Klamath River study area for the regional analysis of impacts on economic development, including employment, output, and earnings, as well as related regional socioeconomic resources (e.g., population, housing, public services, fiscal conditions). The Project is located within the boundaries of these counties so that any impacts on the local economy from constructing or decommissioning Project facilities or implementing PM&E measures, including local recreation opportunities, would involve these counties. The economies of the counties downstream of Iron Gate dam, including Humboldt and Del Norte counties in California, and Curry County, Oregon, are affected by the quality of the water-based recreation opportunities and subsistence and commercial fishing activities in the Lower Klamath River as well as commercial and sport ocean salmon fishing. To the extent that the proposed Project and PM&E measures affect these resources, there is a link to the economies in this region as well.

The benefit-cost analysis describes the significant economic effects of the incremental Project and PM&E measures to make a determination on net economic benefits from a national perspective. This analysis is based on the changes in natural resources (i.e., fish, recreation, water quality, visual resources, terrestrial resources, hydrology, etc.) and developed resources (e.g., power), which are limited in geographic scope as defined in their respective resource area summaries.

ES9.2 SUMMARY OF ALL INFORMATION

The socioeconomic resources study describes the existing socioeconomic condition in the study area and addresses the following key questions related to estimating expected changes in the socioeconomic condition resulting from differences between the proposed Project and the current Project:

- Which major economic sectors (e.g., recreation, construction) are affected and how do those effects translate into changes in local employment and earnings in the study area?
- What are the related effects on population growth, community services, and other socioeconomic resources in the study area?
- What are the changes in market (e.g., power benefits, construction costs) and nonmarket (e.g., recreation opportunities, fish and wildlife resources) economic benefits and costs (i.e., described in monetary, nonmonetary, or qualitative terms)?
- How are the anticipated benefits and costs distributed within and across regions in the study area (i.e., which societal groups would bear the burdens and who would reap the benefits)?

Those key study questions are addressed using the following analyses:

- A regional economic impact analysis was conducted to estimate changes in local employment, output, and earnings in the study area resulting from differences between the proposed Project and the current Project. A component of the regional economic impact analysis is the sector analysis, which defines the effect of the proposed Project on major economic sectors (e.g., recreation and tourism, and construction).
- Descriptions of the changes in other socioeconomic resources (e.g., population, community services, local fiscal conditions) in the study area resulting from differences between the proposed Project and the current Project.
- National level economic benefit-cost analysis to quantitatively and qualitatively describe the changes in net benefits to the public resulting from differences between the proposed Project and the current Project.

ES9.2.1 Summary of Existing Condition

This description of the existing socioeconomic condition includes the following socioeconomic factors:

- Population
- Housing
- Economic development (employment, earnings, and output), including descriptions of the current commercial salmon fishery, Klamath River-based recreation industries, and the construction industry in the study area

- Local (Project area) government fiscal conditions
- Public services (police, fire, emergency personnel, schools) in the Project area
- Infrastructure (roads, bridges, water supply, water treatment, electricity rates, and natural gas)

ES9.2.1.1 Population

Within the six-county study area, the total population, according to the U.S. Census 2000, is 464,507. The three counties that comprise the upstream region have a combined population of 289,345. The combined population of the downstream region is 175,162. The upstream region contains more than 60 percent of the study area population, with Jackson County, Oregon, comprising almost 40 percent of the total study area population. The physical structures of the Project are all within the three upstream counties of Klamath and Jackson in Oregon and Siskiyou in California.

The largest racial group in the study area is white, representing more than three-fourths of the population in the study area. The American Indian population constitutes the second largest racial group in all but Jackson County, Oregon. The communities within the 5-mile buffer area have exhibited lower population growth and have a higher-percentage minority population than average for their respective counties and states.

ES9.2.1.2 Housing

According to the U.S. Census 2000, the study area has adequate housing as indicated by high vacancy rates. Vacancy rates exceeding 5 percent generally are thought to indicate surplus of housing units available for rent. Jackson County, Oregon, has the highest percentage of owner-occupied housing and Humboldt County, California, has the lowest percentage. A higher owner-occupancy rate is indicative of a higher standard of living.

ES9.2.1.3 General Economic Development

<u>Employment and Unemployment</u>

Each county in the study area has experienced a net job growth during the period of 1980 to 1999. In general, however, the average annual growth rates for the study area counties have been lower than their respective state growth rates, and the study area counties showed negative job growth for the period of 1980 to 1985. The exception is Jackson County, Oregon, which has experienced continuous job growth at average annual rates greater than the Oregon average.

Throughout the study region, services, retail trade, and government are the three sectors with the greatest percentage of total county employment. For the upstream region as a whole, recreation and tourism (which are included in the services and retail trade sectors) have become important industries for many of the smaller communities along the river, replacing lost jobs from the timber industry. The services industry has seen consistent increase in importance during the last 20 years.

For the communities within the 5-mile buffer area, the services and retail trade sectors account for about two-thirds of the industry employment.

The county unemployment rates for the year 2000 are all higher than the state averages for California and Oregon, both of which had statewide unemployment rates of 4.9 percent in 2000. The unemployment situation is even worse at the community level. Excepting Ferndale, Myrtletown, and Pine Hills, most of the communities in the 5-mile buffer area had unemployment rates that were higher than those reported at the county or state level. Tribal authorities report unemployment rates as high as 40 percent within the tribal community (Waddell, 2002).

Income

According to the U.S. Census 2000, county-level per capita personal income for each study area county is less than the state averages for California and Oregon. Jackson County, Oregon, has the highest per capita income of all counties in the study area, while Del Norte County, California, has the lowest. In general, the communities within the 5-mile buffer area are characterized by lower median household and per capita incomes than those observed at the county or state levels.

The per capita income of the American Indian population in each of the six counties is significantly lower (about 50 percent lower) than that observed for the entire population in each of the six counties. In addition, poverty status among American Indians is higher than for the general population in all counties except for Curry County, Oregon. The communities within the 5-mile buffer area are characterized by pockets of American Indians with incomes below poverty level.

ES9.2.1.4 Specific Economic Development

Under current conditions, the Project is related to the economy in the Project area and perhaps to the economies of the broader study area. PacifiCorp contributes to local employment in the Project area. The operation and maintenance of the Project facilities results in the employment of 19 individuals for a total annual payroll of about $820,000.

Recreation Resources

Recreation is a major component of the Project area economy. The recreation industry includes whitewater boating (private and commercial), recreational sports fishing (private and commercial), and gold mining. Total nonlocal expenditures for all recreational activities within the Upper Klamath River region (excluding gold mining) are approximately $900,000 for the 5-mile buffer area and about $1.67 million for the 50-mile buffer area.

Whitewater boating, recreational sportfishing, camping, ocean sportfishing, and gold mining are important recreational activities within the Lower Klamath River region. Total non-local expenditures are about $6.3 million for the 5-mile buffer area and $7.5 million for the 50-mile buffer.

Commercial and Native American Fishing

Commercial and American Indian commercial fishing also are a major component of the Project area economy. To protect the threatened Klamath River coho and Chinook salmon, all salmon fishing in the Klamath Management Zone has been restricted. While salmon landings in Klamath Management Zone ports have dropped significantly, total landings for the commercial fishery have not been affected to the same extent. Study results suggest that it is likely that some of the commercial fleet that formerly fished for salmon has re-geared and switched its effort to other species as a result of the salmon restrictions.

Of the fish resource available in the Klamath River basin, 50 percent must, by law, go to the Yurok and Hoopa Valley Tribes (Viele, 2002). The Yurok Tribe receives 80 percent of the tribal allocation and the Hoopa Tribe receives the remaining 20 percent. For the Karuk Tribe, fishing is regulated to a spot at Ishi-Pishi Falls (Tripp, 2003) and is not limited to a specific allocation.

Revenues for the American Indian commercial fishing have fluctuated with changes in catch while also showing a downward trend has a result of lower market prices. In addition to commercial harvest, the tribes also fish salmon for subsistence and for ceremonial reasons. In many years, especially recently, the value of the subsistence harvest has exceeded the market value of the American Indian commercial harvest. Although the tribal significance of fishing for salmon extends well beyond its commercial value and its value as a source of food, these economic factors are nonetheless important considering the high percentage of low-income American Indians in the study area. Salmon fishing continues to play a role in the economic well-being of American Indians in the study area.

Irrigated Agriculture

Irrigated agriculture is another important component of the Project area economy. The USBR's Klamath Irrigation Project provides irrigation water for both agricultural and wildlife refuge lands in the Klamath River basin. According to the 1997 U.S. Census of Agriculture, there were 1,744 farms and ranches that used irrigation water supplied by the Klamath Irrigation Project. Of the total farms and ranches using irrigation water, 80 percent are in Siskiyou County, California, and Klamath County, Oregon, the two counties that are in the Project area.

The USBR's Klamath Irrigation Project and PacifiCorp's Klamath Hydroelectric Project are connected through the Keno reservoir. The water diverted through Keno reservoir supports about 490 farmers (or 41 percent of the total number of farmers supported by the Klamath Irrigation Project) and irrigates about 95,600 acres of Project farmland and 4,000 acres of non-Project land. Thus, water diverted through Keno reservoir irrigates about 45 percent of the total irrigated acres in the Klamath Irrigation Project (Green, 2003).

ES9.2.1.5 Local Fiscal Conditions

In addition to employment, PacifiCorp contributes to the economies of the Project area through various taxes. During fiscal year (FY) 2002 to 2003, Klamath County received a total of $35 million in property taxes. PacifiCorp's contribution was about $ 1.7 million ($105,160 to the City of Klamath Falls and $1.58 million to Klamath County) in FY 2002 to 2003, or about 4.5 percent of the total (Long, 2003). Siskiyou County received a total of $6.54 million in property

taxes in FY 2002-03. PacifiCorp's contribution was about $1.1 million, or about 18 percent of the total property tax receipts (Hammar, 2003). In 2002, the city of Yreka received $64,767.03 (1 percent of 647,670.30 in gross revenues) in franchise taxes from PacifiCorp (Ramirez, 2003).

ES9.2.1.6 Property Value

The development of the Project facilities at Keno in Klamath County, Oregon, and Copco in Siskiyou County, have contributed to the value of the land adjacent to these two facilities. There are 157 parcels (or 805 acres) of land adjacent to Keno reservoir, of which 135 (or 637 acres) are privately owned. According to the Klamath County Assessor's office, the total assessed value of all private property adjacent to Keno reservoir for the FY 2003-2004 was $25,731,910. The total property tax due on these properties for the FY 2003-2004 was $222,728 (Shaw, 2003). In the case of Copco reservoir, there are 226 parcels (or 2,402 acres), of which 204 (or 811 acres) are privately owned. Private property adjacent to the Copco facilities had a total assessed value, in FY 2003-2004, of $8,111,212, with $84,818 due in property taxes (Hammar, 2003).

Several of these properties include docks, which can be affected by changes in reservoir levels. For example, lower reservoir levels can require extending the docks in order for them to continue to be in deep enough water to be accessible to the boats. Copco reservoir has about 47 docks and Keno reservoir has about 22 docks. These figures include private and publicly owned docks. Additional docks in the Project area include two each at Iron Gate, J.C. Boyle, and Link River bypass and three at Lake Ewauna.

ES9.2.1.7 Infrastructure

The current infrastructure (e.g., roads, utilities) is adequate for meeting existing needs of the communities in the Project area.

ES9.2.1.8 Public Services

Project area public service providers include fire, police, schools, and medical services. Although the Project facilities in Oregon are outside its service area, the Keno Fire Protection District (FPD) provides fire protection and emergency medical services. The Klamath County Sheriff's Department provides law enforcement services to the Project facilities in Klamath County, Oregon, and has a dispatch center out of Klamath Falls. The schools in Klamath County, Oregon, are in the Jackson Education Service District. Within this service district, the Klamath County School District has a total of 20 schools and the Klamath Falls City Schools consist of nine additional schools.

The Project facilities in California (Copco, Iron Gate, and Fall Creek) are all within the jurisdiction of the Hornbrook Fire District. Northern Siskiyou Ambulance in Siskiyou County provides emergency services in the Project area. Siskiyou County Sheriff's Department provides law enforcement services to the Project facilities in Siskiyou County, California. In California, the Project facilities are all in Siskiyou County, which has 28 school districts.

ES9.2.2 Summary of Resource Changes

This section summarizes the proposed Project and PM&E measures as they relate to changes in resources that impact the socioeconomic condition. The following sections describe the proposed Project induced resource changes and PM&E measures that could affect the socioeconomic condition.

ES9.2.2.1 Recreation Resources

Proposed improvements and increased management presence at selected recreation sites (primarily on Iron Gate reservoir) would allow for some increased use levels while minimizing visitor and resource conflicts. These proposed improvements are summarized in Section ES7.0 and are described in detail in the draft RRMP (Appendix E7-A). In addition, the recreation specialists used the available information from the fisheries, hydrology, and water quality specialists and their best professional judgment to assess potential Project-induced effects on the suitability of the Project area to support the various types of recreation activities. It is estimated that recreation visitor days will increase in the Upper Klamath River area over time and that a portion of that increase would result from the proposed PM&E measures. The induced increment to annual visitation would increase from about 3,300 recreation days on implementing the new measures to about 19,000 visitor days per year. Over time, these improved recreation opportunities were estimated to generate a net present value of $9.9 million (assuming a 2 percent discount rate) or $3.9 million (assuming a 7 percent discount rate).

ES9.2.2.2 Water Quality and Fish Habitat

Removing the East Side and West Side developments from service will result in a net benefit to the listed sucker species (and other species) by eliminating entrainment and by improving water quality in the Link River. Although this action will not lead to allowable harvests of the sucker species, it is of cultural consequence to the Klamath tribes. In addition, this action will increase the amount of usable habitat for all aquatic species, including state of Oregon sensitive species redband trout (also recognized as a species of concern by federal resource management agencies) and slender sculpin, and it will aid in fish migration through the Link River reach. ODFW (1997) reported that redband trout in the Klamath River are a unique stock indigenous to the river and its tributaries and referred to them as the “Klamath River redband stock.” These enhancements are not expected to lead to changes in sport or subsistence catch. Consult the decommissioning plan, the Fish Resources and Water Quality FTRs and applicable sections of Exhibit E for additional details.

In all, the fisheries and water quality PM&E measures are expected to increase water quality; increase habitat for resident species; increase spawning habitat for trout and other resident species; enhance trout habitat connectivity; and have a dampening effect on stranding, which is already negligible. Several PM&E measures are anticipated to benefit anadromous populations downstream of Iron Gate dam. Continued operation of the Iron Gate fish hatchery is expected to maintain the hatchery’s contribution to downstream populations. Without the hatchery, there likely would be a significant loss in harvestable fish. Two other PM&E measures would contribute favorably to downstream populations: (1) heating steelhead egg incubation water will allow for larger smolt size at release and increased smolt-to-adult survival and (2) an enhanced data collection effort is proposed to improve management and thus the long-term viability of the

in-river anadromous fishery. These changes would benefit the downstream in-river sportfishery, American Indian commercial and subsistence fisheries, ocean salmon sport fishery, and commercial fishery. Although it was not possible to estimate all of the economic benefits associated with these improvements, a ballpark figure for the in-river and ocean salmon recreation harvest is $23.6 net present value (NPV) (2 percent discount rate) or $11.7 million (7 percent discount rate). In addition, the wholesale value of the tribal subsistence fishery for in-river and ocean salmon harvest is estimated at $15.3 million NPV (2 percent) or $7.6 million NPV (7 percent), respectively.

ES9.2.2.3 Wildlife and Botanical Resources

The terrestrial PM&E measures will (1) reduce the level of adverse impact to vegetation and wildlife next to Project facilities, recreation sites, roads, and power lines, (2) improve wildlife habitat connectivity through enhanced flows for riparian habitat in the J.C. Boyle bypass and peaking reaches and on-site habitat restoration activities along Project reservoirs and river reaches, and (3) provide a monitoring plan to track habitat improvements. The details on these measures and enhancements are provided in the Terrestrial Resources FTR. The net effect of these enhancements would be to increase the value of wildlife and botanical resources, and the quantity and quality of the ecological services that these resources provide to the public.

ES9.2.2.4 Visual and Aesthetic Resources

The visual and aesthetic resources study identified several Project facilities that present a moderate or high degree of contrast with the natural environment that could be reduced through painting or vegetative screening. The benefit of implementing these visual enhancements would be improved quality of the visual environment.

The following measures to enhance visual and aesthetic resources in the Project area are proposed. These measures are described in more detail in the draft RRMP (Appendix E7-A).

ES9.2.2.5 Cultural Resources

PacifiCorp contracted with the Klamath River Inter-Tribal Fish and Water Commission to produce an integration report that will be based on the results of tribal ethnographic studies prepared by the Klamath, Shasta, Karuk, and Yurok tribes. (See the Cultural Resources FTR and Exhibit E6.0 for details.) The individual tribal studies documented the critical importance of the Klamath River and its salmon and other associated resources to their past culture and to the continuation of their present and future culture. The tribal reports urged recognition and documentation of an NRHP-eligible ethnographic riverscape. The forthcoming integration report will discuss common themes among the Klamath River basin tribes and provide a basinwide overview, evaluation, and assessment of broad tribal concerns about basinwide water management and its effects on historic properties. Management implications of possible designation of an NRHP-eligible riverscape will be explored in the integration report.

ES9.2.2.6 Power Production

As described in Exhibit D, PM&E changes to operation of the Klamath Falls project will result in a 23.2 million (kilowatt-hour) kWh reduction in average annual power generated at the Project.

ES9.2.2.7 Other Resources

Any proposed Project-induced changes in municipal water supply, flood control, irrigated agriculture, or property values are expected to be minimal.

ES9.3 ASSESSMENT OF PROJECT IMPACTS

This section summarizes the results of the analyses of key socioeconomic questions related to the proposed Project and PM&E measures. The proposed Project-induced resource changes and PM&E measures affect various aspects of the socioeconomic condition, including local economic development (e.g., employment and earnings), economic development-induced changes in other local socioeconomic resources (e.g., population growth, use of community resources), and net social benefits.

ES9.3.1 Economic Development

For the upstream counties, of the two major sectors whose regional economic impacts were evaluated in this section, construction has the larger impact on employment, income, and output. The impacts from recreation expenditures are relatively small. The creation of an additional 53 (construction phase) or 26 (operation phase) jobs is not significant enough to help reduce the high unemployment rates observed for the communities within the 5-mile or 50-mile buffer areas. Similarly, the additional income and output, though welcome, is not significant enough to help raise the low per capita incomes observed for these communities.

For the communities downstream of Iron Gate dam, the recreation, subsistence, and commercial salmon fisheries are likely to be affected by the proposed Project. The available information suggest that the Iron Gate fish hatchery PM&E measures could contribute roughly 15 percent of the income that is generated by these sectors.

It is not anticipated that the incremental changes resulting from the proposed Project and PM&E measures would lead to changes in employment and earnings in any other sectors of the economy.

ES9.3.2 Other Regional Effects

Because construction is a temporary activity and most of the construction workers are expected to commute from either inside the upstream region or from neighboring counties, and impacts to population and housing are expected to be minimal. As a result of the anticipated minimal changes in population, the proposed Project and PM&E measures are expected to have minimal impacts on local infrastructure and public services**.**

Changes in property values are anticipated to be minimal because (1) the anticipated improvements in water quality, terrestrial habitat, and aquatic habitat are not likely to lead to

increased property values in the area, and (2) the anticipated changes in reservoir water levels do not appear to be significant enough to change property values near the reservoirs.

Anticipated changes in property tax payments are limited to those related to the East Side and West Side facilities. The decommissioning of these facilities might lead to the removal of a relatively small amount of property from the property tax rolls. The taxes paid on the property represent less than 0.1 percent of the annual property taxes that Klamath County and the City of Klamath Falls collected during FY 2002 to 2003.

Project expenditures will need to be recovered through PacifiCorp's rate charges to its customers in its six-state service area. Because Project expenditures will not be directly offset by any associated project revenues or cost reductions, the PacifiCorp's rates will need to be increased relative to their level under continued Klamath generation at the Project. Given the size of PacifiCorp's service area, expenditures on any one project have a relatively small impact on rates charged to retail customers. Nonetheless, PacifiCorp strives to make prudent expenditures on each project so that the cumulative effect of expenditures on all projects keeps PacifiCorp's rates as low as possible while still providing safe, reliable, and environmentally responsible service.

PacifiCorp believes that Project expenditures meet this criterion. Expenditures are being prudently made. While they will significantly increase Project costs, there will be numerous, valuable environmental benefits.

ES9.3.3 Net Social Benefits

The incremental social costs of the changes in the Project include investment in PM&E facilities, associated increases in operating costs, and losses in power generation. The NPV of social costs was estimated at $101.6 million using a 2 percent discount rate and $66.6 million using a 7 percent discount rate. The incremental changes resulting from the proposed Project and PM&E measures relative to the continuation of the existing Project will lead to a number of changes in valued resources, including recreation opportunities, fish populations, aquatic and terrestrial habitat for fish and wildlife, cultural resources, and aesthetics.

The quantifiable social benefits of the proposed Project and PM&E measures are conservatively estimated to have an NPV of about $48.8 million (2 percent discount rate) or $22.2 million (7 percent discount rate). This includes (1) the improved recreation opportunities in the Upper Klamath River area, (2) the protected Lower Klamath River in-river and ocean sport fisheries, and (3) the wholesale value of the Lower Klamath River tribal subsistence fishery. Omitted from the quantitative analysis is society's willingness to pay for the enhancements to fish populations, water quality and aquatic habitat and connectivity, wildlife habitat connectivity, aesthetics, American Indian commercial catch, and the consumer surplus from the tribal subsistence fishery. These economic values are only partially reflected in the value of recreation opportunities and the wholesale value of subsistence fish.

The lower bound estimate of NPV should not be interpreted as a precise figure. Rather, it provides a ballpark estimate of the lower bound based on a series of assumptions and analyses documented in Exhibit E9.0. The upper bound on the social benefits was not estimated and depends on the nature and extent of the resource improvements and how they contribute to

supporting human needs and wants. For example, characterization of the cultural significance of the incremental changes as a result of the proposed Project and PM&E measures relative to continued operations of the existing Project was not attempted (see the Cultural Resources FTR for these discussions). However, it was observed that the reduction in entrainment of sucker species, the improvements to aquatic and terrestrial habitat, and the maintenance of anadromous fish populations are movements in a positive direction. Finally, in the socioeconomic study plan, the potential for changes in flood moderation, municipal water supply, and irrigation water supply was identified as an area of study. However, no such Project-induced effects were identified.

ES9.4 PROPOSED ENHANCEMENT MEASURES

No enhancement measures were specifically identified as socioeconomic enhancements. Rather, the socioeconomic condition is affected indirectly through the changes to other resources, as described in Section 4.7.2 of the Socioeconomics FTR titled Assessment of Project Impacts.

ES10.0 CONCLUSION

PacifiCorp has completed an extensive amount of work in preparing this license application. Much of the work was identified by stakeholders in the relicensing collaborative process. PacifiCorp maintains that the information collected and the consideration of balancing both environmental and social resources have led to the identification of responsive Project operational changes and PM&E measures. These Project changes and measures are estimated to cost approximately $106,677,000, and the Project is estimating an annual loss of roughly 23,000 MW hours of generation during the next 30 years. The resulting license will ensure continued production of clean renewable energy, minimize impacts to other water users, significantly reduce impacts to ESA species thereby enhancing the recovery of federally listed species, provide important recreational flows that are unique to the west coast, improve habitat conditions for fish and wildlife through improved water quality and enhancement/new construction projects, create recreation improvements, and protect and better manage cultural resources.

PacifiCorp is committed to completing unfinished studies and conducting other activities, such as reviewing study results and analysis, finalizing models and reviewing model run results and, if appropriate, further discussions on potential PM&E measures through collaboration with relicensing stakeholders. Upon completion of studies and modeling efforts, documentation of collaboration and final study reports will be provided to the FERC. At that time, PacifiCorp will identify to the FERC any recommended operational changes or PM&E measure modifications beyond those proposed in this license application.

In the interest of acquiring a new Project license in a timely manner, PacifiCorp commits to being responsive to the FERC as it completes the relicensing process. Following this significant milestone of submitting the license application to FERC, PacifiCorp will be fully engaged in the third stage of this relicensing proceeding. For example, PacifiCorp plans to provide the FERC with responses to any additional study requests provided by stakeholders. PacifiCorp is committed to assist the FERC in completing necessary ESA Section 7 consultations with the USFWS and NOAA Fisheries. In addition to the relicensing process, PacifiCorp will be working with the states of Oregon and California to acquire CWA Section 401 certifications.

The Klamath River basin is a complex, controversial basin with many stakeholders, many forums for decisionmaking, and complex resource issues. The PacifiCorp relicensing effort has become a central forum for gathering critical resource information through studies and model development. While not easy, the collaborative process has improved the exchange among stakeholders and the quality of the information available to all stakeholders for making future critical decisions for the Klamath River basin. PacifiCorp looks forward to working closely with the FERC, federal and state resource agencies, tribes and other interested stakeholders contributing to good decisions for the PacifiCorp Klamath Hydroelectric Project.

ES11.0 INFORMATION SOURCES

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U.S. Bureau of Land Management (BLM). 1996. Topsy/Pokegama landscape analysis. Bureau of Land Management; Klamath Falls Resource Area, Klamath Falls, Oregon. 250 pp.

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APPENDIX ES-2A

KLAMATH CONSULTATION LIST

Klamath Consultation List

Agency	Name		Organization	Address	City	State	Zip
City							
	Jeffrey	Ball	City of Klamath Falls	500 Klamath Ave - PO Box 237	Klamath Falls	OR	97601
		The Mayor (FERC)	City of Yreka	701 Fourth Street	Yreka	CA	97097
County							
			Siskiyou County - Bd Of Supvrs	311 4th Street	Yreka	CA	96097
			Klamath County-Govt Center	305 Main St	Klamath Falls	OR	97601
	Marcia	Armstrong	Siskiyou County Farm Bureau	809 Fourth St.	Yreka	CA	96097
	Board of	County Comm. (FERC)	County of Klamath	305 Main St	Klamath Falls	OR	97601
	Jim	DePree	County of Siskiyou	312 Butte Street - Courthouse Annex	Yreka	CA	96097
	Jeanninne	Galatioto	Del Norte County	981 H Street - Suite 210	Crescent City	CA	95531
	Dave	Gravenkamp	Dept. of Public Works-Siskiyou County	305 Butte St.	Yreka	CA	96097
	Pat	Harper	Siskiyou County Library	719 4th Street	Yreka	CA	96097
	Paul	Kirk	Humboldt County	5280 Lookout Court	Weed	CA	96094
	R. Howard	Moody	County of Siskiyou	PO Box 750	Yreka	CA	96097
	Denver	Nelson	Humboldt Co. Fish & Game Comm	5240 Blackberry	Eureka	CA	95503
	Pete	Oringer	Humboldt County	1527 Irene Street	Bayside	CA	95524-9338
	Jimmy	Smith	County of Humboldt - Bd Of Supvrs	825 5th Street	Eureka	CA	95501-1153
	Joan	Smith	Siskiyou County - Bd of Supvrs	311 4th St	Yreka	CA	96097
	Carolyn	Stacey	Humboldt County Library	1313 3rd Street	Eureka	CA	95501

Agency	Name		Organization	Address	City	State	Zip
	Don	Tuttle	Humboldt Co. Dept. of Public Works	1106 2nd Street	Eureka	CA	95501
	Steve	West	Klamath County Commissioners	305 Main St	Klamath Falls	OR	97601
Federal							
			U.S. EPA - Region 10	811 SW 6th Avenue, 3rd Floor	Portland	OR	97204
	Ann	Badgley (FERC)	U.S. Fish & Wildlife Service	911 NE 11 th Avenue-Eastside Complex	Portland	OR	97232-2036
	Gary	Baker	U.S. Bureau of Reclamation	6600 Washburn Way	Klamath Falls	OR	97603
	Mel	Berg	BLM-Klamath Falls Res. Area	2800 Cottage Way	Sacramento	CA	95825-1886
	Scott	Bergstrom	USDOI-Office of the Solicitor	1849 C Street NW - MS 6456	Washington	DC	20240-0001
	Bob	Berman	U.S. Dept of Interior	1849 C Street, N.W.	Washington	DC	20240-0001
	Bill	Bettenberg	USDOI - Office of Policy Analysis	1849 C Street NW - Rm 4410	Washington	DC	20240-0001
	Randy	Brown	U.S. Fish & Wildlife Service	1655 Heindon Rd.	Arcata	CA	95521
	Patty	Buettner	BLM-Klamath Falls Res. Area	2795 Anderson Avenue, #25	Klamath Falls	OR	97603
	Bernie	Burnham (FERC)	Bureau of Indian Affairs	911 NE 11th Ave	Portland	OR	97232
	Tim	Canaday	BLM-Klamath Falls Res. Area	2795 Anderson Avenue, #25	Klamath Falls	OR	97603
	Christy	Cheyne	U.S. Forest Service	63822 Highway 96	Happy Camp	CA	96039
	Brian	Cluer	National Marine Fisheries Service	777 Sonoma Avenue	Santa Rosa	CA	95404
	Gary	Curtis	U.S. Fish & Wildlife Service - Yreka	1829 S. Oregon St	Yreka	CA	96097
	Tom	Dang	Bureau of Indian Affairs	2800 Cottage Way	Sacramento	CA	95825
	Bob	Davis	U.S. Bureau of Reclamation	6600 Washburn Way	Klamath Falls	OR	97603-9365
	Juan	De la Fuente	USFS - Klamath National Forest	1312 Fairlane Road	Yreka	CA	96097

Agency	Name		Organization	Address	City	State	Zip
	Phil	Detrich	U.S. Fish & Wildlife Service	1829 S. Oregon Street	Yreka	CA	96097
	David	Diamond	U.S. Department of the Interior	1849 C St, NW; MS 4426	Washington	DC	20240
	Shanna	Draheim	U.S. EPA - Region 9	75 Hawthorne Street, CMD-2	San Francisco	CA	94105
	Michelle	Durant	BLM-Klamath Falls Res. Area	2795 Anderson Avenue, #25	Klamath Falls	OR	97603
	Steven	Edmondson	NMFS / SWO22	777 Sonoma Ave Rm 325	Santa Rosa	CA	95404-6528
	Michael	Egge	U.S. Army Corp of Engr - NW Div	POB 2870 code CENWD-CM-WP-N	Portland	OR	97208
	Jean	Elder	U.S. Fish & Wildlife Service	6610 Washburn Way	Klamath Falls	OR	97601
	Steve	Ellis	BLM- Lakeview	1303 South G Street	Lakeview	OR	97630
	John	Engbring	Klamath River Basin Fisheries Task Force	2800 Cottage Way, Suite W 2606	Sacramento	CA	95825
	Calvin	Fong - CESPN-OR-R	U.S. Army Corps of Engrs -Regulatory	333 Market Street - Rm 805	San Francisco	CA	94105
	George	Frey	USFS - Six Rivers National Forest	1330 Bayshore Way	Eureka	CA	95501
	Gary	Frey	U.S. Bureau of Reclamation	200 Union Blvd. - Suite 530	Lakewood	CO	80228
	Chris	Gephardt	EPA - Region 10	1200 6th Avenue, ECO-088	Seattle	WA	98101
	Phillip	Graf	U.S. Bureau of Reclamation	6600 Washburn Way	Klamath Falls	OR	97603
	John	Grunbaum	USFS - Klamath National Forest	63822 Highway 96	Happy Camp	CA	96039
	Dan	Hall	U.S. Bureau of Indian Affairs	2800 Cottage Way	Sacramento	CA	95825
	Harry T	Hall, P. E.	FERC- Portland Reg Off	101 SW Main St, Suite 905	Portland	OR	97204
	John	Hamilton	U.S. Fish & Wildlife Service	1829 S. Oregon St.	Yreka	CA	96097
	Rick	Hardy	U.S. Fish & Wildlife Service	6600 Washburn Way	Klamath Falls	OR	97603
	Jane	Hicks	USACE - Regulatory Branch	333 Market Street	San Francisco	CA	94105

Agency	Name		Organization	Address	City	State	Zip
	Dan	Hirschman	U.S. Dept of Interior-Solicitor's Office	1849 C Street, NW	Washington	DC	20240
	Don	Hoffheins	BLM-Klamath Falls Res. Area	2795 Anderson Avenue, #25	Klamath Falls	OR	97603
	Chuck	James	U.S. Bureau of Indian Affairs	911 NE 11th Avenue	Portland	OR	97232
	John K.	Johnson	National Marine Fisheries Service	525 NE Oregon St. #500	Portland	OR	97232-2737
	Jim	Kilgore	USFS - Klamath National Forest	Scott River R.D. - 11263 N. Hwy 3	Fort Jones	CA	96032
	Chuck	Korson	U.S. Bureau of Reclamation	6600 Washburn Way	Klamath Falls	OR	97603
	Irma	Lagomarsino	National Marine Fisheries Service	1655 Heindon Road	Arcata	CA	95521
	Jennie	Land	U.S. Bureau of Reclamation	6600 Washburn Way	Klamath Falls	OR	97603-9365
	Ron	Larson	U.S. Fish & Wildlife Service	6610 Washburn Way	Klamath Falls	OR	97601
	James	Lecky	National Marine Fisheries Service	501 West Ocean Blvd, Suite 4200	Long Beach	CA	90802-4213
	Stacy	Li	National Marine Fisheries Service	777 Sonoma Avenue	Santa Rosa	CA	95404
	Laurie	Lindell	BLM - Medford District Office	3040 Biddle Road	Medford	OR	97504
	Robert	Lohn	National Marine Fisheries Service	7600 Sand Point Way NE 15700	Seattle	WA	98115-0070
	Barbara	Machado	BLM - Lakeview	1301 South G Street	Lakeview	OR	97630
	Mark	Magneson	U.S. Fish & Wildlife Service	1655 Heindon Rd	Arcata	CA	95521
	Field	Manager	BLM-Klamath Falls Res. Area	2795 Anderson Avenue, #25	Klamath Falls	OR	97601
	Elaine	Marquis-Brong	BLM - OR and WA State Office	333 SW First Avenue	Portland	OR	97204
	J. William	McDonald	U.S. Bureau of Reclamation	1150 N. Curtis Road	Boise	ID	83706-1234
	Kemper	McMaster (FERC)	U.S. Fish & Wildlife Service	2600 SE 98th Ave., Suite 100	Portland	OR	97266
	Elizabeth R.	Mitchell (FERC)	NOAA-GCNW	7600 Sand Point NE,Bin C15700	Seattle	WA	98115-6349

Agency	Name		Organization	Address	City	State	Zip
	Jerry	Mosier	U.S. Forest Service	1312 Fairlane Road	Yreka	CA	96097
	John M.	Mudre, Ph. D.	Federal Energy Regulatory Comm.	888 First St., N.E. Rm. 51-19	Washington	DC	20426
	Curt	Mullis	U.S. Fish & Wildlife Service	6610 Washburn Way	Klamath Falls	OR	97603
	Allison	O'Brien	U.S. Department of Interior	1849 C Street NW - MS-4426	Washington	DC	20240-0001
	Steven R.	Palmer(FERC)	U.S. Department of Interior	2800 Cottage Way Room E1712	Sacramento	CA	95825-1846
	Russell D.	Peterson (FERC)	U.S. Fish & Wildlife Service	2600 S.E. 98th Ave.-Suite 100	Portland	OR	97266
	Mike	Pool	BLM - California State Office (CA910)	2800 Cottage Way, Suite W-1834	Sacramento	CA	95825-1886
	Jon	Raby	BLM-Klamath Falls Res. Area	2795 Anderson Ave, Bldg. 25	Klamath Falls	OR	97603
	Donald	Reck (FERC)	National Marine Fisheries Service	1655 Heindon Road	Arcata	CA	95521
	Eric	Ritter	BLM - Redding	355 Hemsted Dr	Redding	CA	96002
	Robert	Roninger	BLM-Klamath Falls Res. Area	2795 Anderson Avenue #25	Klamath Falls	OR	97603
	Susan	Rosebrough	National Park Service	909 First Ave	Seattle	WA	98104-1055
	Mike	Ryan	U.S. Bureau of Reclamation	6600 Washburn Way	Klamath Falls	OR	97603
	Dave	Sabo	U.S. Bureau of Reclamation	6600 Washburn Way	Klamath Falls	OR	97603-9365
	Magalie R.	Salas, Sec. (FERC)	Federal Energy Regulatory Comm.	888 First Street NE, Rm. 1A	Washington	DC	20426
	Charles	Schultz	BLM - Redding	355 Hemsted Dr	Redding	CA	96002
	Barbara	Scott-Brier (FERC)	USDOI - Office of Solicitor	500 NE Multnomah, Ste. 607	Portland	OR	97232
	Scott	Senter	BLM-Klamath Falls Res. Area	2795 Anderson Avenue #25	Klamath Falls	OR	97603
	Tom	Shaw	U.S. Fish & Wildlife Service	1655 Heindon Rd	Arcata	CA	95521
	Rip	Shively	USGS-Klamath Falls Field Stn	6935 Washburn Street	Klamath Falls	OR	97603-9365

Agency	Name		Organization	Address	City	State	Zip
	Wes	Silverthorne	National Marine Fisheries Service	777 Sonoma Street, Rm 325	Santa Rosa	CA	95404
	Laurie	Simons	U.S. Fish & Wildlife Service	1829 S. Oregon Street	Yreka	CA	96097
	Jennifer	Smith	BLM - Medford District Office	3040 Biddle Rd.	Medford	OR	97540
	Dennis	Smith	U.S. Forest Service	650 Capitol Mall Suite 8-200	Sacramento	CA	95814
	Gloria D.	Smith	USDOI, Office of the Solicitor	1849 C St., NW, Rm. 6557	Washington	DC	20240
	Mike	Smith	U.S. Bureau of Indian Affairs	2800 Cottage Way	Sacramento	CA	95825
	Gloria T.	Smith (FERC)	U.S. Department of Interior	888 First Street, NE LJ1	Washington	DC	20426
	Scott	Snedaker	BLM-Klamath Falls Res. Area	2795 Anderson Avenue, #25	Klamath Falls	OR	97603
	Lester	Snow	U.S. Bureau of Reclamation	2800 Cottage Way	Sacramento	CA	95825
	Tom	Stewart	U.S. Fish & Wildlife Service	Rt 1 Box 74	Tulelake	CA	96134
	Jim	Stow	U.S. Fish & Wildlife Service	911 NE 11th Ave	Portland	OR	97232
	Joe	Tague	BLM	1301 South G Street	Lakeview	OR	97630
	Doug	Tedrick	U.S. Bureau of Indian Affairs	Mail Stop 4513 MIB - 1849 C Street NW	Washington	DC	20240
	Julie	Tupper	U.S. Forest Service	650 Capitol Mall Suite 8-200	Sacramento	CA	95814
	Michael	Turaski	BLM-Klamath Falls Res. Area	2795 Anderson Avenue, #25	Klamath Falls	OR	97603
	Roberta	Van de Water	USFS-Klamath & Six Rivers Nat. Forest	1312 Fairlane Rd.	Yreka	CA	96097
	Grant	Weidenbach	BLM-Klamath Falls Res. Area	2795 Anderson Ave. #25	Klamath Falls	OR	97603
	Pat	Welch	U.S. Bureau of Reclamation	2800 Cottage Way	Sacramento	CA	95825
	Jim	West	U.S. Bureau of Reclamation	2800 Cottage Way (NP-152)	Sacramento	CA	95825
	Rory	Westberg	Pacific Northwest Region	909 First Avenue Suite 546	Seattle	WA	98104-1060

Agency	Name		Organization	Address	City	State	Zip
	Lou	Whitaker	BLM-Klamath Falls Res. Area	2795 Anderson Ave., Bldg.	Klamath Falls	OR	97603
	David	White	National Marine Fisheries Service	777 Sonoma Ave - Rm 325	Santa Rosa	CA	95404
	Tim	Wilhite	EPA - Region 9	1312 Fairlane Road	Yreka	CA	96097
	Harry	Williamson (FERC)	National Park Service c/o BLM CA office	2800 Cottage Way- W-1834 CA942	Sacramento	CA	95825
	Frank	Winchell	Federal Energy Regulatory Comm.	888 First St NE Rm 6H-04	Washington	DC	20426
	SE "Lou"	Woltering	U.S. Forest Service - Six Rivers NF	1330 Bayshore Way	Eureka	CA	95501
	Jacqueline	Wyland	National Marine Fisheries Service	525 NE Oregon #500	Portland	OR	97232
	Jonathan	Yip	USACE -CESPD-CM-O	333 Market Street	San Francisco	CA	94105
	Bill	Yocum	BLM - Medford District Office	3040 Biddle Rd.	Medford	OR	97504
	Paul	Zedonis	U.S. Fish & Wildlife Service	1655 Heindon Road	Arcata	CA	95521
Legal							
	Richard	Cross(FERC)	Alexander & Karshmer	2150 Shattuck Ave., Ste. 725	Berkeley	CA	94704
	Robert	McDiarmid (FERC)	Spiegel & McDiarmid	1333 New Hampshire Ave NW	Washington	DC	20036-1511
	Tom	Nelson (FERC)	Law Offices of Thomas H. Nelson	825 NE Multnomah, Suite 925	Portland	OR	97232-2150
	Michael A.	Swiger (FERC)	Van Ness Feldman, P.C.	1050 ThomasJeffersonSt, NW FL 7	Washington	DC	20007
Local Citizen							
	John	Fortune		1145 Tamera Drive	Klamath Falls	OR	97603
	Mavis	McCormic		1815 Van Ness	Klamath Falls	OR	97601
	Rudy	Ramp		37A California Avenue	Arcata	CA	95521
	Richard	Taylor		PO Box 637	Ashland	OR	97520

Agency Name	Organization	Address	City	State	Zip
Other					
	Midland Drainage District	PO Box 63	Midland	OR	97634
	Klamath County Library	126 S. 3rd Street	Klamath Falls	OR	
	Plevna District Improvement Co	PO Box 16	Klamath Falls	OR	97601
	Butte Valley Irrigation District	PO Box 86	Macdoel	CA	96058
	Shasta View Irrigation District	PO Box 46	Malin	OR	97603
	Jackson County Plng & Develop.	10 S. Oakdale Ave., Rm. 199	Medford	OR	97501
	Klamath Drainage District	20201 Hwy 97 S	Klamath Falls	OR	97603
	Pine Grove Irrigation District	4806 Highway 39	Klamath Falls	OR	97603
	Modoc Point Irrigation District	29270 Doak Rd	Chiloquin	OR	97624
	Poe Valley Improvement District	6640 KID Ln	Klamath Falls	OR	97603
	Tulelake Irrigation District	PO Box 699	Tulelake	CA	96134
	Pioneer District Improvement Co	11147 Hwy 66	Klamath Falls	OR	97601
	Upper Van Brimmer Drainage Dist	14889 Anderson Rd	Klamath Falls	OR	97603
	Klamath Basin Improve. District	6640 Kid Lane	Klamath Falls	OR	97603
	Meadows Drainage District	PO Box 426	Fort Klamath	OR	97626
	Keno Irrigation District	9350 Hwy 66	Klamath Falls	OR	97601
	Malin Irrigation District	PO Box 355	Malin	OR	97632
	Horsefly Irrigation District	37820 Jones Rd	Bonanza	OR	97623
	Langell Valley Irrigation District	104440 W Langell Valley R	Bonanza	OR	97623

Agency	Name		Organization	Address	City	State	Zip
			ADY District Improvement Company	18110 Keno Worden Rd	Klamath Falls	OR	97601
			Enterprise Irrigation District	4806 Highway 39	Klamath Falls	OR	97603
			Sunnyside Irrigation District	PO Box 1009	Merrill	OR	97633
	John	Alexander	Klamath Bird Observatory	PO Box 758 / 1497 East Main St.	Klamath Falls	OR	97520
	Rick	Applegate	NW Power Planning Council	851 S. W. Sixth Ave.-Suite 1100	Portland	OR	97204
	Leslie	Bach	The Nature Conservancy	821 SE 14th Street	Portland	OR	97214
	Brian	Barr	World Wildlife Fund	116 Lithia Way, Suite 7	Ashland	OR	97520
	Leo	Bergeron	California State Grange	345 N. Main Street	Yreka	CA	96097
	Chuck	Bonham	Trout Unlimited	828 San Pablo, Suite 208	Albany	CA	94706
	Nick	Bouwes	Eco Logical Research	456 South 100 West	Providence	UT	84332
	Donna/Randy	Boyd	Friends of the River	314 Sheldon Avenue	Mt. Shasta	CA	96067
	Ronnie Lee	Budge	Jackson County Library	413 W. Main	Medford	OR	97501
	Jim & Stephanie	Carpenter	Carpenter Design	658 Front Street	Klamath Falls	OR	97601
	Jim	Carter	HRA, Inc	119 Pine St Ste 207	Seattle	WA	98101
	Kelly	Catlett	Friends of the River	915 20th Street	Sacramento	CA	95814
	Mary	Cheyne	Klamath Drainage District	280 Main Street	Klamath Falls	OR	97601
	Pat	Collins	Klamath Bass Masters	PO Box 106	Dorris	CA	96023
	Jim	Cook	Shasta River CRMP	PO Box 459	Montague	CA	96064
	Ted	Coombes (FERC)	Southeastern Power Res. Assn.	PO Box 471827	Tulsa	OK	74147-1827
	Ric	Costales	Frontiers for Freedom - People for the USA	26310 Duzel Creek Rd	Ft Jones	CA	96032

Agency	Name		Organization	Address	City	State	Zip
	Bill	Cross (FERC)	American Whitewater Affiliation	715 Grandview Drive	Ashland	OR	97520
	Bob	Davis	People for USA	17130 Janice Road	Montegue	CA	96064
	Woody	Deryckx	Klamath Basin Ecosystem Foundation	PO Box 1711	Klamath Falls	OR	97601
	Rick	Dowdy	Copco Sportsman's Club	16104 Patricia Avenue	Montague	CA	96064
	Jim	Finses	Copco Sportsman's Club	17025 Patricia Avenue	Montague	CA	96064
	Brendan	Fletcher	Defenders of Wildlife	926 J Street, Suite 522	Sacramento	CA	95819
	Dale	Forsee	PacifiCorp	5816 Southgate Drive	Klamath Falls	OR	97603-7663
	Frank	Frisk (FERC)	Great Lakes Elec Cons Assn.	1054 31st St., NW, 2nd Floor	Washington	DC	20037
	John	Gangemi (FERC)	American Whitewater Affiliation	482 Electric Ave.	Bigfork	MT	59911-3641
	Dr. Richard	Gierak	Interactive Citizens United	5814 Highway 96	Yreka	CA	96097
	Thomas	Graves (FERC)	Mid-West Elec. Cons. Addn.	4350 Wadsworth Blvd., Ste. 330	Wheat Ridge	CO	80033
	Keri	Green	Facilitator and Mediator	288 Ninth Street Alley	Ashland	OR	97520
	Frankie	Green	The Lewis Berger Group	620 Jones Way	Sacramento	CA	95818
	Noah	Hague	Noah's River Adventures	53 N. Main St. - PO Box 11	Ashland	OR	97520
	Tom	Harris	Living Waters Recreation	PO Box 1192	Mt. Shasta	CA	96067
	Bob	Hunter	Waterwatch of Oregon	27 North Iry	Medford	OR	97501
	Chuck	Huntington	Clearwater BioStudies, Inc.	23252 S. Central Point Road	Canby	OR	97013
	Chrissie	Ishida	Copco Lake Resident	27734 Copco Road - Apt. A	Montague	CA	96064
	Jacob	Kann	Aquatic Ecosystem Sciences	232 Nutley St.	Ashland	OR	97520
	Zac	Kaufman	Adventure Center	40 N. Main	Ashland	OR	97520

Agency	Name		Organization	Address	City	State	Zip
	Jim	Keller	Klamath Water Users Assn.	5232 Starlit Court	Klamath Falls	OR	97603
	Doug	Kelly	Trout Unlimited	PO Box 337	Arcata	CA	95521
	Dan	Keppen	Klamath Water Users Ass'n	2455 Patterson Road - Suite 3	Klamath Falls	OR	97603
	Michael	Kirwin	Osprey Outdoors Kayak School	2925 Cantara Loop Road	Mt. Shasta	CA	96067
	Mary	Knapp	Humboldt Chapter - AFS	1655 Heindon Road	Arcata	CA	95521
	Curtis	Knight	California Trout, Inc.	205 N. Mt. Shasta Blvd.- Suite 500	Mt Shasta	CA	96067
	Tim	Lancaster	Klamath County Flycasters	PO Box 324	Klamath Falls	OR	97601
	Randy	Landolt (FERC)	PacifiCorp	825 N.E. Multnomah, Suite 1500	Portland	OR	97232-2135
	Carol	Legard	Adv. Bd. On Historic Preservation	12136 W. Bayaud Ave. Suite 330	Lakewood	CO	80228
	Rick	Lemos	Siskiyou Chapter-People for USA	1715 Montague-Grenada Rd	Montague	CA	96064
	Lynn	Long	Klamath Water Users Ass'n	5116 Ridgewood Dr	Klamath Falls	OR	97603
	John	McDermott	River Dancers Dancing	302 Terry Lynn Avenue	Mt. Shasta	CA	96067
	Tim	McKay	N. Coast Environmental Center	575 H Street	Arcata	CA	95521
	Joseph R.	Membrino (FERC)	Hall, Estill, Hardwick, Gable	1120 20th St., NW, Suite 750 South Bldg.	Washington	DC	20036-3406
	Ruth	Mirth	Klamath Watershed Council	2316 S 6th St	Klamath Falls	OR	97601
	Tam	Moore	Capital Press	186 White Oak Road	Medford	OR	97504
	Brady	Moss	Trust for Public Land	116 New Montgomery Street-3rd Fl.	San Francisco	CA	94105
	Bob	Nelson	Rocky Mountain Elk Foundation	24320 122nd Ave E	Graham	WA	98338
	Ralph	Opp	Audubon Society	2650 Memorial Drive	Klamath Falls	OR	97601
	James	Ottoman	Shasta View Irrigation District	PO Box 46	Malin	OR	97632

Agency	Name		Organization	Address	City	State	Zip
	Felice	Pace (FERC)	Klamath Forest Alliance	640 Wilcox - PO Box 820	Etna	CA	96027-0820
	Michael	Parker	S. Oregon University	1250 Siskiyou Blvd.	Ashalnd	OR	97520
	Cindy	Paulson	Brown & Caldwell	201 North Civic Drive	Walnut Creek	CA	94596
	Phil	Reynolds	Copco Sportsman's Club	27734 Copco Road - Apt. A	Montague	CA	96064
	Alan	Richardson (FERC)	American Public Power Assn.	2301 M Street, NW	Washington	DC	20037
	Elizabeth	Rodgers	S. Oregon Land Conservancy	P.O. Box 954	Ashland	OR	97520
	Steve	Rothert	American Rivers-Dams Program	409 Spring Street 5th FL	Nevada City	CA	95959
	Aubrey	Russell	Oregon Trout	117 SW Naito Pkwy	Portland	OR	97204
	Thomas P.	Schlosser (FERC)	Morisset, Schlosser, Ayer & Jozwiak	801 2nd Ave., 115 Norton Bldg.	Seattle	WA	98104-1576
	Maureen	Sevigny	Klamath Cty Bike & Pedestrian Adv Comm.	736 Mt. Pitt Street	Klamath Falls	OR	97601
	Michael R.	Sherwood (FERC)	Earth Justice Legal Defense Fund	1426 17th Street, 5th Floor	Oakland	CA	94612-2820
	Risa	Shimoda (FERC)	American Whitewater Affiliation	1430 Fenwick Lane	Silver Spring	MD	20910
	Paul S.	Simmons (FERC)	Somach, Simmons and Dunn	813 Sixth Street-3rd Floor	Sacramento	CA	95814-2403
	Dave	Solem (FERC)	Klamath Irrigation District	6640 Kid Lane	Klamath Falls	OR	97603
	Glen	Spain	Pacific Coast Fed. of Fisherman's Assn.	PO Box 11170	Eugene	OR	97404-3370
	Mark	Stern	The Nature Conservancy	821 SE 14th St	Portland	OR	97214
	George	Stroud	The Nature Conservancy	PO Box 409	McCloud	CA	96057
	Wallace F.	Tillman (FERC)	National Rural Elec Coop Assn.	4301 Wilson Blvd.	Arlington	VA	22203-1867
	Steve	Truffa		358 War Admiral Avenue	San Jose	CA	95111
	Susie	Van Kirk	Sierra Club- Redwood Chapt.	PO Box 238	Arcata	CA	95521

Agency	Name		Organization	Address	City	State	Zip
	Steve	Wald	CHRC	2140 Shattuck Ave, Suite 500	Berkeley	CA	94704
	Jim	Waltman	The Wilderness Society	1615 M St NW	Washington	DC	20036
	Lauren	Ward	American Land Conservancy	1388 Sutter St., Suite 810	San Francisco	CA	94109
	Anita	Ward	Arc-En-Ciel	129 Southshore Lane	Klamath Falls	OR	97601-9111
	Dave	Webb	Shasta River CRMP	PO Box 277	Mt. Shasta	CA	96067
	Thomas	Weseloh	California Trout, Inc.	1976 Archer Rd.	McKinleyville	CA	95519
	Murrel	Wiggington	Copco Sportsman's Club	16500 Patricia Ave	Montague	CA	96064
	Leah	Wills	Forest Community Research	4405 Main St. - PO Box 11	Taylorsville	CA	95983
	Wendel	Wood	OR Natural Resources Council	680 Sand Hill Rd.	Crescent city	CA	95531
	Paula	Yoon	Fisheries Focus	1686 Old Arcata Road	Bayside	CA	95524
	Wayne	Zallen	Rogue Klamath River Adventures	1516 Stardust Way	Medford	OR	97504
State							
	Curtis	Anderson	CA Dept of Water Resources	2440 Main Street	Red Bluff	CA	96080
	Steve	Applegate	Dept of Ag.-Natural Res. Section	635 Capitol St NE	Salem	OR	97301-0110
	Dick	Bailey	OR Water Resources Dept	158 12th St. NE	Salem	OR	97310
	Bill	Bennett	CA Dept of Water Resources	1416 9th Street	Sacramento	CA	95814
	Steve	Brutscher	OR Parks & Recr. Dept.	725 Summer St. NE. Suite C	Salem	OR	97301
	Stephanie	Burchfield (FERC)	OR Dept of Fish & Wildlife	3406 Cherry Ave., NE	Salem	OR	97303-4924
	Tom	Byler	Office of the Governor-Natural Res. Office	900 Court Street - Suite 160	Salem	OR	97301-4047
	Jim	Canaday	CA State Water Res. Control Board	1001 I Street	Sacramento	CA	95814

Agency	Name		Organization	Address	City	State	Zip
	Paul	Cleary	OR Water Resources Dept	158- 12th Street NE	Salem	OR	97310-0210
	Thomas	Collom	OR Dept of Fish & Wildlife	1850 Miller Island Rd W	Klamath Falls	OR	97601
	Christine	Curran	State Historic Preservation Office	725 Summer St. NE. Suite C	Salem	OR	97301
	Paul	DeVito (FERC)	ODEQ	2146 NE 4th St Suite 104	Bend	OR	97701
	Tom	Dunbar	N. Coast Water Res Control Bd	5550 Skylane Blvd	Santa Rosa	CA	95403
	Lee	Gilsen	OR State Historic Preserv. Office	725 Summer St. NE. Suite C	Salem	OR	97301
	Rich	Grant	Economic Development Dept	775 Summer St NE	Salem	OR	97301
	Dennis	Griffin	State Historic Preservation Office	725 Summer St. NE. Suite C	Salem	OR	97301
	James	Hamrick	State Historic Preservation Office	725 Summer St. NE. Suite C	Salem	OR	97301
	George	Heise	CA Dept of Fish & Game	1416 9th St.	Sacramento	CA	95814
	Bill	Hobson	N. Coast Water Res Control Bd	5550 Skylane Blvd. Suite A	Santa Rosa	CA	95403
	Jeannette	Holman	Division of State Lands	775 Summer Street	Salem	OR	97310
	Ken	Homolka	ODFW - Southwest Region	4192 N. Umpqua Highway	Roseburg	OR	97470
	Jan	Houck	OR Parks & Recreation	20300 Empire Ave #B1	Bend	OR	97701-5745
	Robert	Hughes	CA Dept of Fish & Game	1416 9th St.-NAFWB	Sacramento	CA	95814
	Russ J.	Kanz	CA State Water Res. Control Board	1001 I Street - PO Box 2000	Sacramento	CA	95814
	Alice	Kilham	Klamath River Compact Commission	6600 Washburn Way	Klamath Falls	OR	97603
	Steve	Kirk	ODEQ	2146 NE 4th Street	Bend	OR	97701
	Don	Koch	CA Dept of Fish & Game	601 Locust Street	Redding	CA	96001
	R. Craig	Kohanek (FERC)	OR Water Resources Dept	151 12th St., NE	Salem	OR	97310

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	Rick	Kruger	OR Dept of Fish & Wildlife	3406 Cherry Ave., NE	Salem	OR	97303-4924
	Barbara J.	Leidigh	CA State Water Res. Control Board	1001 I Street - PO Box 100	Sacramento	CA	95814
	David	Leland	N. Coast Water Res Control Bd	5550 Skylane Blvd	Santa Rosa	CA	95403
	Annie	Manji (FERC)	CA Dept of Fish & Game	601 Locust St	Redding	CA	96001-2711
	Reed	Marbut	Water Resources Department	725 Summer St. NE, Suite C	Salem	OR	97301-1271
	Dennis	Maria	CA Dept of Fish & Game	1625 Main Street	Yreka	CA	96097
	Mike	McGirt	CA Off. Of Historic Preservation	PO Box 94296	Sacramento	CA	94296-0001
	Bill	McNamee	OR Public Utility Comm.	550 Capitol Street NE - Ste 215	Salem	OR	97301
	Tom	Meehan	OR Dept of Energy	625 Marion Street N.E.	Salem	OR	97310
	Knox	Mellon	CA Off. Of Historic Preservation	1416 9th Street	Sacramento	CA	95814
	Ray	Miller	Forestry Department	2600 State Street	Salem	OR	97310
	Nancee	Murphy (FERC)	CA Dept of Fish & Game	1416 9th Street - 12th Floor	Sacramento	CA	95814-5510
	Nancee	Murray	CA Dept of Fish & Game	1416 Ninth Str., 12th Fl.	Sacramento	CA	95814
	Dennis	Olmstead	OR Dept of Geology & Mineral Ind	800 NE Oregon Str., Suite 965	Portland	OR	97232
	Don	Oswalt	Land Conserv & Dev. Commission	635 Capitol Street N.E. - #150	Salem	OR	97301-2540
	Martha	Pagel (FERC)	Water Resources Dept	158 12th St NE-Mill Creek Office Pk	Salem	OR	97310-0001
	Paul	Philps	CA Dept of Fish & Game	8638 Lakeview Road	Hornbrook	CA	96044
	Stephen G.	Puccini (FERC)	CA Dept of Fish & Game	1416 Ninth Str., 12th Fl.	Sacramento	CA	95814-5510
	Meg	Reeves(FERC)	Water Resources Department	158 12th Street NE	Salem	OR	97310
	Rob	Rindy	Land Conservation & Development	635 Capitol Street N.E.-Suite 150	Salem	OR	97301-2540

Agency	Name		Organization	Address	City	State	Zip
	Mike	Rode (FERC)	CA Dept of Fish & Game	#3 North Old Stage Road	Mt. Shasta	CA	96067-9701
	Kim	Rushton (FERC)	CA Dept of Fish & Game	8638 Lakeview Road	Hornbrook	CA	96044-9765
	Andrew H.	Sawyer (FERC)	Cal State Water Res Control Board	1001 I Street - PO Box 2000	Sacramento	CA	95814-2000
	Wayne	Shuyler	OR State Marine Board	435 Commercial St. NE., #400	Salem	OR	97309-5065
	Trygve	Sletteland	Pacific Rivers Council	PO Box 10798	Eugene	OR	97440
	Roger	Smith	OR Dept of Fish & Wildlife	1850 Miller Island Rd W	Klamath Falls	OR	97601
	Gary	Smith	CA Dept of Fish & Game	830 S Street	Sacramento	CA	95814
	Del	Sparks	Water Resources Dept	5170 Summers Lane	Klamath Falls	OR	97603-8248
	Amy	Stuart	OR Dept of Fish & Wildlife	3042 SE Paulina Hwy	Prineville	OR	97754-9071
	Noah	Tilghman	CA Dept of Parks & Recreation	PO Box 942896	Sacramanto	CA	94296-0001
	Steve	Turek (FERC)	CA Dept of Fish & Game	601 Locust Street	Redding	CA	96001-2711
	Bob	Wakefield	CA Dept of Fish & Game	8638 Lakeview Rd.	Hornbrook	CA	96044
	Laurie A.	Warner	OR Parks & Recr. Dept.	725 Summer St. NE. Suite C.	Salem	OR	97301
	Lowell	Watkins	OR Dept of Fish & Wildlife	3406 Cherry Ave., NE	Salem	OR	97303-4924
	Ed	Weber	Dept of Agr-Natl Res Div	635 Capitol Street N.E.	Salem	OR	97310-0110
	Caryn	Woodhouse	CA Regional Water Quality Control Bd	5550 Skylane Blvd.	Santa Rosa	CA	95403
Tribes							
	Shayleen	Allen (FERC)	The Klamath Tribes	P.O. Box 436	Chiloquin	OR	97624-0436
	Mike	Belchik	Yurok Fisheries Program	Box 196 Weltchpec Route 96	Hoopa	CA	95546
	Curtis	Berkey	Yurok Tribe	2150 Shattuck Avenue - Suite 725	Berkeley	CA	94704

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	Bradley	Bledsoe-Downes (FERC)	Off. Of the Hoopa Tribe Attorney.	Highway 96, PO Box 188	Hoopa	CA	95546-0188
	Donald	Boat	Shasta Tribe, Inc.	PO Box 235	Murphy	OR	97533
	Mary	Carpelan	Shasta Tribe, Inc.	820 Knapp St - PO Box 773	Yreka	CA	96097
	Charlie	Chamberlain	Yurok Tribe	Box 196 Hwy 96 Wietchpec Route	Hoopa	CA	95546
	Douglas	Deur, Ph.D.	University of Washington	PO Box 58	Arch Cape	OR	97102
	Larry	Dunsmoor	The Klamath Tribes	501 Chiloquin Blvd.	Chiloquin	OR	97624
	Ken	Fetcho	Yurok Tribe Environmental Program	P.O. Box 1027	Klamath	CA	95548
	Troy	Fletcher	Yurok Natural Resources	190 Klamath Avenue - PO Box 1027	Klamath	CA	95548
	Allen	Foreman	The Klamath Tribes	PO Box 437	Chiloquin	OR	97624
	Tom	Gates	Yurok Tribe - Culture	15900 Hwy 101 N.	Klamath	CA	95548
	Merv	George Jr	Klamath Rvr Inter-Tribal Fish & Water Com	PO Box 1449	Hoopa	CA	95546
	Roy	Hall	Shasta Tribe, Inc.	PO Box 1054	Yreka	CA	96097
	Jim	Henderson	Karuk Tribe of California - Wtr Res	39051 Hwy 96 - PO Box 282	Orleans	CA	95556
	Charlene	Henry	Quartz Valley Indian Reservation	13601 Quartz Valley Rd-PO Box 24	Fort Jones	CA	96032
	David	Hillemeier	Yurok Tribe	15900 Hwy 101 N	Klamath	CA	95548
	Leaf	Hillman	Karuk Tribe of California - Wtr Res	39051 Hwy 96 - PO Box 49	Orleans	CA	95556
	Alvis	Johnson	Karuk Tribe of California	64236 2nd Ave -PO Box 1016	Happy Camp	CA	96039
	Susan	Masten	Yurok Tribe	190 Klamath Avenue - PO Box 1027	Klamath	CA	95548
	Howard	McConnell	Yurok Natural Resources	190 Klamath Avenue - PO Box 1027	Klamath	CA	95548
	Kevin	McKernan	Yurok Tribe	15900 Hwy 101 N	Klamath	CA	95548

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	Dalene	McNair	The Klamath Tribes	P.O. Box 436	Chiloquin	OR	97624
	Elwood	Miller (cvltr)	The Klamath Tribes	PO Box 436	Chiloquin	OR	97624
	Jeff	Mitchell	Klamath Rvr Inter-Tribal Fish & Water Com	205 Valley	Chiloquin	OR	97624
	Michael	Orcutt (FERC)	Hoopa Valley Tribal Fish. Dept.	PO Box 417	Hoopa	CA	95546-0417
	Aaron	Peters	Quartz Valley Indian Reservation	13601 Quartz Valley Rd-PO Box 24	Fort Jones	CA	96032
	Ronnie	Pierce	Klamath Rvr Inter-Tribal Fish& Water Comm.	1111 Forson Road	McKinleyville	CA	95519
	Jim	Prevatt	Shasta Nation	614 Alberts Street	Medford	OR	97501
	Scott	Quinn	Karuk Tribe of California -Wtr Res	39051 Hwy 96 - PO Box 282	Orleans	CA	95556
	Ron	Reed	Karuk Tribe of California - Wtr Res	39051 Hwy 96 - PO Box 282	Orleans	CA	95556
	John	Salter	Karuk Tribe - Consultant	3980 Waterhouse Road	Oakland	CA	94602
	William	Scott	Resighini Rancheria	PO Box 529	Klamath	CA	95548
	Duane	Sherman, Sr.	Hoopa Valley Tribe	PO Box 1348	Hoopa	CA	95546
	Gerald	Skelton	The Klamath Tribes	PO Box 436	Chiloquin	OR	97624
	Kate	Sloan, M.A.I.S.	Yurok Tribe Culture Dept.	15900 Hwy 101 N	Klamath	CA	95548
	Rebecca	Sluss	Quartz Valley Indian Reservation	13601 Quartz Valley Rd-PO Box 24	Fort Jones	CA	96032
	Josh	Strange	Yurok Tribe	PO Box 641	Trinidad	CA	95570
	Soto	Toz	Karuk Tribe	1829 S. Oregon Street	Yreka	CA	96097
	Allen	VanDyke	Shasta Nation, Inc.	61341 Solomon Court	Bend	OR	97702
	Anthony	West	The Klamath Tribes - Attorney	425 Market Street	San Francisco	CA	94105
	Howard	Wyant	Shasta Nation, Inc.	PO Box 40	Macdoel	CA	96058