United States Department of the Interior

FISH AND WILDLIFE SERVICE
California/Nevada Operations Office
2800 Cottage Way, Room W-2606
Sacramento, California 95825-1846

In Reply Refer to:
CNO/80270

JAN 2 4 2006

Ms. Magalie R. Salas
Secretary
Federal Energy Regulatory Commission
888 First Street NE – Room 1A
Washington, DC 20426

Subject: The Department of Interior's Filing of Modified Terms, Conditions, and Prescriptions (Klamath Hydrolectric Project, No. 2082)

Dear Ms. Salas:

The Department of the Interior (Department) herewith files its modified terms, conditions and prescriptions for the Klamath Hydroelectric Project, FERC Project No. 2082. The filing includes analysis of alternatives and consideration of effects under Section 33 of the Federal Power Act. The filing also includes the Supplemental Administrative Record. Each party named on the service list for this proceeding is being provided a copy of the above documents at this time.

The Department's filing includes the following sections:

Section A: Modified conditions for the protection and utilization of the Bureau of Land Management reservations pursuant to Section 4(e) of the Federal Power Act.

Section B: Modified conditions for the protection and utilization of federal lands and facilities of the Bureau of Reclamation pursuant to Section 4(e) of the Federal Power Act.

Section C: Modified fishway prescriptions of the Fish and Wildlife Service and National Marine Fisheries Service pursuant to Section 18 of the Federal Power Act.

Specific questions or requests for clarification regarding any of the comments contained herein may be directed to David Diamond at (530) 842-5763.

Thank you for your assistance in filing these documents.

Sincerely,

Steve Thompson
Manager

Attachments

TAKE PRIDE IN AMERICA

UNITED STATES DEPARTMENT OF THE INTERIOR
MODIFIED TERMS AND CONDITIONS,
AND PRESCRIPTIONS FOR FISHWAYS
FILED PURSUANT TO SECTIONS
4(e) AND 18 OF THE FEDERAL POWER ACT
WITH THE FEDERAL ENERGY REGULATORY COMMISSION
FOR THE KLAMATH RIVER HYDROELECTRIC PROJECT
PROJECT NO. 2082
KLAMATH RIVER, SISKIYOU COUNTY, CALIFORNIA; AND KLAMATH COUNTY, OREGON

January 26, 2007

BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PacifiCorp Klamath River, Oregon and California	))))))	Klamath Hydroelectric Project, Project No. 2082

UNITED STATES DEPARTMENT OF THE INTERIOR'S
CONDITIONS FOR THE PROTECTION AND UTILIZATION OF
FEDERAL LANDS MANAGED BY THE
BUREAU OF LAND MANAGEMENT
PURSUANT TO SECTION 4(e) OF THE FEDERAL POWER ACT

Approved this 22nd day of January 2007 by:

Edward W. Shepard, State Director

United States Department of the Interior
Bureau of Land Management
333 SW First Ave
Portland, OR 97204

BEFORE THE
UNITED STATES OF AMIERCIA
FEDERAL ENERGY REGULATORY COMMISSION

PacifiCorp Klamath River, Oregon and California	))))))	Klamath Hydroelectric Project, Project No. 2082

UNITED STATES DEPARTMENT OF THE INTERIOR'S
CONDITIONS FOR THE PROTECTION AND UTILIZATION OF FEDERAL
LANDS AND FACILITIES OF THE BUREAU OF RECLAMATION
PURSUANT TO SECTION 4(e) OF THE FEDERAL POWER ACT

Approved this 26 day of January 2007, by

Kirk Rodgers, Regional Director

United States Department of the Interior
Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95825

BEFORE THE
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PacifiCorp Oregon and California Klamath River	))))))	Klamath Hydroelectric Project, Project No. 2082

UNITED STATES DEPARTMENT OF THE INTERIOR'S
PRESCRIPTIONS FOR FISHWAYS
PURSUANT TO SECTION 18 OF THE FEDERAL POWER ACT

Approved this 26 day of January 2007 by:

Steve Thompson, Manager, California and Nevada Operations

United States Department of the Interior
Fish and Wildlife Service
2800 Cottage Way, Room W-2606
Sacramento, California 95825

Section A: U.S. Department of the Interior Modified 4(e) Conditions – BLM Reservation

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Attachment A1: U.S. Department of the Interior Modified 4(e) Conditions – BLM Reservation **1**

Section A: Modified Conditions for the Protection and Utilization of the Bureau of Land Management Reservations Pursuant to Section 4(e) of the Federal Power Act

INTRODUCTION

This submission constitutes the Department of the Interior's (Department) through the Bureau of Land Management (BLM)'s Modified Conditions submitted pursuant to section 4(e) of the Federal Power Act (Modified Conditions) and supporting analysis for the Klamath Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC or Commission) No. 2082. This submission supplements the *Department of the Interior's Filing of Comments, Preliminary Terms, Conditions, Prescriptions, and Recommendations*, dated March 27, 2006 (USDI 2006). The March 27, 2006 submission is part of the administrative record in support of the Modified Conditions.

The Department through the BLM has developed these Modified Conditions pursuant to the *Federal Power Act* (FPA), as amended by the *Energy Policy Act of 2005* (EPAct). The EP Act provides parties to this licensing proceeding the opportunity to request trial-type hearings regarding issues of material fact that support the preliminary conditions developed pursuant to FPA Section 4(e). Procedures for trial-type hearings are set forth at 43 C.F.R. Part 45 of the Department's regulations. A trial-type hearing was held that included disputed material facts related to BLM's preliminary condition No. 4 – River Corridor Management. The administrative law judge (ALJ) decision (ALJ 2006) issued September 27, 2006 by the Hon. Parlen L. McKenna, made findings of fact regarding the Project's effects to the BLM reservation and the effects of the BLM's preliminary condition, resolving those material facts that were disputed by PacifiCorp. (hereafter "ALJ Decision"). The ALJ Decision is referenced as follows: ALJ Decision at [page number] [Finding of Fact (FOF) number]; ALJ Decision at [page number] [Ultimate Findings of Fact and Conclusions of Law (UFOF) number]. Testimony and exhibits submitted in the hearing are cited [Agency] [Witness Name], and [page number], where applicable. The EP Act also provides parties the opportunity to propose alternatives to the BLM's preliminary conditions. Procedures for proposing alternative conditions and analyzing such alternatives are set forth at 43 C.F.R. Part 45 of the Department's regulations. Proposed alternative conditions were submitted for all nine of the BLM's preliminary conditions. The conditions and rationale have been modified to reflect new information, evidence and supporting material, the ALJ's Decision, proposed alternative conditions, FERC's Draft Environmental Impact Statement (DEIS) and other information related to the BLM's preliminary conditions.

Structure of this Submission

Section 1 contains the overall BLM resource management plan goals and objectives and statutory authorities.

Section 2 contains BLM's discussion and a description of change between the BLM preliminary and modified conditions.

Section 3 contains the Alternative Condition Analyses as required by 43 C.F.R. Part 45 § 45.73(b), and includes the equal consideration of effects demonstration as required by 43 C.F.R Part 45 § 45.73(d).

Section 4 contains the literature cited and references used in the submission.

Attachment A1 contains the Modified Conditions.

Appendix A1 contains the supplemental administrative record.

Section 1. RESOURCE MANAGEMENT PLAN GOALS AND OBJECTIVES AND STATUTORY AUTHORITY

RESOURCE MANAGEMENT PLAN GOALS AND OBJECTIVES

The continued protection and utilization of the BLM reservation requires management on the basis of multiple use and sustained yield pursuant to the *Federal Land Policy and Management Act of 1976* (FLPMA). The FLPMA establishes the policy of the United States to retain public lands in federal ownership, unless as a result of the land use planning process provided for FLPMA it is determined that disposal of a particular parcel is in the national interest. The FLPMA further directs the BLM to develop and maintain land management plans to guide management:

> "…in a manner that will protect the quality of scientific, scenic, historical, ecological, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use…"

Section 102(8) of FLPMA.

According to FLPMA multiple use refers to the:

> "…management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; the use of some land for less then all of the resources; a combination of balanced and diverse resource use that takes into account the long-term needs of future generations for renewable and non-renewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, and historical values; and harmonious and coordinated management

of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output."

Section 103(c) of FLPMA

The Klamath Falls Resource Area Resource Management Plan (RMP), Rangeland Program Summary, and Record of Decision (ROD) (USDI BLM 1995a); the Medford District RMP and ROD (USDI BLM 1995b); and the Redding Field Office RMP and ROD (USDI BLM 1993) were developed in accordance with FLPMA. The Klamath Falls Resource Area and Medford District RODs and RMPs are consistent with and incorporate provisions of the 1994 *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (Northwest Forest Plan).

The Klamath Falls Resource Area RMP responds to the need for healthy forest ecosystems and habitat to support native species, including protection of riparian areas and waters as well as the need for a sustainable supply of timber and other forest products necessary to maintain local and regional economies (USDI BLM 1995a). The Klamath Falls Resource Area encompasses 212,000 acres including 19,450 acres of "Riparian Reserves" in Klamath County, Oregon. The Klamath River occurs in the Northwest Forest Plan area and is administered as a riparian reserve.[1] According to the Klamath Falls Resource Area RMP the riparian reserve for the Klamath River includes "the stream and the area on each side of the stream extending from the edges of the active stream channel to the outer edges of the 100 year floodplain or 320 feet on each side of the river, whichever is greater" (USDI BLM 1995a). As a general rule, management of riparian reserves prohibits or regulates activities that retard or prevent attainment of objectives of the Aquatic Conservation Strategy (ACS).

The ACS seeks to prevent degradation and restore habitat and ecosystem health by maintaining and restoring aquatic habitat, restoring habitat connectivity, and maintaining flows sufficient to sustain component elements of aquatic systems.[2] Among specific provisions of the ACS are provisions for managing roads, energy production, recreation, lands, riparian areas, fish and wildlife, and watershed and habitat restoration. Specific provisions for land management as it relates to hydroelectric projects under the jurisdiction of FERC are provisions requiring BLM input on the maintenance of instream flows and habitat conditions and maintenance/restoration of riparian resources and stream channel integrity necessary to ensure that ACS objectives are met (USDI BLM 1995a).

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[1] Riparian reserves are designed to restore and maintain aquatic ecosystem functions and together with the Aquatic Conservation Strategy (ACS) provide substantial watershed protection benefits including attaining and maintaining water quality standards and moderating peak stream flows.

[2] The ACS Standards and Guidelines specific to hydropower relicensing require the BLM to "identify instream flows necessary to maintain and restore riparian resources, fish passage, and channel integrity" (USDA; USDI 1994). Lands allocated as Riparian Reserves require further evaluation to assess whether occupancy and use is acceptable and will not detract from or can be mitigated so that ACS objectives can continue to be met (USDA; USDI 1994).

The BLM reservation is occupied by portions of the Project and the Project affects the BLM reservation. As such, the Project is therefore subject to conditions that the Secretary of the Interior, acting through the BLM, deems "… necessary for the adequate protection and utilization of [these] reservation[s]" (FPA). As explained in greater detail below, the Project affects water resources, recreation, wild and scenic river values, travel and access management, cultural resources, terrestrial and riparian resources, special status species and fish and wildlife resources within these BLM-administered lands. The BLM has developed conditions for the license that are designed to provide for the adequate protection and utilization of the BLM reservation based on multiple use objectives.

The following conditions are necessary for the adequate protection and utilization of these reservations and the multiple use resource values for which the reservations are managed. These conditions are based on resources identified for management pursuant to FLPMA and approved RMPs for the Lakeview District, Klamath Falls Resource Area; Medford District and Redding Field Office. Therefore, the following Modified Conditions covering specific requirements for protection and utilization of the BLM-administered lands shall be included in any license issued for the Project.

STATUTORY AUTHORITY

The BLM Modified Conditions are deemed necessary for the protection and utilization of the BLM-administered reservation affected by the Klamath Hydroelectric Project. Section 4(e) of the FPA provides that "…licenses issued within any reservation…shall be subject to and contain such conditions as the Secretary of the Department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservation." The definition of "reservations" includes "lands and interests in lands owned by the United States, and withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws..." 16 U.S.C. § 796 (2).

The BLM manages federal lands (BLM lands) within and adjacent to the Project that are "reservations" as defined by the FPA. Specifically, the BLM lands are located adjacent to J.C. Boyle Reservoir and along the J.C. Boyle Bypass and Peaking reaches of the Klamath River. Portions of the J.C. Boyle Development occupy BLM lands, including the J.C. Boyle Powerhouse, J.C. Boyle Canal, J.C. Boyle Bypass and Peaking reaches and Project - related roads.

Currently, the BLM lands are withdrawn by either the *Revested Oregon and California Railroad Grant Lands Act* (O&C Act) or Power Site Reserve No. 258. The O&C Act (50 Stat 874) provided that these BLM lands were to be "conserved and perpetuated" rather than divested by the United States and be managed as timberlands and power site lands that shall be managed for purposes[3] provided for in BLM resource management plans

[3] In addition to providing for a permanent source of timber supply according to the principle of sustained yield, the O&C Act requires the Secretary to protect watersheds, regulate stream flow, provide recreation, and contribute to economic stability.

developed for these areas. The Power Site Reserve No. 258 was approved by Executive Order dated April 13, 1912 and reserved BLM lands withdrawing them from "settlement, location, sale, or entry, and reserved for water-power site." These BLM lands were originally reserved under the *Pickett Act of 1910*[4] but were subsequently withdrawn by Power Site Reserve No. 258.

In developing conditions under FPA Section 4(e) for the protection and utilization of the BLM reservation, it is appropriate for the BLM to consider the broad purposes – including environmental and fish and wildlife concerns – that Congress has identified in more recent laws such as FLPMA. *Southern California Edison v. FERC*, 116 F.3d 507, 518 (D.C. Cir. 1997). It is the reservation that exists now, not the reservation as it existed years ago, that is to be protected and utilized. *Keating v. FERC*, 114 F.3d 1265, 1279 (D.C. Cir. 1997).

Because Project facilities are located on BLM-administered lands that constitute the reservation, including the J.C. Boyle Powerhouse and parts of the J.C. Boyle canal road and tailrace, the BLM has the authority to submit conditions under the FPA § 4(e) for the adequate protection and utilization of the reservation (See *Escondido Mutual Water Co. v. LaJolla Band of Mission* Indians, 466 U.S. 765 (1984)). The D.C Circuit Court of Appeals recently clarified this authority in the decision, *City of Tacoma v. FERC*, 460 F.3d 53 (D.C. Cir. 2006). In that case, the court upheld the Department's authority to impose the conditions stating "so long as some portion of the project is on the reservation, the Secretary is authorized to impose any conditions that will protect the reservation, including utilization of the reservation…." *Id.* at 66-67. *See also Public Utility District No. 1 of Pend Orielle County, Washington*, 117 FERC 61,205 (2006), p. 23, para. 59-60 (noting that Section 4(e) conditions are not limited to the geographic scope of the effects of project works located on the reservation nor are restricted to reservation lands within the project boundary.)

The BLM recognizes that the FERC has the sole jurisdiction to determine the Project boundary for the Project. Per 18 CFR § 4.41 (h)(2):

> The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of the environmental resources.

As such, the BLM expects that the Project boundary for a new license, if one is issued, will not be limited to lands proposed by PacifiCorp in its license application, but will

[4] The Pickett Act of 1910 authorized the Executive Department to "temporarily withdraw from settlement, location, sale, or entry any public lands of the United States…and reserve the same for water-power sites, irrigation, classification of lands, or other public purposes to be specific in the orders of withdrawals: "[S]uch withdrawals or reservations shall remain in force until revoked…" "…and therefore in law and in practice Pickett Act withdrawals can continue indefinitely." Opinion of the Solicitor, M-37005 (January19, 2001).

include BLM-administered lands in order to fulfill Project purposes such as recreation and protection of environmental resources.

Section 2. DESCRIPTION AND RATIONALE FOR MODIFIED CONDITIONS

The full text of the Modified Conditions can be found in Attachment A1.

Additional rationale for the Modified Conditions is included in the *Department of the Interior's Filing of Comments, Preliminary Terms, Conditions, Prescriptions, and Recommendations* (USDI 2006). This previous submission is incorporated by reference as part of the rationale for the Modified Conditions.

BLM Modified Condition 1: Activities on or Affecting Bureau of Land Management-Administered Lands

Discussion

Based on review of the BLM preliminary condition No. 1 and PacifiCorp's proposed alternative condition and supporting information, as well as other information that includes, but is not limited to, PacifiCorp 2006a; PacifiCorp 2006b; PacifiCorp 2006c; FERC 2006; and HVT 2006, the BLM revised Condition No. 1 to clarify the requirements of the condition and to address issues raised by PacifiCorp. The underlying rationale for the Modified Condition is that BLM has the authority to review and approve Project-related activities to be undertaken by the Licensee that will occur on or affect BLM-administered lands and resources. These activities are related to the Licensee's implementation of license conditions contained in the new license, if one is issued.

If additional BLM-administered lands are included in the Project boundary, the licensee is required to obtain a BLM use authorization for the use and occupancy of those lands, pursuant to the FLPMA (43 U.S.C. § 1701 *et seq.*). To ensure consistency with BLM land management direction, the Licensee will prepare site-specific plans for activities authorized by the license that have the potential to impact BLM-administered lands or resources. These site-specific plans will enable the BLM to ensure that the proposed activity is consistent with BLM land management direction and policies as well as the various laws pertaining to BLM-administered lands. In the case of *National Environmental Policy Act* (NEPA) compliance, while many proposed activities may have been included in the Commission's environmental analysis, that analysis is focused on whether to issue a license and what the conditions of that license would be. In some cases, the Commission's environmental analysis may not contain sufficient site-specific information as to the location, timing and nature of the activity nor the site-specific effects of a particular proposed activity to meet BLM requirements for disclosure. In these cases, subsequent NEPA analysis may be required for the proposed activity.

PacifiCorp took exception to elements of BLM's preliminary conditions, which it concluded to be potentially duplicative and/or conflicting. For example, the BLM preliminary condition required submission of Safety During Construction, Hazardous Substances, and Spoils Disposal plans that PacifiCorp viewed as duplicative of a FERC requirement. BLM's Modified Condition does not require these plans. The BLM anticipates that where specific actions may necessitate such plans and measures, the measures would be included as part of the site-specific plan for that activity.

Other requirements are administrative and intended to ensure that administration of the Project according to the licensee does not result in damage to BLM lands and resources. If this is not the case the licensee shall be accountable for correcting the situation. The BLM has the authority to impose these conditions as the agency deems necessary for the adequate protection and utilization of the BLM reservation. The BLM has the authority to submit conditions under FPA § 4(e) for the adequate protection and utilization of the reservation (See *Escondido Mutual Water Co. v. LaJolla Band of Mission* Indians, 466 U.S. 765 (1984). Recently, this was clarified by a D.C. Circuit Court decision, *City of Tacoma v. FERC*, 460 F.3d 53 (D.C. Cir. 2006), wherein the court upheld the Department's authority to impose the conditions stating "so long as some portion of the project is on the reservation, the Secretary is authorized to impose any conditions that will protect the reservation, including utilization of the reservation…." *Id.* at 66-67. *See also Public Utility District No. 1 of Pend Orielle County, Washington*, 117 FERC 61,205 (2006), p. 23, para. 59-60 (noting that Section 4(e) conditions are not limited to the geographic scope of the effects of project works located on the reservation nor are restricted to reservation lands within the project boundary). Narrowing the scope, as the alternative condition proposes, would result in less than adequate protection and utilization of the BLM reservation.

Rationale for the Modified Condition

The BLM administers approximately 197 acres within the current Project boundary (PacifiCorp 2003a, Exhibit A, page 2-17) for recreation use, fish and wildlife habitat, terrestrial and riparian resources, cultural resource protection, and road and facilities maintenance. Project operations and maintenance and other Project-related activities, including recreation, affects these and other BLM-administered lands and associated resources. The new license, if one is issued, will contain articles directing actions to be undertaken on these BLM-administered lands. Among these will be protections, mitigations and enhancements for the Project's effects on BLM-administered lands and resources. To ensure these activities are in compliance with the laws, regulations, policies and land use plan decisions that guide activities on BLM-administered lands, the condition requires preparation of site-specific plans. The condition also contains other administrative components to ensure some degree of accountability in the event an action results in unanticipated consequences affecting BLM-administered lands and resources.

BLM has the authority to authorize the use and occupancy of BLM-administered lands and resources through FLPMA. FLPMA also establishes the general objectives for the management of BLM-administered lands, and directs that these lands be managed according to land use plans developed according to Sec. 202 of FLPMA. BLM Resource Management Plans (RMPs) provide direction for issuing, renewing, or granting authorizations to occupy, use or traverse BLM-administered lands for, among other uses, power generation, transmission, and distribution. If such actions have the potential to affect BLM-administered resources, they must be evaluated for consistency with the BLM RMPs developed pursuant to FLPMA and analyzed according to the NEPA.

BLM Modified Condition 2 – Consultation with the Bureau of Land Management

Discussion

Based on BLM's preliminary condition No. 2, PacifiCorp's proposed alternative condition with rationale and PacifiCorp's comments on the BLM's conditions (PacifiCorp 2006b, pages 13-14), the BLM has refined Condition No. 2 to clarify the requirements of the condition and to address some of the rationale PacifiCorp has provided. The objective of the Modified Condition is to ensure routine consultation with the BLM prior to initiating Project-related activities on or affecting BLM-administered lands. The Modified Condition also requires an annual meeting between the Licensee and the BLM, and establishes general reporting requirements of the Licensee. The Modified Condition also incorporates requirements of BLM's preliminary condition No. 1 requiring consultation with the BLM and other authorized users in the Project area to avoid conflicting uses of Project lands and facilities.

The PacifiCorp proposed alternative condition narrows the scope of the BLM's condition. The BLM has the authority to impose conditions as the agency determines are necessary for the adequate protection and utilization of the BLM reservation (*See* discussion for Condition No. 1 above). PacifiCorp's proposed alternative condition would result in less than adequate protection and utilization of the BLM reservation.

PacifiCorp took exception to BLM's reservation of the right "to require changes to Project operations through revision of 4(e) conditions" in the preliminary condition PacifiCorp 2006, page 30). Without conceding to PacifiCorp's legal arguments regarding the BLM's authority under the FPA, the BLM has removed the language from this condition and addresses its reservation of authority in BLM Modified Condition No. 9.

Rationale for the Modified Condition

The FLPMA directs BLM management according to multiple-use principles that provide for the use and occupancy of BLM-administered lands by other entities. To ensure that Project operation and maintenance and other Project-related activities that take place on BLM-administered lands occurs in a manner consistent with BLM management direction, the agency has required routine consultation and reporting as elements of the condition. The BLM believes the consultation and reporting requirements are necessary for the

continued protection and utilization of BLM-administered lands and resources and will achieve consistency with BLM management direction and objectives for these lands.

While the licensee is authorized to use and occupy BLM-administered lands through a new license and/or a BLM use authorization, other authorized uses of BLM-administered lands in the Project area may be affected by Project activities. Conflicts between uses and/or users may necessitate consultation, planning, or dispute resolution in order to meet objectives among the BLM and other permitted users.

BLM Modified Condition 3 – Roads Inventory Analysis and Roads Management

Discussion

Based on review of BLM's preliminary condition No. 3, PacifiCorp's alternative condition with rationale, PacifiCorp's comments on the BLM's conditions (PacifiCorp 2006b, page 14), the BLM revised Condition No. 3 to clarify the requirements of the condition and to address issues raised by PacifiCorp. The Modified Condition requires the licensee to complete an Inventory Analysis (Analysis) of the roads in PacifiCorp's *Study Area Roadway Inventory Analysis and Project Roadway Management Plan – Klamath Hydroelectric Project (FERC Project No. 2082)*(PacifiCorp 2006m) and estimate the percentage of use associated with Project operations and maintenance and other Project-related activities (e.g. recreation). Once complete, the licensee will develop a Road Management Plan (Roads Plan) to address management of roads that are used for Project-related purposes, including roads on or affecting BLM-administered lands (BLM Roads). The condition also requires consultation with the BLM prior to erecting signs on BLM-administered lands.

The BLM Modified Condition requires similar components to PacifiCorp's proposed alternative condition. The BLM Modified Condition is broader scope in terms of the Inventory Analysis and the Road Management Plan. The Modified Condition's requirement to estimate use of BLM Roads for Project-related activities in the Analysis and the lack of reference to the Project boundary in the Roads Plan are two examples. PacifiCorp itself identifies that "…the Alternative Condition … would have the Licensee develop an Inventory Plan [actually an Inventory Analysis in the alternative condition] in the broader study area, as provided in BLM's condition…" (PacifiCorp 2006 page 35). PacifiCorp also refers to the alternative condition having "the Licensee prepare a Road Plan for continued operation of those roads *within the Project boundary where the Licensee has authority*." [emphasis in original] PacifiCorp 2006 page 36). This statement illustrates inconsistencies within the proposed alternative condition. Although part of the alternative condition appropriately refers to the need for the Roads Plan to address the Licensee's responsibilities for road management, the alternative condition qualifies these responsibilities in various and inconsistent ways. These qualifications include:

- "…within the Project boundary for which the Licensee is solely or jointly responsible, as determined by the Commission…"

- "…within the Project boundary."
- "within the Project boundary where the Licensee has authority."
- "within the proposed Project boundary.'

The BLM's expectation is that the Project boundary, which will be determined by FERC at the time a license is issued and will identify those lands needed for Project purposes. BLM expects further that the Licensee's responsibilities will be conveyed through the license articles and not based on "proposals" or the Licensee's estimation of scope of authority.

Rationale for the Modified Condition

Project Impacts - Road damage can occur as a function of the number and type of vehicles and/or frequency of trips. Use of BLM Roads for any Project-related purpose has the potential to impact the roads, facilities, and adjacent resources. PacifiCorp has not provided to the BLM data specific to the use of BLM Roads for Project purposes or for recreation access. It is well established that transportation management systems must be routinely maintained to ensure that Project operations and maintenance are uninterrupted. The same holds true for roads necessary for Project-related recreation activities, particularly where road maintenance is necessary to ensure public safety. While PacifiCorp's inventory (2004m) includes the majority of the BLM Roads affected by the Project, the report fails to describe the amount of Project-related use that each road receives. The report goes on to analyze only a subset of roads based on the premise that the Licensee is only responsible for roads within the Project boundary as proposed in PacifiCorp's final license application (FLA). FERC has sole jurisdiction over what constitutes the Project boundary, and PacifiCorp, by completing the analysis for a subset of roads in the Project area, failed to analyze the impacts from road use necessary for Project purposes, including recreation. For an analysis to be useful, it must be based on Project-related impacts to all BLM Roads and not narrowed in scope based on arbitrary criteria that are used to discriminate between roads within the current or proposed Project boundary. Narrowing the scope of the analysis limits the utility of conclusions regarding the effects of Project-related activities on BLM Roads.

Rationale - Section 302(b) of FLPMA requires BLM to address road maintenance and management, and specifically authorizes the Secretary of the Interior (Secretary) to "regulate, through easement, permits, leases, licenses, published rules, or other instruments as the Secretary deems appropriate, the use, occupancy, and development of the public lands, including, but not limited to, long-term leases to permit individuals to utilize public lands for habitation, …" The BLM manages travel and access on roads through a road management plan (USDI BLM 1995a, page 71).

Since PacifiCorp submitted the *Study Area Roadway Inventory Analysis and Project Roadway Management Plan – Klamath Hydroelectric Project (FERC Project No. 2082)* (PacifiCorp 2004m) to FERC. Since that time, PacifiCorp has not proposed any management actions or consulted with BLM regarding road maintenance and use. While PacifiCorp has acknowledged that, "PacifiCorp is the primary entity responsible for the

continued management and maintenance of Project-related roads…," (PacifiCorp 2004m page ES-1), the scope of that responsibility is limited to particular road classifications within the proposed Project boundary where PacifiCorp shares "management and maintenance responsibilities of jointly-maintained Project-related roads both within and directly adjacent to the proposed FERC Project boundary where there is a Project nexus." (PacifiCorp 2004m page 31). An adequate travel management plan relies on a complete Analysis of roads necessary for Project-related purposes (See BLM Figure 3-1: Road Inventory Map in *Department of the Interior's Filing of Comments, Preliminary Terms, Conditions, Prescriptions, and Recommendations*) (USDI 2006). A Roads Plan which can be developed based on a broader travel management plan could establish a Project nexus between roads within PacifiCorp's proposed Project boundary and those outside of the Project but which are necessary for Project maintenance, operation, and recreation access. The Roads Plan should be based on Project-related roads where there is a Project nexus wherever they occur, not just within PacifiCorp's proposed Project boundary.

Travel and access management through a roads management plan is directed by the KFRA RMP (USDI BLM 1995a, page 71) and Section 302(b) of FLPMA that requires road maintenance, management, and mitigation for impacts resultant from authorized activities that have the potential to impact BLM-administered lands. Thus, a BLM roads plan would include recommendations for management, maintenance, improvement or closure of roads as necessary. The objective of the condition is to bring this same information to bear from the standpoint of the Project and with the objective to develop a comprehensive plan and maintenance schedule for all roads affected by Project-related activities.

This BLM condition is intended to assure that PacifiCorp accurately identifies miles, level of use, and projected future use of roads necessary to operate and maintain the Project as well as to provide access to Project-related recreation facilities within and adjacent to the Klamath River canyon (*See* Area of Project Influence Map in USDI 2006). The Licensee will be required to, as part of the Roads Plan, to:

- Provide improvements necessary to bring existing roads up to BLM standards.
- Provide a percentage of the annual maintenance costs for roads that are used by the licensee and the public based on an estimation of user frequency.

The BLM agrees the roles and responsibilities as set forth in Section 3.1 of the *Study Area Roadway Inventory Analysis and Project Roadway Management Plan – Klamath Hydroelectric Project (FERC Project No. 2082)* (PacifiCorp 2004m) are appropriate but maintains that the scope of the proposed alternative condition is insufficient for addressing all Project-related roads that sustain Project-related uses in the area.

The Roads Plan should facilitate coordination of transportation maintenance and management to:

-continue to provide for public safety;
-minimize potential damage and disturbance to big game winter range;
-manage transportation access consistent with BLM management objectives;
-coordinate off-highway vehicle (OHV) management;

-minimize the potential for spread of noxious and invasive plants;
-restore hydrologic function in areas that have been impacted by use of BLM Roads for Project purposes; and
-continue to protect cultural resources.

Based on data compiled for the cooperative road inventory the BLM identified management needs for several roads within the Project area. At a minimum, approximately 14 miles adjacent to the J.C. Boyle Bypass and Peaking Reaches appear to remain necessary for the operation and maintenance of the Project. About 3.4 miles of these roads traverse PacifiCorp land and the remaining 10.6 miles are BLM Roads. This illustrates the necessity for a comprehensive and coordinated inventory and road management plan for the Project area. Additionally, many roads associated with the original Project construction, maintenance, and operation and those roads that are used for Project-related recreation within and adjacent to the Klamath River canyon were assessed. The Licensee will need to incorporate this analysis into the Inventory Analysis and the Road Management Plan in consultation with BLM.

BLM Modified Condition 4 – River Corridor Management

Introduction: Description of Modified Condition

Discussion

Four proposed alternative conditions were provided to BLM preliminary condition 4. Two alternatives were proposed by PacifiCorp for BLM preliminary condition 4 (See PacifiCorp 2006a, pages 41-47 [First Alternative Condition] and pages 62-64 [hereafter "Second Alternative Condition"]). A proposed alternative condition was also submitted by the Oregon Department of Fish and Wildlife (ODFW) (ODFW 2006) and another was submitted by the California Department of Fish and Game (CDFG) (CDFG). Both of the States' proposed alternative conditions are similar in nature.

An additional proposed alternative condition was submitted by PacifiCorp on December 1, 2006 (PacifiCorp 2006d) as an "Addendum" to the Second Alternative Condition. PacifiCorp requested that the proposed "modifications" to the BLM's preliminary condition No. 4 be at least considered by Interior when developing its modified conditions. *See* PacifiCorp 2006d at 1. The regulations implementing the EPAct expressly require that any alternative must be filed within 30 days after the deadline for the BLM to file preliminary conditions with FERC. See 43 C.F.R. § 45.71 (a)(2) As this proposed alternative condition was submitted months after the time period designated in the regulations, it will not be considered as an alternative condition. However, the BLM reviewed the "Addendum" and considered "evidence and supporting material" that was relevant to consideration and evaluation of the Second Alternative Condition and the development of the Modified Condition. See 43 C.F.R. § 45.73(a). *See also* 16 U.S.C. § 823d(b)(4) (information "provided in a timely manner" must be

taken into account in preparation of the written statement explaining basis for ultimate decision to accept or reject and alternative).

With the review of the BLM preliminary condition No. 4, PacifiCorp's two timely submitted alternative conditions with rationale (PacifiCorp 2006), the Oregon Department of Fish and Wildlife (ODFW)'s alternative condition and rationale (ODFW 2006), California Department of Fish and Game's alternative condition and rationale (CDFG 2006), the substantial information and findings that came out of the trial type hearing, and other information, the BLM refined Condition No. 4 to clarify the requirements of the condition and to address the findings of fact contained in the ALJ Decision by the Hon. Parlen McKenna. The underlying objectives of the Modified Condition are similar to those contained in the BLM's preliminary condition, in that the Licensee is required to 1) provide minimum streamflows and a seasonal high flow in the J.C. Boyle Bypassed Reach; 2) limit "peaking" flows in the J.C. Boyle Peaking Reach; 3) implement ramp rate restrictions for both reaches; 4) conduct streamflow measuring and reporting; 5) develop a Sediment Management Plan that will result in the augmentation of sediment to the J.C. Boyle bypassed reach; and 6) develop an Adaptive Management Plan to adaptively manage the river corridor over a new license term. The Modified Condition also includes a provision for flow continuation measures in the event of powerhouse shutdowns, as proposed by ODFW's proposed alternative condition and by PacifiCorp in its license application.

Rationale for the Modified Condition

Additional rationale for BLM Modified Condition 4 – River Corridor Management (Modified Condition) is included in the Department of Interior's submission of the *Klamath Hydroelectric Project, No. 2082. Department of the Interior's Filing of Comments, Preliminary Terms, Conditions, Prescriptions, and Recommendations*, dated March 27, 2006 (USDI 2006).

Portions of the previous submission are also being supplemented with new information and findings of fact as developed through the trial-type hearing process which concluded in the ALJ Decision issued by the Hon. Parlen L. McKenna, dated September 27, 2006. The BLM, in the development of the Modified Condition, considered additional evidence/supporting material provided by other parties to the license proceeding and that was otherwise reasonably available to the agency. This includes, but is not limited to:

- FERC's DEIS (FERC 2006);
- PacifiCorp's Dec. 1, 2006 Comments on the DEIS (PacifiCorp 2006c);
- PacifiCorp's Dec. 1, 2006 submission titled: PacifiCorp's Addendum to PacifiCorp's Second Alternative Condition to the Bureau of Land Management Condition No. 4 (PacifiCorp 2006d);
- Hoopa Valley Tribe's Comments on PacifiCorp's Addendum and Modifications to PacifiCorp's Proposed Alternative Section 18 Prescriptions and Section 4(e) Conditions for the Klamath Hydroelectric Project (FERC Project No. 2082 December 12, 2006. (HVT 2006a);

- PacifiCorp's Dec. 29, 2006 submission titled: Klamath Hydroelectric Project, FERC Project No. 2082; PacifiCorp's Response to Comments and Documents submitted by Stakeholders on the FERC DEIS Related to Fish Passage, Water Quality, Instream Flows and Ramping Rates (PacifiCorp 2006e).

The BLM Modified Condition is intended to provide increased base flows and peak flows that more reflective of seasonal fluctuations typical of a natural hydrograph for the Klamath River. First, a proportional flow (40% of inflow) would be required when inflow to J.C. Boyle Reservoir exceeds 1,175 cubic feet per second (cfs). Second, a minimum of 470 cfs would be released at J.C. Boyle Dam when the average inflow of the previous three days is between 470 cfs and 1,175 cfs. Third, when the inflow is less than 470 cfs, then the flow released below the dam would equal inflow. Most of the time, the proposed base flows would provide a minimum flow of approximately 700 cfs in the J.C. Boyle peaking reach, about twice the current base flow. The BLM proposal would provide a seasonal high flow event, for seven full days, between February 1 and April 15, when inflows first exceed 3,300 cfs, during which time power generation would be suspended to allow all inflows down the J.C. Boyle bypass and peaking reaches during that one-week period. During the period between May 1 and October 31, the BLM Modified Condition provides for a single peaking event of 1,500 cfs to 3,000 cfs per week, with a priority set for peaking operations on Saturday, Sunday, and Friday in priority order to accommodate whitewater boating. The BLM Modified Condition results in higher base flows in the peaking reach comprised of spring accretions and minimum base flows to the bypass reach. The Modified Condition also requires a maximum ramp rate of two inches per hour.

The following section is organized by the components of the Modified Condition (e.g., J.C. Boyle Bypass Reach, J.C. Boyle Peaking Reach, etc.).

J.C. Boyle Bypassed Reach

Required minimum streamflows (proportional flow requirement, seasonal high flow, and minimum base flow requirement): The objective and the requirement in this portion of the BLM's Modified Condition are the same as in the Preliminary Condition, however some language was clarified in the Modified Condition.

Ramping: The objective and the requirements in this portion of the BLM's Modified Condition are the same as in the preliminary condition, however some language was clarified in the Modified Condition.

J.C. Boyle Peaking Reach

Streamflow Requirements: The objectives in this portion of the BLM's Modified Condition are the same as in the preliminary condition; however in the Modified Condition the language and some of the requirements were changed. The May 1 through October 31 allowance for a once weekly peaking event is changed to describe that such events will have a minimum peaking streamflow of 1,500 cfs and that this flow shall occur at the Spring Island Boat Launch between 0900 and

1400 hours. The Modified Condition includes these changes because these flows provide whitewater boating opportunities.

Ramping: The objectives and the requirement in this portion of the BLM's Modified Condition are the same as in the preliminary condition, however some language was clarified in the Modified Condition. High ramping rates associated with peaking operations can adversely impact fish survival by increasing downstream migration rates and predation pressure on stranded individuals, and by causing energy deficits in fish responding to rapid changes in flow. The existing daily flow patterns have a negative effect on the fishery resource because they affect food availability, available habitat area, and stranding losses. The fact that peaking, including associated ramp rates, is negatively impacting fish populations in the peaking reach was established during the hearing. The Project impacts are substantiated by the ALJ in the ALJ Decision.

Streamflow measurement and reporting:

The objectives and the requirement in this portion of the BLM's Modified Condition are the same as in the preliminary condition, however in the Modified Condition the language was changed to clarify the requirements.

FERC validated that implementation of the BLM preliminary 4(e) condition would require a stream gage on Spencer Creek. This requirement is also part of the BLM Modified Condition. FERC notes that the gage would be needed because flows would be calculated as a percentage of inflow to the J.C. Boyle Reservoir:

> **"**The need for this [Spencer Creek] gage depends on the flow regime requirement downstream of J.C. Boyle dam (See discussion in section 3.3.3.2.1, *Instream Flows*). Reactivation and likely upgrades to allow for the continuous and real time reading of this gage only would be required if the flow regime for the J.C. Boyle bypassed or peaking reaches is calculated as a percentage of inflow to J.C. Boyle reservoir" (FERC 2006, page 3-126:2-6).

In the DEIS, FERC substantiated that implementation of the BLM preliminary condition (and retained in the Modified Condition) would require gages for streamflow measurements. These measurements would be needed above the dam and below the dam to establish minimum flows and document compliance.

> "The flow regimes…entail the use of proportional flows, where the minimum flow would be either a specified value or a proportion of inflow to the reservoir or diversion dam of each development, whichever is the larger flow. Therefore, both establishing the minimum flow at any particular time, and documentation of compliance with that minimum flow would require gages that accurately measure inflow to each development on a real-time basis and outflow below each project dam or powerhouse where a minimum flow specification has been established" (FERC 2006, page 5-23:42-48).

FERC adopted the BLM measure to "provide instantaneous real time data that is readily available and accessible to the public, and design a database for reporting on surface water" in the DEIS (FERC 2006, page 5-79).

River "Gravel" Management Plan: The objectives and the requirement in this portion of the BLM's Modified Condition have been changed to be less prescriptive and reflect the stipulation from the hearing. In addition the plan should address the need for an initial introduction of sediment.

Although the Klamath River corridor downstream from J.C. Boyle Dam is narrow and coarse, the small alluvial features that exist can temporarily store gravel and finer sediment to benefit fisheries and riparian habitat, provided sediment continuity and seasonal high flows are implemented to mobilize and distribute the sediment. Project induced physical processes have significantly altered the geomorphic function and biological productivity of the J.C. Boyle Bypassed Reach. First, the largest magnitude floods continued to bypass the Project's diversion but contain no sediment load, which is trapped in the reservoir. This has progressively stripped sediment from the relatively small but important pockets, pools, bar tops, and channel margins over the past fifty years (the "hungry water" concept). Second, the frequent annual floods have been reduced in magnitude and frequency by Project diversions, and a persistently very low summer base flow results from Project operations. Third, the design and operation of the J.C. Boyle emergency bypass spillway has resulted in massive hillslope erosion and delivery of unsorted hillslope debris to the river channel. Infrequent floods combined with repeated debris delivery have resulted in the accumulation of unsorted sediment in the channel at the outlet of the emergency bypass spillway. This body of sediment attracts fish for spawning but it is embedded with fines and inherently unstable.

The BLM preliminary condition intended the term "gravel" to include a range of sediment sizes. However, the term "gravel" was interpreted literally by PacifiCorp and FERC as only gravel-sized sediment, such as spawning-sized gravel for salmonids. Thus, the term "gravel" in the BLM preliminary condition is replaced with the term "sediment" in the Modified Condition when a range of sediment sizes is the intending meaning. Specific size classes are used in the Modified Condition where necessary. To reflect this clarification, the "River Gravel Management Plan" in the BLM's preliminary condition is changed to the "Sediment Management Plan" (SMP) in the Modified Condition.

In the Modified Condition, the SMP is less prescriptive than the River Gravel Management Plan in the BLM preliminary condition. The SMP will be developed, such that objectives outlined in the Modified Condition are met. One example of a change in from the BLM preliminary condition is that sediment augmentation quantities are not specified in the Modified Condition. The BLM preliminary condition discussed a range of sediment augmentation from 20% to 100% of the annual quantity trapped in J.C. Boyle Reservoir (6,134 tons per year). This quantity is composed of gravel and coarser sediment and does not include finer sediment sizes. PacifiCorp responded to the BLM preliminary condition with a proposal designed to, "…be an adaptive mitigation measure

with an initial augmentation followed by recurring augmentation based on detailed monitoring of the added material over the life of the new license" (PacifiCorp Appendix E, page 4-169). PacifiCorp reasoned that, "Given the long-term reduction in gravel supply below Project dams, gravel augmentation could begin with a larger volume to fill in-channel storage sites" (PacifiCorp Appendix E, page 4-169). The large initial augmentation concept, to mitigate for long-term reduction below the Project dams, followed by recurring smaller augmentation amounts, is adopted in the strategy of the BLM Modified Condition. The Modified Condition also refers to "sediment storage" and "sediment storage potential" of the reach in several places. This responds to PacifiCorp's statement above in that a large initial augmentation could be focused on filling the in-channel storage sites that have sustained the long term reduction of sediment due to the Project. If this strategy is employed, then the sediment augmentation program could be adaptively managed more effectively in future years, with annual sediment augmentation amounts being responsive to the flows that the reach receives in any given year. While estimates of the bed-stored sediment potential exist, estimates for bar top and channel margin trapping of sediment remain to be developed. In the Modified Condition, the annual sediment augmentation amount will be determined in the SMP as stipulated between BLM and PacifiCorp and will be based upon meeting the overall objectives of the SMP. In addition, the monitoring program needed to determine if the objectives are met will also be developed in the SMP. This will facilitate adaptive management and modifications to the SMP as needed.

Adaptive Management Plan (AMP): The objectives and the requirements in this component of the BLM's preliminary condition are the same as in the Modified Condition, however some language was expanded upon and clarified in the Modified Condition. In the Modified Condition, the connection between the AMP and all of the requirements of the condition are made clear.

In the rationale for requiring an adaptive management plan in the preliminary condition, it is stated that monitoring is needed to determine the effects of Project operations and implementation of the FPA Section 4(e) conditions on the resident, migratory and anadromous fish populations. FERC, in describing its rationale for Aquatic Resource Monitoring measures in its Staff Alternative notes that, "Monitoring the effects of environmental measures that are included in a new license helps to ensure that the measures are effective, and it affords the opportunity for measures to be modified, if needed, to meet resource management goals (FERC 2006, Page 5-46:32-37). This rationale is identical to the purposes and needs for the BLM's AMP.

The modified Adaptive Management Plan (AMP) requirement reflects the changes in the Modified Condition and is intended to clarify the connections between the AMP and implementation of the requirements in the River Corridor Management Condition 4 (e.g., sediment management plan, required minimum streamflows, recreation flows, ramping rates, and streamflow measurement and reporting). The revised AMP portion of the Modified Condition more accurately reflects the specific aquatic resource objectives of the Modified Condition that are to be included in the AMP. FERC acknowledged that the habitat-related measures that the BLM specifies "…would constitute a substantial change

from current operations, and would warrant monitoring to determine their effects and evaluating whether additional alteration of project operations may be warranted." (FERC 2006, Page 5-46:47-49). As such, BLM has substantiated the need for an AMP to monitor how implementation of the Modified Condition is effective in meeting the goals and objectives of the Modified Condition. Implementation of the AMP will provide the information needed to develop proposed modifications if resource goals are not being met or additional information warrants changes.

Flow Continuation Valve: The Modified Condition adds a provision for flow continuation measures in the event of powerhouse shutdowns. This provision was included to allow the flow regime in the J.C. Boyle Bypassed and Peaking reaches to remain essentially unchanged during intermittent shutdown. Currently the J.C. Boyle Powerhouse cannot maintain downstream river flow levels or ramp rates if there is an unscheduled outage (one or both of the generating units trip off line.) During an unscheduled outage the Klamath River water level, downstream of the J.C. Boyle Powerhouse, drops rapidly. Flow capacity through each unit is roughly 1,425 cfs. When one unit trips off line the river drops 1.3 feet and if both units trip off line the river will drop approximately 3 feet. When either event occurs the water is released at the canal spillway, or water is released at the dam (PacifiCorp 2004a, Exhibit E, 2004).

The impacts of unscheduled outages are a rapid drop in the Klamath River water level and erosion due to the use of the canal emergency spillway. A rapid change in water levels could cause fish to become stranded during these events. If the flow is not restored quickly enough, stranded fish could die (PacifiCorp 2004a, Exhibit E, 2004). Past use of the spillway has resulted in erosion of the hillside leading down to the J.C. Boyle Bypassed Reach and subsequent increases in sediment and turbidity in the river. It also has caused a large erosional feature, and if left un-restored, could undermine the road and canal.

The installation of the synchronous bypass valves would eliminate rapid water level fluctuations. This would reduce the negative effects on the fishery resource, including the lack of food availability and habitat area, and stranding losses. In addition, it would reduce the use of the canal emergency spillway, minimizing further erosion.

BLM Modified Condition 5 – Cultural Resources and Management

Discussion

Based on review of the BLM preliminary condition No. 5, PacifiCorp's proposed alternative condition with rationale, PacifiCorp's comments on the BLM's conditions (PacifiCorp 2006b, page 27) and other information, BLM has refined Condition No. 5 to clarify the requirements and incorporate a stipulation between PacifiCorp and the BLM that was recorded during the hearing. The objectives of the Modified Condition are that the Licensee shall complete the cultural resources inventory for BLM-administered lands within the Area of Potential Effect (APE), amend the Historic Properties Management Plan (HPMP) to address the management of all sites within the APE and to meet certain

other requirements, and to conduct site specific studies of specific sites as identified in the stipulation and, if necessary, incorporate appropriate mitigation measures for these sites into the HPMP.

The BLM's Modified Condition contains similar general requirements to PacifiCorp's alternative condition.. Wording changes relate to PacifiCorp's attempting to narrow the scope of the BLM's authority. The BLM has the authority to impose these conditions as they are related to the adequate protection and utilization of the BLM reservation (*See* Statutory Authority above). PacifiCorp's narrowing of the condition in their alternative condition results in less than adequate protection and utilization of the BLM reservation.

PacifiCorp's attempt to narrow the condition is counter to proceedings where once an APE is established, cultural resource surveys are completed according to specific protocols within the entire APE, not a portion thereof. By definition, it is the area of *potential* effect, and is not determined or limited to the existing Project boundary or the known or anticipated effects to cultural resources.

Rationale for the Modified Condition

The BLM cultural resource condition is intended to ensure that protection of cultural properties on BLM-administered lands from effects of Project-related activities is accomplished.

Cultural resources on BLM-administered lands are managed pursuant to the *Antiquities Act* of 1906, the *Archaeological Resources Protection Act* (ARPA) of 1979, the *Historic Sites Act* of 1935, the *Historic and Archaeological Data Preservation Act* of 1974, the *National Historic Preservation Act* (NHPA) of 1966 (as amended), the *National Environmental Policy Act* (NEPA) of 1969, the *American Indian Religious Freedom Act* (AIRFA) of 1992, the *Native American Graves Protection Act* (NAGPRA) of 1990, the *Federal Land Policy and Management Act* (FLPMA) of 1976, Executive Order 11593 issued in 1972, and 36 CFR part 800. In addition, the Klamath Falls Resource Management Plan (RMP) (USDI BLM, 1995a) directs the BLM to identify, manage and protect cultural resources as well as to consult and coordinate with affected Native American tribes. All federal actions that have a potential to affect cultural resources are subject to these laws and regulations, including the Commission's current proceeding to determine whether to issue a new license for the Klamath Hydroelectric Project, and if so, under what conditions would a license be issued.

The Project affects cultural resources as a function of roads, facilities operation, and recreation use. Eighteen NRHP-eligible cultural sites on BLM-administered land exist within the currently defined Area of Potential Effect (APE). The Licensee has acknowledged impacts to cultural sites within the Project boundary resultant of public access and recreation (e.g., "*Some of these sites appear to be affected by Project operations and/or Project-related activities such as public access and recreation*" PacifiCorp 2004e, pg 3-1). Additional impacts identified by the Licensee include looting, vandalism, erosion, road and utilities development, livestock grazing, and camping

(PacifiCorp 2004e, Tables 3.6-1 and 3.6-2). In addition, Project flow management may be affecting five sites (35KL21/786, 35KL22, 35KL24, 35KL558, and 35KL577) within the APE (See below).

In a letter to the ALJ dated August 11, 2006 and as ordered by the ALJ on August 14, 2006, BLM and PacifiCorp jointly submitted a stipulation stating that:

> PacifiCorp and the BLM agree that PacifiCorp's flow operations do not cause erosion impacts at the following 13 BLM cultural sites: 35KL18, 35KL550, 35KL567, 35KL576, 35KL629, 35KL630, 35KL632, 35KL633, 35KL635, 35KL785, 35KL791, 35KL1083, and JC03-29. The parties further agree that more detailed, site-specific studies are required to determine the erosion impacts, if any, from PacifiCorp's flow operations at the following 5 BLM cultural sites which are within, or partially within, the T1 terrace: 35KL21/786, 35KL22, 35KL24, 35KL558, and 35KL577. PacifiCorp agrees that it will coordinate and consult with the BLM when it carries out any of the aforementioned site-specific studies.

Recreation in the Project area is expected to increase over the period of the next license (PacifiCorp 2004k, pg 3-54). The Licensee notes that visitors to the Project area mainly are concerned with resting/relaxing, fishing, camping and boating opportunities (PacifiCorp 2004k, pg 3-59 – 3-60). Within the APE on BLM land, these opportunities tend to occur on the river terraces and immediately adjacent to the river. These terraces contain the remains of numerous historical and prehistoric sites which are at risk of continued disturbance. Increased recreation use results in increased disturbance associated with casual collection of artifacts and inadvertent disturbance. This will continue over the period of the new license and over time will contribute to the loss of cultural resources or at a minimum, reduce site integrity.

Of particular concern is the use of all-terrain vehicles (ATVs), including motorcycles, within the canyon. Disturbance to archaeological sites on BLM lands by ATV use has been documented (Canaday 2003) and is expected to continue. At several sites within the canyon, especially at Frain Ranch, ATVs are using prehistoric house pit depressions as jumps/ramps and obstacle courses (Canaday 2003). This severely disturbs the artifacts as well as the integrity of the structures. Disturbance of archaeological sites from ATV use is expected to continue as long as access to these areas is unrestricted, and should be considered in the HPMP.

Complete Cultural Resources Inventory – BLM lands within the APE have not been fully inspected for cultural resources. Therefore, the full extent of Project effects on the BLM reservation is unclear. All BLM lands within the APE require cultural resources surveys to fulfill the intent of the NHPA as well as to meet Tribal trust responsibilities. The BLM routinely conducts cultural resource surveys for its' own ground disturbing activities and requires outside entities wishing to conduct undertakings on BLM-administered lands (such as the relicensing of the Klamath Hydroelectric Project) to comply with laws and regulations related to cultural resources.

The Licensee did not identify a cultural resources APE prior to the initiation of cultural resources surveys for the relicensing effort. Instead, the Licensee proposed a Field Inventory Corridor (FIC) that would encompass the APE when one was designated. Cultural resource surveys were conducted within portions of the FIC during the 2002/2003 field seasons. A proposed APE was submitted to the California and Oregon State Historic Preservation Officers (SHPO) and the Yurok Tribal Heritage Preservation Officer on February 2, 2004. A copy of the proposed APE was also provided to the relicensing Cultural Resources Work Group (CRWG) at this time. The surveys conducted within the FIC do not adequately cover the entire APE. The Licensee stated in a letter to the Oregon SHPO dated August 2, 2004 (PacifiCorp 2004g), that all land within the APE was adequately inspected for cultural resources. The Licensee maintains that areas within the APE located on BLM land should be surveyed by the BLM. The BLM has noted (USDI 2004, Raby 2004a, 2004b) that under Section 106 of the NHPA, the Licensee is obligated to ensure that surveys within the APE are conducted. Further, the BLM notes that portions of the APE on BLM lands have been inspected or cleared by BLM in association with management actions unrelated to the Project relicensing proceeding. However, when one compares past surveys with those conducted by the Licensee within the currently defined APE, it is clear that several hundred acres have yet to be inspected. Included in this total are approximately 77.2 acres of BLM land that have not been surveyed. Additional BLM-administered lands within the APE have also not been inspected, but it is too steep or marshy for effective survey. The 77.2 acres identified here are areas of relatively gentle topography. FERC has also indicated that survey of BLM land within the APE should be conducted by PacifiCorp (FERC 2006 page 5-53) and the Oregon State Historic Preservation Office (SHPO), by letter dated November 15, 2006 to FERC on the DEIS, concurs with this condition (OPRD 2006).

Amend Historic Properties Management Plan – Cultural resources on BLM lands have and will continue to be affected by the Project. The Licensee did not adequately address the survey, protection, monitoring, and mitigation of cultural resources located on BLM lands. The HPMP does not include NRHP eligible sites located on BLM-administered land within the J.C. Boyle Peaking Reach. These sites are within the APE included in the FLA, may be impacted by Project-related activities, and must be included in the HPMP. The Licensee notes, "*The FERC has regulations that require that a Historic Properties Management Plan be prepared to mitigate and manage Project effects on cultural resources that are eligible for the National Register of Historic Places (NRHP).*" (PacifiCorp 2004j, pg 1-1). In the Final Technical Report, the Licensee evaluates NRHP eligibility for 20 sites on BLM land within the APE (PacifiCorp 2004e, Table 3.6-1 and 3.6-2). Two sites (35KL634 and 35KL1419) are not eligible for inclusion on the NRHP. One site (35KL785) was not evaluated because it was not within the FIC inspected by the Licensee. The Licensee's proposed APE now encompasses this site that the BLM considers eligible for the NRHP. The 17 remaining sites were evaluated by the Licensee as being eligible for inclusion on the NRHP. At the time, the Licensee noted the effect of Project operations on these sites (PacifiCorp 2004e, Table 3.6-1 and Table 3.6-2). However, none of the sites are included in the HPMP. This condition requires the Licensee to include these sites in the HPMP. FERC staff also

concludes that the HPMP should be amended to encompass the entire APE (FERC 2006, page 5-53).

The BLM monitors at least 20% of its' cultural resources as directed in the RMP (USDI BLM 1995a). The intent of the condition is to incorporate required monitoring of cultural resources on BLM-administered lands within the APE to be consistent with BLM's current management direction.

Cultural resource surveys conducted on federal land are considered adequate for compliance purposes for approximately 15 years (Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation). Changes in vegetation cover, surface visibility, erosion, and survey techniques can affect the reliability of past surveys. BLM routinely re-surveys areas prior to undertakings if the original survey is older than approximately 15 years and often sooner if a proposed undertaking is planned within areas considered to be high probability for containing cultural resources (river terraces, gentle slopes, adjacent to water, etc.). The condition requires the Licensee to re-inspect past surveyed areas on BLM-administered lands if ground disturbing projects are proposed for areas that have past survey clearance older than 15 years.

Detailed Site Specific Studies – The five sites (35KL21/786, 35KL22, 35KL24, 35KL558, and 35KL577) on BLM administered land within the APE immediately adjacent to the Klamath River in the J.C. Boyle Peaking Reach may be impacted by Project flow fluctuations eroding the river bank. The stipulation described above recognized that PacifiCorp flow operations may be causing adverse impacts to these sites. The Modified Condition directs PacifiCorp to conduct (in consultation and coordination with the BLM) site specific studies to determine whether Project flow management is causing impacts from erosion at these sites. At least one prehistoric site (35KL22) containing human remains is included in the list of sites to be investigated. Emergency stabilization efforts currently protect a portion of this site. Cultural deposits at these sites may be at risk from erosion through periodic wetting and drying of the fragile archaeological deposits. Continued ramping, changes in discharge during summer months, and the short duration of peaking, need to be evaluated as potential forces of erosion during the detailed site specific studies at these five sites.

BLM Modified Condition 6 – Recreation and Aesthetic Resources Management

Discussion

Based on review of the BLM preliminary condition No. 6, PacifiCorp's alternative condition with rationale, and PacifiCorp's comments on the BLM's conditions (PacifiCorp 2006b, pages 27-28), the BLM has refined Condition No. 6 to clarify the requirements of the condition. The objective of the Modified Condition requires the Licensee to complete a Recreation Resource Management Plan (RRMP) that describes the management of all Project-related recreation activities and Project-related recreation facilities, including those on or affecting BLM-administered lands. The RRMP will also

include a Visual Resource Management Plan that identifies provisions and guidelines for managing visual resources in and around Project facilities on BLM-administered lands.

In general, the BLM's Modified Condition is similar to BLM's preliminary condition, and has similar general requirements to PacifiCorp' alternative condition. The condition differs significantly in terms of identified recreation facilities, which is a consequence of a dispute over what constitutes Project-related recreation. PacifiCorp has narrowed the scope of its responsibilities for Project-related recreation and further through its alternative has attempted to narrow the scope of BLM's authority under Section 4(e) of the FPA. The BLM has the authority to impose these conditions as they are related to the adequate protection and utilization of the BLM reservation (*See* Statutory Authority above). PacifiCorp's narrowing of the condition in its alternative condition would result in less than adequate protection and utilization of the BLM reservation.

PacifiCorp took exception to the BLM's reserving the right "to require changes to the plan…" wording in the preliminary condition. While its arguments are related to a lack of BLM authority to require changes to Project operations through revision of FPA §4(e) conditions (not applicable in BLM preliminary condition No. 6), the BLM has removed the language from this condition and will rely on the consultation requirements contained in this and other conditions. The BLM Modified Condition does modify the timing for monitoring and assessment of visitor use to determine the need for new facilities or management to coincide with Form 80 Report requirements of the Licensee.

Rationale for the Modified Condition

Recreation Resource Management Plan

Recreation Opportunities and Demand

Summer whitewater rafting, fishing (including fly fishing) reservoir-based boating, and camping are all Project-related recreation activities. Peaking operations for power generation accommodate high quality whitewater boating that otherwise would be absent during summer months. Predictable flows that accommodate whitewater boating have developed a commercial whitewater boating industry on the upper Klamath River in this area. In the absence of the Project, the upper Klamath River would likely afford only "technical" whitewater or low-flow boating (e.g. kayaking) opportunities during the summer months. The Project has also created and led for an increased demand for reservoir based recreation. In response to demand for Project-related recreation and the need for access to accommodate this demand, BLM developed and has maintained recreation infrastructure to partially supply this demand. BLM has incurred the cost associated with construction and maintenance of this infrastructure as well as for the costs associated with staffing, planning, maintenance, and monitoring use and condition of these facilities. The Licensee needs to take a larger role in providing for Project-related recreation in a new license, and needs to develop a Recreation Resource Management Plan (RRMP) that coordinates the management of Project-related recreation resources in the area with other stakeholders and agencies, including the BLM.

Recreation use and demand for developed, staffed and maintained facilities will continue to grow as the population of the Klamath Basin expands over the next 30 to 50 years (PacifiCorp 2004k, pages 5-46-49). Increased recreation use of the Project and Project-created recreation opportunities presents a challenge to BLM-administered lands management that requires balancing resource protection with increased demand for diverse recreation opportunities. Increased recreation use of public lands, including Project-related recreation, without a corresponding increase in capital improvements necessary to maintain the infrastructure will ultimately result in negative impacts to other resource values; the quality of the recreation experience; and to human health and safety. To date, the cost associated with developing or maintaining recreation infrastructure, including some areas where Project-related recreation dominates, has mainly been borne by the BLM.

The Commission acknowledges recreation demand resultant of Project operations and requires the details of recreation management be developed through a comprehensive recreation management plan (See 18 CFR Ch. 1, 4-1-96 Ed.). The Commission requires that the comprehensive recreation management plan be prepared in consultation with federal agencies with managerial responsibilities for lands utilized by the Project and including agency recommendations for creating, preserving or enhancing recreation opportunities at the Project and in the Project vicinity.

The Licensee developed a Draft Technical Report for Recreation Resources (PacifiCorp 2003c) and the Recreation Needs Summary (PacifiCorp 2003d) that identified existing and proposed recreation facilities and opportunities for BLM-administered lands including: Topsy Campground, Spring Island Boaters Access, Klamath River Campground, Stateline Takeout, and dispersed day-use sites. These needs were omitted from subsequent filings to the Commission regarding recreation needs and opportunities in the Final License Application (PacifiCorp 2004a), however, the recreation needs remain and must be addressed. In the absence of provisions to improve, develop, or maintain these facilities the Licensee would fail to meet existing or projected demand for recreation resources (PacifiCorp 2004k, pages 5-46 through 5-49). The BLM condition is intended to ensure that the licensee accommodates the recreation demand that the Project has induced. While the BLM has supported a significant percentage of the Project-related recreation in the past, it is time that the licensee takes a larger role in supporting the Project-related recreation in a new license.

Topsy Campground

The Topsy Campground receives recreation use that is a direct result of the Project reservoir and would not have been constructed if the Project had not created a demand for this type of recreation facility. Existing recreation demand for developed camping at the J. C. Boyle Reservoir is met entirely by the Topsy Campground. The Topsy Campground is the only developed and staffed camping facility on J.C. Boyle Reservoir. Demand for camping at Topsy Campground is high on most weekends during summer months and the number of campsites (16), group sites, and improved day-use sites are

limited. In fact, the BLM has had to close the entrance to Topsy Campground on numerous weekends when site capacity is filled.

FERC recognized the nexus of Topsy Campground to the Project and recommended as part of the Staff Alternative in the DEIS to "[r]etain Topsy Campground in the Project boundary, develop a potable water system for this facility, address this facility in the Operations and Maintenance Program of PacifiCorp's Recreation Resources Management Plan, and develop a Memorandum of Agreement with the Bureau of Land Management that defines PacifiCorp's and the Bureau's responsibilities at this site." (FERC 2006 Page 5-20).

Availability of a potable water supply at Topsy Campground has become problematic. Two wells at the site have failed due to poor water quality and currently BLM transports potable water to the site. A reliable potable water supply is a necessity for public safety and health. The Licensee recognized the need for water system improvements, stating, "BLM's water system needs refurbishment and/or a new potable well source created." (PacifiCorp 2004k, page 5-20).

The Topsy Campground access road is potholed, washboarded, and as a result is difficult to maintain. The BLM receives frequent complaints from the public regarding the condition of the road and associated dust. This situation, and other similar situations, should be evaluated in the RRMP to address and implement appropriate measures to reduce these road hazards and dust from vehicles. FERC concluded, as part of the Staff Alternative in the DEIS, that the portion of Topsy Grade from Highway 66 to the intersection of the road that provides access to J.C. Boyle dam, including access to Topsy Campground, should be included as part of the Project since it is needed for Project operations and maintenance, as well as for Project-related recreation. The BLM agrees.

The BLM agreed with the Licensee, that, in the Draft Technical Report for Recreation Resources (PacifiCorp 2003c) and the Recreation Needs Summary (PacifiCorp 2003d), the identified the need for a group site on J.C. Boyle Reservoir to handle large weekend gatherings, and additional day-use picnic and camping sites for Topsy Campground was needed. Day-use and camping sites at the Topsy campground are not designed to accommodate the increased number of day-users, campers, or groups that access the area. Off-site developments at the Boyle Bluffs area are preferred as additional space for expansion at Topsy Campground is not available. The Licensee has recognized this need in the Final License Application: "Approximately 10 new RV/tent campsites will likely be needed as the BLM's Topsy Campground reaches capacity. Infill or expansion is not feasible at this location. A new day use and campground facility at Boyle Bluffs may be considered." (PacifiCorp 2004a, Exhibit E, page 7-99). The DEIS Staff Alternative incorporates PacifiCorp's proposed measure # 28P, which included modification of "the schedule for construction of a potable water supply and restroom facilities at the proposed J.C. Boyle bluffs campground and day-use area to correspond with the initial construction phase at this site…" (FERC 2006 pages 5-4) The DEIS also indicates that these measures should be completed earlier than the 20 years after license issuance, as proposed by PacifiCorp.

J.C. Boyle Bypass Reach

The BLM administers lands along the J.C. Boyle Bypassed Reach for fishing, hiking, sightseeing, and other dispersed recreation. The J.C. Boyle Bypassed Reach boating and fishing access sites have not been improved with signage, barriers, or designated parking spaces. Historically, the Licensee allowed angler and boater access to the reach. Additional graveled and delineated boating and fishing access sites on BLM-administered lands are needed to meet existing demand, provide safe parking and trail access to the Bypassed Reach. These sites were identified by the Licensee for potential development: "*J.C. Boyle Bypass Reach/Powerhouse Area Fishing Access Trails.*" There are a number of opportunities to formalize user-defined trails and/or create new hardened fishing access trails in the J.C. Boyle Bypassed Reach and powerhouse area. Formalized fishing access trails could be developed below J.C. Boyle dam and near the J.C. Boyle powerhouse. One or more pull-offs along the Canal Access Road could be used for parking. A second location for a formalized trail would start at the gravel parking area adjacent to the J.C. Boyle Powerhouse 'shed' and follow the river upstream. This short fishing access trail probably would require some new trail construction. (PacifiCorp 2004k, pages 5-100 and 5-101) The BLM concurs with FERC staff conclusions for the J.C. Boyle Bypassed Reach recreation developments in the DEIS, and the management of these developments should be incorporated into the RRMP.

Spring Island Boater Access

The Spring Island site was constructed by the BLM in the early 1980s, principally in response to commercial whitewater boating interests. The facility was constructed after PacifiCorp prohibited launching from just above the J.C. Boyle powerhouse. Because summer white-water boating is dependant on flow releases from the Project, the BLM concludes that the Spring Island boater access is Project-related, serves the Project purpose of recreation and has a direct nexus to the Project.

The Spring Island boater access is accessed by the Project-related road located within the existing Project boundary. The Powerhouse road leading to the Spring Island Boater's access is often washboarded, dusty, and difficult to maintain. Additional maintenance and re-surfacing is necessary to reduce hazards and for dust control. FERC recognized in the DEIS that the Powerhouse Road to the Spring Island turn-around serves Project purposes (FERC 2006, page 3-467, lines 6-16), but as the Spring Island boater access is also Project-related, this facility and the rest of the road accessing this site must be included in the RRMP. As no other facility exists or is proposed by the Licensee to meet the demand for improved day-use launching facilities below the J.C. Boyle Powerhouse, the Spring Island boater access is a critical part of the recreation infrastructure for Project-related recreation. The BLM recognizes that the opportunities for whitewater boating during the summer months will be reduced with the implementation of BLM Modified Condition No. 4 and will occur primarily on the weekends during this time. This will necessitate that the Spring Island boaters access be evaluated to accommodate this more focused use in the RRMP.

PacifiCorp has proposed a small boat and kayak launch facility below J.C. Boyle Dam (DEIS page 3-418, lines 4-6). While this new facility will likely see most use during spring/early summer spill events when flows are higher, Spring Island will continue to see use primarily during summer hydropower peaking events. Under all of the alternatives considered in detail in the DEIS, flow releases at J.C. Boyle Dam would be insufficient for white-water boating during summer months in the Bypassed Reach. The vast majority of use at Spring Island boat launch is for launching of commercial float trips during the summer months.
The Spring Island boater access (for put in) is needed for Project purposes as are the Stateline Takeout and Fishing Access 1 (for take-out.) FERC identified in the DEIS that the existing road from the Ager-Beswick road to the Stateline Takeout is needed for the Project purpose of recreation (with which BLM agrees), and likewise, the access road below the turn-around to and including the Spring Island boater access is also needed for the Project purpose of recreation.

For the reasons stated above, Spring Island boater access meets a needed Project purpose by providing an improved recreation access for whitewater boating, including during times of hydropower peaking. As such, this facility and the road accessing it should be included in the RRMP which results in the Licensee assuming at least a percentage of the operation and maintenance and improvements needed at the site.

Klamath River Campground

The BLM's Klamath River Campground is accessed by an extremely rough road that requires maintenance including grading, rock fall protection, and rock removal. The campground would not be accessible if this road had not been constructed for the Project. The Licensee recognized the need for road improvements in its Recreation Resources Draft Technical Report (PacifiCorp 2003c, page 5-144): "Consider some improvement to the primitive access road to this site, while not attracting large crowds to this site."

BLM estimates that annual use of the site accounted for approximately 1,000 visits (USDI BLM 2004a). Approximately 70 percent of annual recreation use at this site occurs during the summer peak season (PacifiCorp 2004k, page 5-72) and the majority of visitors in the Upper Klamath River participated in whitewater boating (PacifiCorp 2004k, page 3-16). The campground and rutted access road needs improvement. The Licensee recognized the need for site improvements in its Recreation Resources Draft Technical Report: "In general, these may include site improvements and/or site relocation." (PacifiCorp 2003c, page 5-144).

Overall, use of this site is considered to be approaching its recreation capacity (PacifiCorp 2004k, pages 5-72 and 5-73) Additional sites are needed to meet demand for improved camping facilities below the J.C. Boyle Powerhouse. There are no other existing or proposed developed facilities for camping on this segment of the Klamath River. As this facility has been shown to receive recreation use that is a direct result of the Project roads and Project peaking operations and would not have been constructed in

the absence of the Project, the BLM concludes that the facility and access road should be included in the RRMP and that the Licensee has some responsibility for maintaining and operating this facility.

Stateline Takeout

The Stateline Takeout Recreation Site and access road, which the BLM and PacifiCorp currently share responsibility for managing, receives heavy use during peak summer months. Primary recreation users include commercial whitewater rafting companies and the general public. The BLM portion of the Stateline site is impacted as a function of recreation demand and lack of developed camping and day use facilities. The Stateline Takeout Recreation Site would not exist in the absence of the peaking flows from Project operations. Currently, Fishing Access 1 and the Stateline Takeout provide the only public boater takeouts.

BLM has provided permanent vault and rented portable toilets at both the BLM and the PacifiCorp portions of the Stateline Takeout. While PacifiCorp proposed in the FLA to exclude the BLM portion of the Stateline Takeout site, the PacifiCorp portion of the Stateline Takeout can only be accessed through BLM-administered lands. The DEIS Staff Alternative proposes that the access road from Ager-Beswick Road to the existing site on PacifiCorp land is needed for Project purposes, and it would be illogical to identify that only the PacifiCorp portion of the Stateline Takeout site is needed for Project purposes. The management of the access road and the entire Stateline Takeout Recreation Site needs to be addressed in the RRMP.

The Licensee has identified several resource protection measures and recreation enhancements for the BLM-administered portion of Stateline Recreation site in the draft technical reports and needs summaries. Overall, use of this site is considered to be approaching its recreation capacity (PacifiCorp 2004k, page 5-145). Road improvements are needed to reduce erosion, rutting and impacts from uncontrolled recreation use. Designated camping areas are needed to reduce loss of vegetation and conflicts with cultural sites. These items are necessary to meet an existing recreation demand and reduce conflicts with other resources.

As the BLM portion of the Stateline site has been shown to receive whitewater boating use that is a direct result of the Project (PacifiCorp 2004k, pages 5-145 and 5-146); is only accessible by the same access road needed for the PacifiCorp portion of the site, and would not have been constructed in the absence of the peaking flows from the Project, the BLM concludes that the Licensee has some fiscal obligation for maintenance and operation of these facilities.

Dispersed Day-use Sites

Several dispersed and undeveloped campsites and day-use areas on BLM-administered lands receive camping, fishing and boating use. Recreationists gain access to these sites via Project roads or while floating the Klamath River during times of hydropower

peaking. Several sites have fire grates and picnic tables and serve as "designated" dispersed camps when summer fire restrictions are in effect. These day-use sites are needed to meet an existing recreation demand as identified by the Licensee (PacifiCorp 2004k, pages 5-148 through 5-150). As these day-use sites have been shown to receive Project-related recreation use, the BLM concludes that these sites should be addressed in the RRMP and that the Licensee has some fiscal obligation for maintenance and operation of these facilities.

While FERC concludes in the DEIS that Frain Ranch and other dispersed sites, and associated whitewater scouting trails along the peaking reach do not provide access to Project lands or waters or accommodate Project recreation, the BLM considers that some level of Project-related recreation use occurs at these sites. As stated in the DEIS and in PacifiCorp's Recreation Final Technical Report (PacifiCorp 2004k), there is a clear nexus between whitewater boating and PacifiCorp's peaking operations. Whitewater boaters use all of these sites and scouting trails during summer hydropower peaking. Therefore, these sites do accommodate Project-related recreation and should be included in the RRMP and that there is some level of Licensee responsibility for the operation and maintenance and potential improvements at these sites.

Monitoring and Coordination

The BLM Modified Condition requires monitoring and coordination components to be included in the RRMP. Monitoring of recreation use is an integral part of the implementation of any RRMP, and should include provisions for monitoring and assessment of visitor use on BLM-administered lands that are affected by Project-related recreation at an interval no greater than six years. The BLM changed the assessment requirements from the preliminary condition to comport with Form 80 Report requirements of FERC. The BLM's expectation is that the assessment will identify when new facilities or changed management of recreation uses are needed and that the RRMP will consult appropriately with the BLM for Project-related recreation use occurring on BLM-administered lands on an annual basis. The BLM also expects that the RRMP will also include thresholds or trigger points for actions to be taken in situations where adaptive management is needed.

Other Considerations

Additional educational and interpretation materials are needed to better inform the public about whitewater hazards and other safety concerns. These items have been identified as a recreation need in the Recreation Resources Final Technical Report (PacifiCorp 2004k, page 5-143). PacifiCorp's proposed protection and enhancement measure #32P has identified the need for including a multi-resource interpretation and education program with new signs, kiosks, brochures and/or services in the RRMP should address this concern.

The BLM and National Park Service have identified the need for enhanced and up-to-date flow information for the boating public. The BLM agrees with FERC staff where

they include in the DEIS Staff Alternative the additional measure #32P modified to include: expanding "the flow-related information available to the public on PacifiCorp's website and addressed in the Whitewater Boating and River-based Fishing Program component of PacifiCorp's Recreation Resources Management Plan to include real-time-flow information at all telemetry-gaged project-reaches." (FERC 2006, page 2-46, lines 19-22).

Visual Resource Management (VRM) Plan

The Commission requires discussion of scenic values and protection of this resource in consultation with Federal or state agencies with land management responsibility (18 CFR Ch. 1, 4-1-96 Ed.). The consultation must indicate the nature, extent, and results of the consultation. The report must include a description of the measures proposed by the applicant to ensure that any proposed Project works, rights-of-way, access roads and other topographic alterations blend, to the extent possible with the surrounding environment. Metal powerline structures, concrete structures, canals, roads and other Project facilities detract from the scenic quality of the BLM-administered lands along the lower portion of J.C. Boyle Reservoir and the Upper Klamath River to Iron Gate Reservoir. To date, PacifiCorp has not proposed measures to improve aesthetic resources for the J.C. Boyle Bypass Canal and other facilities, which has resulted in FERC Staff not being able to identify specific measures to improve aesthetic resources at this Project facility (the bypass canal) in the DEIS (FERC 2006 page 3-468-469).

Strong visual contrasts are apparent in the Bypass Reach where large continuous concrete structures dominate much of the view of visitors as they descend into the canyon. These Project facilities continue to impact aesthetic resources and do not meet BLM Visual Resource Management class III objectives for the area (USDI BLM 1995a, Map 2-5). VRM Class III objectives allow for moderate levels of change to the characteristic landscape and management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements of form, line, color, texture and scale found in the predominant natural features of the characteristic landscape.

The Licensee has indicated that BLM's VRM guidelines and standards would be used to improve some of the existing facilities which are visible from public viewing points on BLM-administered lands (PacifiCorp 2004L, pages 64-66). The BLM has determined that additional facilities need to be included in the VRM Plan as they do not meet the VRM objectives for the area. The Project facilities on BLM-administered lands impacting scenic resources include the J.C. Boyle Bypass Canal and other concrete structures; switch yards, power houses, buildings, penstocks, metal powerline structures; and Project recreation facilities including campgrounds and day-use sites. Project structures likely require screening or concealment using methods as described in this condition in order to meet BLM VRM objectives. The VRM Plan will provide for managing landscape character in such a way as to accommodate existing and new Project-related facilities. Revegetation and site rehabilitation are likely necessary to help meet VRM Plan guidelines for the Topsy campground. While the Licensee has identified

in its Draft RRMP that mitigation measures such as recoating or repainting facilities to reduce contrasts can be accomplished during regular Project maintenance, the BLM stresses that these items should be accomplished within a specific implementation schedule that is described in the VRM Plan.

In 1994, the Upper Klamath River was designated by the Secretary of the Interior as a Scenic River and is included in the National Wild and Scenic Rivers system pursuant to the Wild and Scenic Rivers Act. The BLM requires protections for the designated reach that provide for VRM Class A management in the river corridor that should be addressed in the VRM Plan.

BLM Modified Condition 7 – Vegetation Resources Management Plan

Discussion

Based on review of the BLM preliminary condition No. 7, PacifiCorp's alternative condition with rationale, and PacifiCorp's comments on the BLM's conditions (PacifiCorp 2006b, pages 28-30), the BLM has refined Condition No. 7 to clarify the requirements of the condition and to address some of the rationale PacifiCorp has provided. The objective of the Modified Condition requires the Licensee to complete a Vegetation Resources Management Plan (VRMP) that describes the management of vegetation resources for those areas affected by Project-related activities, including Project-related recreation. The VRMP will include, at a minimum, activities and management related to noxious weeds and threatened, endangered and BLM Sensitive species on BLM-administered lands affected by Project-related activities, and contain rehabilitation measures for the area below the J.C. Boyle emergency spillway.

The BLM's Modified Condition contains similar general requirements to BLM's preliminary condition, although is structured differently and has different specific wording in some areas. The BLM's Modified Condition also contains similar general requirements to PacifiCorp' alternative condition, but differs significantly in terms of PacifiCorp's attempting to narrow the scope of the BLM's authority under Section 4(e) of the FPA. The BLM has the authority to impose these conditions as they are related to the adequate protection and utilization of the BLM reservation (see Statutory Authority above). PacifiCorp's narrowing of the applicability of the condition in their alternative condition would result in less than adequate protection and utilization of the BLM reservation.

PacifiCorp took exception to inclusion of "invasive species" in the preliminary condition in addition to noxious weeds. While the BLM assumes that the VRMP will also include discussion regarding management of invasive species and noxious weeds, BLM has removed the reference in the Modified Condition.

PacifiCorp also takes exception to the BLM's reserving the right "to require changes to the plan…" wording in the preliminary condition. While its arguments are related to the lack of BLM's authority to require changes to Project operations through revision of FPA

§4(e) conditions (not applicable in BLM preliminary condition No. 7), the BLM has removed the language from this condition and will rely on the consultation requirements contained in this and other conditions.

Rationale for the Modified Condition

Maintenance of the J.C. Boyle powerhouse, canal, and Project road and transmission line ROWs as well as use of BLM roads used for Project-related recreation all impact vegetation resources administered by the BLM. The Licensee proposes to develop a Vegetation Resources Management Plan (PacifiCorp 2004a, Exhibit E 5-122) to guide vegetation and weed management and monitoring near Project facilities and roads, recreation sites, and transmission lines. This condition is intended to ensure that the Vegetation Resources Management Plan (VRMP) is completed in consultation with the BLM and that BLM-administered lands affected by Project-related activities are included in the VRMP. Specific areas needing attention in the VRMP include limiting the introduction and potential spread of noxious weed species, management of threatened, endangered and sensitive species, and the rehabilitation of the severe erosion downslope of the emergency spillway.

Noxious Weeds

Powerhouse maintenance, transmission line and road ROW maintenance, and use of Project roads contribute to the spread of noxious weeds and invasive non-native plant species, placing other native plant communities at risk. Noxious and invasive weed species are effective at colonizing disturbed areas such as those associated with Project facilities. Once established these species have the capacity to invade undisturbed, adjacent sites as well.

Vegetation maps for the Project include 165 acres adjacent to the Klamath River, Jenny Creek, and Spencer Creek and approximately 75 acres adjacent to the J.C. Boyle and Keno reservoirs that were surveyed for botanical resources. Surveys from 2002 revealed 60 infestations and the presence of 17 target weed species. Infestations include populations of St. Johns' wort, hoary cress, Canada thistle, Dyer's woad, and Mediterranean sage (PacifiCorp 2004b, page 8-5). BLM previously mapped 52 of the 60 infestations. Previous surveys also recorded the presence of common toadflax, Himalayan blackberry, poison hemlock, and salt cedar. The botanical survey is inadequate for determining the geographic scope of Project impacts on vegetation resources. Current information for noxious weeds and invasive non-native plants does not reflect the widespread distribution of some species. For example, six "widespread species" (cheatgrass, Dalmatian toadflax, medusahead, yellow starthistle, and bull thistle) were not mapped, and only their general distribution was described based on plot data. The distribution and relative abundance of yellow starthistle, a species targeted for prevention and control by the Oregon State Weed Board, should be surveyed and mapped so appropriate treatments to control the species can be developed and implemented in the Project area.

An integrated vegetation management strategy necessitates understanding the distribution of noxious and invasive as well as other species across the broader landscape. The limited spatial scope of the existing vegetation survey limits the ability to analyze or mitigate for effects to vegetation from Project-related activities. Since listed noxious weed species have been targeted for control by the Oregon State Weed Board, the distributions of these species should have been mapped. This is also true for other noxious weed species and targeted non-native invasive species in order to develop an effective, integrated weed management plan for the Project area, including BLM-administered lands affected by Project-related activities.

BLM management direction for the management of noxious weeds requires an integrated program to reduce or control infestations. The program must be coordinated with other agencies, including the Oregon Department of Agriculture, and incorporated into all authorizations for the use and occupancy of BLM-administered lands. The BLM maintains a cooperative agreement with the Oregon State Weed Board. Through the Oregon State Weed Board, the BLM participates in established Weed Management Areas, which include all stakeholders, in order to coordinate across multiple land ownerships. As the Project occupies BLM-administered lands and the Licensee also has lands in the Project area, the Licensee needs to address noxious weed and invasive species management in a coordinated manner in the VRMP.

Threatened, Endangered, and Sensitive Plant Species

Project impacts to threatened, endangered and sensitive (TES) plant species are discussed in the FLA only as they relate to flow and water level manipulations. However, other Project-related activities also have the potential to affect TES species. Project facilities and operations directly and indirectly affect TES species and their habitat. This includes disturbance from Project operations, Project roads, and Project-related recreation.

Information regarding the abundance and distribution of TES plant species is based on field surveys, review of BLM, Oregon Natural Heritage Information Center (ORNHIC), California Natural Diversity Database, and California Native Plant Society records. While PacifiCorp claims that the “intuitive controlled” survey method (Whiteaker et al. 1998) (PacifiCorp 2004b, page 5-3) was used, they failed to confirm information about known TES plant locations within the survey area “because of their remote location within the study area” (PacifiCorp 2004b, page 5-20). The survey focused on sites “most likely to be directly affected by Project activities,” as opposed to areas supporting potential habitat for suspected species. Neither skipping over remote areas nor focusing only on areas that might be directly affected are indicative of an “intuitive controlled” survey. Thus, the location of several known populations of TES plant species that have been recorded from other sources could not be corroborated based on PacifiCorp’s results. Confirmation of species presence/absence and distribution is necessary to determine the magnitude of impacts of Project operations on TES species, as well as ascertaining the proper management for these species in the VRMP. It is unlikely that all TES plant populations within the Project area have been located. For example, bristly sedge, a BLM sensitive species formerly believed to be extinct in Oregon, was identified

along the J.C. Boyle Reservoir and the Topsy Campground subsequent to the 2002 survey. Several TES species were found in the seasonally wet, alkaline flood plains adjacent to Keno reservoir, and may be impacted by changes in reservoir management. These species are Applegate's milkvetch (federally listed as endangered), short-podded thelypodium, pendulus bulrush, Columbia yellow cress, and salt heliotrope. Several other TES plant species are found in seasonally wet meadows not influenced directly by flow manipulations. However, Project roads and roads created off Project roads often cross these meadows and disrupt the natural hydrology to which these species are adapted. These species include red root yampah, Howell's yampah, and Bellinger's meadow foam.

PacifiCorp's propensity to focus only on their proposed Project boundary during their study reports has resulted in an inadequate information base to determine Project effects or how TES plant species should be managed in the Project area. Impacts have been described as "uncertain" and related solely to Project maintenance or flow regulation. Like the evaluation of the affect of Project operations on individual species, assessing changes in habitat as a function of Project operations is described as "difficult." Because impacts to TES plant species are inadequately described, discussion of potential future impacts is likewise inadequate. As a consequence the proposed Vegetation Resources Management Plan lacks detail describing "protections" for plant species and habitats (PacifiCorp 2004a, Exhibit E, page 5-126). Based on this inadequacy, a failure to adequately survey the Project area for TES species, and inappropriate application of the survey methodology, it is unlikely that all TES plant populations within the Project area have been located or that impacts of Project operations have been adequately described. Thus, the provisions of the proposed Vegetation Resources Management Plan, including provisions for TES plant protection are inadequate, and should be revised in consultation with the BLM and other stakeholders.

Emergency Spillway Erosion Rehabilitation

PacifiCorp proposes to install a synchronized bypass valve near the J.C. Boyle powerhouse to at least reduce the use of the emergency spillway. The BLM agrees that this measure is needed, as does FERC staff in the DEIS. While it is uncertain whether this measure would only reduce or would eliminate the use of the emergency spillway (USDI 2006a at 11), there is no question that the restoration of the eroded area downslope of the spillway is necessary. In fact, FERC staff considered the restoration of the slope "…to be imperative." (FERC 2006, page 5-22). The BLM agrees. Remediation measures for this area will, by necessity, include the reestablishment of vegetation on the site, commensurate with the expected use of the spillway, once that is determined. Concerns over the Project's access road also need to be addressed, as well as measures to prevent further damage to the bypassed river channel and aquatic habitat. Considering the extent of damage that has occurred at the site, it is likely that continued monitoring and additional measures will be needed throughout the license term, especially if there is any possibility that the emergency spillway were to be used in the future. For these reasons, the BLM's Modified Condition includes a provision that the rehabilitation of the eroded slope below the emergency spillway be addressed in the VRMP.

BLM Modified Condition 8 – Wildlife Habitat Management Plan

Discussion

Based on review of the BLM preliminary condition No. 8, PacifiCorp's alternative condition with rationale, and PacifiCorp's comments on the BLM's conditions (PacifiCorp 2006b, pages 30-34), the BLM has refined Condition No. 8 to clarify the requirements of the condition and to address some of the rationale PacifiCorp has provided. The objective of the Modified Condition requires the Licensee to complete a Wildlife Habitat Management Plan (WHMP) that describes the management of wildlife habitat for BLM-administered lands affected by Project-related activities, including Project-related recreation.

The BLM's Modified Condition contains similar general requirements to BLM's preliminary condition. The BLM's Modified Condition also has similar general requirements to PacifiCorp' proposed alternative condition, but differs significantly as PacifiCorp attempts to narrow the scope of the condition. The BLM has the authority to impose these conditions as they are deemed necessary for the adequate protection and utilization of the BLM reservation (See Statutory Authority above). PacifiCorp's narrowing of the applicability of the condition in their alternative condition would result in less than adequate protection and utilization of the BLM reservation.

PacifiCorp took exception to BLM's use of the term "effectiveness" monitoring and proposes "use" monitoring instead. The BLM considers effectiveness monitoring as necessary for determining the effectiveness of management actions. In the case of where the term was applied in the preliminary condition, as in to determine the effectiveness of the wildlife crossings, escape ramps and measures for the western pond turtle, monitoring of the use would determine whether the structures are effective or not. Therefore, the BLM Modified Condition uses the term "use" monitoring. Regarding PacifiCorp's addition of "existing" to the escape ramps reference in the preliminary condition based on the rationale that there is no information indicating that additional ramps are necessary; any monitoring of use of these structures will provide valuable information as to the effect of the mitigating activity.

PacifiCorp took exception to the BLM's reserving the right "to require changes to the plan…" wording in the preliminary condition. While its arguments are related to the lack of BLM's authority to require changes to Project operations through revision of FPA §4(e) conditions (not applicable in BLM preliminary condition No. 8), the BLM has removed the language from this condition and will rely on the consultation requirements contained in this and other conditions.

Rationale for the Modified Condition

The Klamath Falls Resource Area RMP requires that the BLM shall "Cooperate with federal, tribal, and state wildlife management agencies to identify and mitigate impacts

associated with habitat manipulation…..and other management activities that threaten the continued existence and distribution of native wildlife inhabiting federal lands" (USDI BLM 1995a, page 31). The Klamath Falls Resource Area RMP requires that as a main objective, the BLM shall manage wildlife habitat and "enhance and maintain biological diversity and ecosystem health in order to contribute to healthy wildlife populations" (USDI BLM 1995a, page 31).

Wildlife Crossings and Escape Ramps for the J.C. Boyle Canal

The J.C. Boyle Canal blocks movement by individual terrestrial mammals and reptiles. Inside the canal, the height of the freeboard (vertical distance between water and top of inside canal wall) varies depending on the amount of water in the canal, but generally exceeds several feet, so that once animals are in the water they cannot exit except at the two existing escape points. There is no way to cross the J.C. Boyle Canal (PacifiCorp 2004c). The PacifiCorp study concluded that Project waterways may alter movement patterns or corridors, which, in turn, may make animals more susceptible to predation or hunting mortality (PacifiCorp 2004c, page 6-23). The study also suggested several management options for terrestrial habitat connectivity focusing on Project waterways. Among these recommendations was the installation of wildlife crossings.

The Klamath River is the only waterway that crosses the southern part of the Cascade Mountain range and is thus one of the most important big game migration and movement corridors in Oregon. The mixture of vegetation types and landforms also supports a high diversity of habitats for other wildlife species. Small and medium-size mammals and reptiles use the rocky habitat in the middle portions of the J.C. Boyle Bypass Reach. Under current operations there is no opportunity for these species to safely cross the Canal to access riparian habitat along the Klamath River. This habitat may provide important summer habitat for reptiles. In addition, juveniles of many species disperse greater distances and may be affected by the canal (PacifiCorp 2004c). There would be benefits to local populations of these species by enhancing crossing opportunities along the canal.

While it may be impossible to prevent all wildlife fatalities associated with water developments, the BLM will make a reasonable effort to ensure that these projects are as wildlife safe as reasonably possible (USDI BLM 2004b). This includes all existing and future water developments on public lands regardless of who constructed them, when they were constructed, or how construction was authorized (USDI BLM 2004b).

Effectiveness Monitoring of Wildlife Crossings and Escape Ramps

The Klamath Falls Resource Area RMP requires monitoring as part of the BLM's land management strategy. The direction and guidance set forth in the RMP states that "Monitoring is an essential component of natural resource management because it provides information on the relative success of management. Monitoring results will provide managers with the information to determine whether an objective has been met and whether to continue or modify the management direction." (USDI BLM 1995a, page

85). Monitoring of the use of the wildlife crossings and escape ramps can be used to inform the effectiveness of the facilities and may lead to adaptive management of the facilities to meet the desired objectives.

Installation of Western Pond Turtle Basking Structure

The western pond turtle is a BLM Sensitive species in Oregon. Western pond turtles occur throughout the Project area, although use appears to be concentrated around basking structures (exposed rocks and occasionally logs) and near areas of slower moving water. They require basking sites, such as logs, rocks, etc. (Csuti et al 1997). Basking sites for thermoregulation are an important component of western pond turtle's habitat (St. John 2002). Pond turtles are ectothermic (cold-blooded), which means that their body temperatures are largely determined by sources of heat outside of their body (Brown et al 1995). During atmospheric basking, turtles elevate and maintain body temperatures near 32 degrees Celsius through a number of thermoregulatory behaviors including: exposing shell to direct sun (heating), dunking the head, feet or body in water (cooling), changing exposure to heating and cooling sources, rotating the body axis, and extending or retracting the limbs and head (Bury and Holland 1993). Changes in water level can affect the availability of suitable basking sites along reservoir and river shorelines. Logs that are partially submerged and available for turtles at one flow or pool level could become entirely exposed at lower flows.

Peaking operations for power production has likely affected habitat suitability for the species. Peaking operations may dislodge basking logs and move logs which are not anchored to the bank or stream bottom. Daily water level fluctuations also increase the rate of decomposition and may make the logs unsuitable (e.g., either inaccessible due to flooding or exposure) for basking. This would occur most often in the J.C. Boyle Peaking Reach where daily peaking results in stage changes of several feet in some locations. Bury (1995) reported that basking logs are limited in this reach (PacifiCorp 2004c). In the J.C. Boyle Peaking Reach, turtles seem to be restricted to relatively few areas that still have suitable basking habitat especially under varying water levels due to peaking operations (Roninger, personal communication, 2005). Peaking operations may also affect pond turtles by periodically widening the distance between the water's edge and shoreline habitat, thus reducing availability of basking sites.

The Topsy/Pokegama Landscape Analysis was prepared by the Klamath Falls Resource Area and the USFWS to meet requirements set forth by the Northwest Forest Plan's Aquatic Conservation Strategy. This plan recommended to "Place large logs in slow water areas known to be important western pond turtle aquatic habitat." (Bury 1995). Logs could be anchored to shore where they would be partially submerged to provide basking and escape cover…Because of the upstream dams and past harvest activity; these areas may have less instream logs than were present historically."(USDI BLM 1996)

Currently, there are few basking structures downstream of the Project facilities. The existing structures receive a high degree of use and should be protected from further degradation. Additional structures located in suitable areas of the J.C. Boyle Peaking

Reach should accommodate more turtle basking at different surface water elevations (PacifiCorp 2004a). The number and distribution of these structures would be determined based on known turtle concentrations, location of recreational activity, and suitability of adjacent uplands for nesting and over wintering.

Effectiveness Monitoring of Installed Western Pond Turtle Basking Structure

The Klamath Falls Resource Area RMP requires monitoring as part of the BLM's land management strategy. Monitoring of the turtle basking structures for use by turtles can be used to inform the effectiveness of the structures and assist in adaptively managing of the structures to meet the desired objectives.

Threatened, Endangered, Sensitive, Special Status Species

Survey, Habitat Protection and Improvement for SS Species on BLM-Administered Lands

The largest number of threatened, endangered and BLM Sensitive (TES) and Special Status (SS) plant and animal species were documented in the J.C. Boyle Peaking Reach; with most of the TES/SS avian species were found in association with riparian, wetland or open water habitats. All TES/SS herptile species (including western pond turtles) and TES/SS mammals (including bats) rely on wetland and riparian habitat during some stage of their life cycle. The extent and suitability of riparian habitat has been affected by Project operations (PacifiCorp 2004c, 5-83 through 5-85).

Preservation of Klamath River aquatic systems and associated peripheral wetland and riparian habitat will be critical to the maintenance of wildlife populations currently existing in and around the study area. The BLM SS species management direction requires that authorized activities taking place on BLM-administered lands, including Project-related activities, provide for the conservation of SS species, and ensure all actions are evaluated to determine if SS species objectives are being met (USDI BLM 2001a, pages 5-6). It will be necessary to conduct protocol surveys for TES/SS species through the life of the new license for habitat disturbing activities on BLM-administered lands in order to evaluate the continuing impacts and maintain current inventories. Surveying initially would supplement the baseline data and subsequent surveys would allow PacifiCorp and the BLM to evaluate the impacts from Project-related activities to TES and SS species over time. Surveys would also be used to identify SS species habitat that would need protection and restoration or mitigation from Project impacts. This is consistent with current RMP direction that states that the BLM should "study, maintain or restore community structure, species composition and ecological processes of special status plant and animal habitat." and consistent with the BLM Special Status Species Policy (USDI BLM 2001a) to monitor and evaluate ongoing management activities to ensure conservation objectives for listed species are being met. The Klamath Falls RMP objectives for Special Status species are to "…manage for the conservation of Federal Candidates and Bureaus Sensitive Species and their habitats so as far as not to contribute the need to list and to recover the species." (USDI BLM 1995a, page 36).

In order to fully evaluate the impacts from the Project an appropriate survey effort of Special Status species and their habitat is needed over the long-term to address those impacts that are on-going as a result of the Project. The surveys conducted, in preparation of the License application, in some cases did not meet BLM protocols, RMP direction, Northwest Forest Plan requirements or the policies in the BLM Special Status Species Manual. Survey protocols for most species are conducted over multiple years to increase the chances of detection. Surveys for Survey and Manage (S&M) Aquatic and Terrestrial Mollusks are required for habitat disturbing actions under the Northwest Forest Plan (USDA USDI 1994) and subsequent 2001 Record of Decision (USDA USDI 2001). The Project has and will continue to impact suitable habitat for terrestrial and aquatic mollusks listed under the S&M species list for the Klamath Falls Resource Area. These surveys should be conducted for those species and according the S&M survey protocol. The current S&M mollusk surveys (PacifiCorp 2004c) were not conducted to Northwest Forest Plan standards (USDA USDI 2001) as stated in the FLA (PacifiCorp 2004a, Exhibit E, page 5-117).

Seasonal Restrictions for TES and SS Species - The Klamath Falls Resource Area RMP/ROD (USDI BLM 1995a, pages 34 and 38-39) provides seasonal restrictions (time of year and/or distance from sensitive area) for management activities on or adjacent to BLM-administered lands that may disturb species during critical periods of their reproduction. Those species include bald and golden eagles, peregrine falcons, Townsend's big-eared bat, northern goshawk, northern spotted owl, and osprey. The BLM condition is proposed to ensure that sensitive avian species continue to be managed consistent with BLM management objectives as well as for State and Federal laws and/or regulations that include provisions for such protections.

Avian Protection Plan for the Upper Klamath River

The bald eagle, golden eagle, osprey, prairie falcon and peregrine falcon have all been documented (Isaacs and Anthony 2005, PacifiCorp 2004a, FTR pp 5-55-60) within the Project and all are susceptible to collision or electrocution from existing transmission facilities. The Final License Application acknowledged that several poles along the transmission line south of the Copco II bypass are not raptor safe (PacifiCorp 2004a Executive Summary 5-5) and it is likely that other poles also impact raptor populations.

An Avian Protection Plan (APP) for Project facilities in the Upper Klamath River should be included in the WHMP, developed in consultation with the BLM and other stakeholders. This plan will address avian interactions (e.g. electrocution, collision, nesting, perching) and the guidelines to be followed with all transmission facilities. The guidelines should follow guidelines in the Avian Protection Plan Guidelines (APLIC and USFWS, 2005), "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996" (APLIC 1996) and/or the most current publication for avian protection at the time. The APP should also include provisions for routine monitoring of Project facilities to discover if additional measures are needed to protect avian species.

<u>BLM Modified Condition 9 – Reservation of Authority</u>

Discussion

Based on review of the BLM preliminary condition No. 9 and PacifiCorp's alternative condition (which is to strike the BLM condition in its entirety) and rationale, the BLM has refined the title and content of Condition No. 9 slightly to provide more clarity as to the requirements of the condition. The objective of the Modified Condition is to ensure that any license issued reserves the authority to require the Licensee to implement such conditions for the protection and utilization of Department of Interior reservations as may be provided by the Secretary of the Interior, pursuant to Section 4(e) of the Federal Power Act, 16 U.S.C. § 797(e).[5]

Rationale for the Modified Condition

PacifiCorp asserts that the Department's reservation of authority condition "would vitiate the due process rights conferred by Congress and contravene the plain language of the…" 2005 amendments to Federal Power Act (FPA) by the Energy Policy Act of 2005 (Pub. L. 109-58, title II, § 241 (2005); 16 U.S.C. §§ 797(e), 811, 823d) (PacifiCorp 2006, page 9).

It is the Department's view that submitting mandatory conditions pursuant to Section 4(e) of the FPA would trigger the Commission's amending the license. The Commission has found that:

> "A reservation of authority is a well-recognized means of obtaining the licensee's consent to modifications that may be necessary during the term of the license…."

Public Utility District No. 1 of Pend Orielle County, Washington 117 FERC 61,205 (2006), p. 32, para. 88. A reservation of authority has also been judicially affirmed. *Wisconsin Public Service Corporation v. FERC*, 32 F.3d 1165 (7th Cir. 1994). Both the Court of Appeals and FERC recognize that future exercise of the reserved authority would require notice and an opportunity for hearing. *Id., Wisconsin Public Service, 32 F.3d at 1170*. Moreover, the joint regulations implementing the EP Act further recognize that the hearing and alternatives process will be available if and when the BLM exercises this reserved authority. 43 C.F.R. § 45.1(c).

Section 3. ALTERNATIVES ANALYSIS

[5] The preamble to the Joint Regulations implementing the EP Act states, however, that license parties cannot request a hearing regarding the reservation of authority itself, or submit alternative to such reservation." 70 Fed. Reg. 69804, 69808 (November 17, 2005). Moreover, the effects of a reservation of authority, by its nature, are indeterminate. The BLM has not considered PacifiCorp's proposed alternative to Condition No. 9 as a formal alternative, but does address PacifiCorp's' contentions in the Rationale section.

In accordance with 43 CFR, Part 45 any party to a license proceeding may propose an alternative Federal Power Act (FPA) section 4(e) condition or section 18 fishway prescription to an agency's preliminary condition or prescription. With respect to the Bureau of Land Management (BLM), the BLM must adopt the proposed alternative section 4(e) condition if the BLM determines, based on evidence and supporting material provided by any party to the license proceeding or otherwise available to the agency, that the alternative condition, as compared to the BLM preliminary §4(e) condition:

1. Costs significantly less to implement or results in improved operation of the project works for electricity production; and

2. Provides for the adequate protection and utilization of the reservation.

[*See* Pub. L. N0. 109.58, §241(c), 119 Stat. 674, 675-76 (2005) (adding new FPA Section 33(a) and (b)) (codified at 16 U.S.C § 823d(a) and (b)).]

The statute and implementing regulations require that agencies must consider the evidence/supporting material provided by any party to the license proceeding or otherwise available to the agency, including any Administrative Law Judge (ALJ) decision on disputed issues of material fact issued under 7 CFR §1.660 (Agriculture), 43 CFR § 45.60 (Interior), or 50 CFR §221.60 (Commerce) with respect to the preliminary FPA §4(e) condition. In this case, this includes the ALJ decision issued by the Hon. Parlen L. McKenna, dated September 28, 2006.

The analysis of the above criteria is included below for each BLM preliminary condition.

When the agency files its modified condition, it must also file with FERC:

1. Any study, data, or other factual information relied on that is not already part of the licensing proceeding record.

2. A written statement explaining:
   a. The basis for the modified condition; and
   b. If the agency is not adopting any alternative, its reasons for not doing so.

This written statement must also demonstrate that the agency gave equal consideration to the effects of the condition adopted and any alternative not adopted on:

1. Energy supply, distribution, cost, and use;
2. Flood control;
3. Navigation;
4. Water supply;
5. Air quality; and
6. Preservation of other aspects of environmental quality.

The entirety of this document constitutes the Secretary's written statement.

BLM Condition 1

One alternative condition was provided by PacifiCorp for BLM Preliminary Condition 1 (See PacifiCorp 2006, pages 10-15):

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production?

Answer – The alternative condition would likely cost less to implement, but not significantly less. The alternative condition would not result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would likely cost less to implement since it provides for reduced requirements when the Licensee undertakes activities on a limited subset of BLM-administered lands. Both the preliminary condition and PacifiCorp's proposed alternative condition are focused on the processes to be taken by the Licensee concerning activities on BLM-administered lands, and neither specifically identifies measures that might take place. Based on estimates provided by PacifiCorp, coordination on any particular issue would cost $1,000 to $2,000, and NEPA analysis for 100 foot right-of ways could potentially cost $1,000 per mile (PacifiCorp 2006, page 25). The costs between the BLM preliminary condition and PacifiCorp's alternative condition would be similar. However, PacifiCorp's alternative condition would reduce the applicability of the condition to a subset of BLM-administered lands which could result in less need for plan development for specific activities and possible NEPA analysis, and correspondingly less cost. The costs provided by PacifiCorp as "…potential additional costs from $500 to $3,000 for additional avian protection on each distribution pole and $5,000 for each transmission-line pole that are otherwise outside the Project boundary; and potential costs of $75,000 per mile of burying small powerlines outside the Project boundary" (PacifiCorp 2006, page 25) are irrelevant to the BLM preliminary condition and PacifiCorp's alternative condition, as neither condition requires or contemplates these actions. Similarly, PacifiCorp's comparison between the number of acres "…that could potentially come within BLM Condition No. 1" and the number of acres in PacifiCorp's proposed Project boundary is not applicable to the cost of the condition, as the conditions are focused on requirements for licensee-conducted activities on those lands, which is not comparable to the number of the acres themselves.

PacifiCorp's alternative condition would not result in improved operation of the project works for electricity production over BLM's preliminary condition. PacifiCorp's "diversion of resources" argument, as well as the potential for duplicative NEPA-related analysis and potentially conflicting requirements

regarding safety and hazardous substances, are not related to improving operation of the project works for electricity production, but are related to PacifiCorp's interpretation that the preliminary condition exceeds BLM's authority. Similarly, PacifiCorp's assertion that other aspects of the condition exceeds BLM's authority, such as those related to surrender, indemnification and reconstruction due to Licensee damage to BLM lands, would not lead to improved operation of the project works for electricity production if PacifiCorp's alternative condition were chosen.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – In general, the alternative condition unnecessarily limits the scope of the condition to BLM-administered lands in the Project area that meet PacifiCorp's interpretation of what constitutes a "reservation" under the Federal Power Act, and similarly limits BLM's authority to only some BLM-administered lands within the Project boundary for the Project. Thus, significant impacts from the Project to BLM-administered lands and resources (of which there are many) would not be addressed in terms of required consultation with the BLM and the development of site-specific plans for required mitigation measures through the new license term.

PacifiCorp's arguments that the BLM does not have authority to impose FPA § 4(e) conditions on certain BLM-administered lands or its assertion that BLM authority is limited to only some BLM-administered lands within the Project boundary are without merit. PacifiCorp presents its interpretation of the Supreme Court's holding in *Escondido Mutual Water Co. v. LaJolla Band of Mission* Indians, 466 U.S. 765 (1984). However, because Project facilities are located on BLM-administered lands that constitute the reservation, including the J.C. Boyle Powerhouse and parts of the J.C. Boyle canal, road and tailrace, the BLM has the authority to submit conditions under FPA § 4(e) for the adequate protection and utilization of the reservation. The D.C. Circuit Court of Appeals rejected an argument virtually identical to PacifiCorp's in the recent decision, *City of Tacoma v. FERC.* No. 05-1054 (D.C. Cir. Aug. 22, 2006). In that case, the court upheld the Department's authority to impose the conditions stating "…so long as some portion of the project is on the reservation, the Secretary is authorized to impose any conditions that will protect the reservation, including utilization of the reservation…." *Id.* at 66-67. *See also Public Utility District No. 1 of Pend Orielle County, Washington,* 117 FERC 61,205 (2006), p. 23, para. 59-60 (noting that Section 4(e) conditions are not limited to the geographic scope of the effects of project works located on the reservation nor are restricted to reservation lands within the project boundary).

The BLM recognizes that the Commission has the sole jurisdiction to determine the Project boundary for the Project. Per 18 CFR § 4.41 (h)(2):

> The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of the environmental resources.

As such, the BLM expects that the Project boundary for the new license, if one is issued, will not be limited to lands proposed by PacifiCorp in its license application, but will include BLM-administered lands in order to fulfill Project purposes such as recreation and the protection of environmental resources. The BLM preliminary condition provides for, among other things, the Licensee to prepare site-specific plans for BLM's approval for activities that would take place on those BLM-administered lands to ensure that those activities meet BLM land management direction.

PacifiCorp's attempt to limit the application of the condition would result in less protection for BLM administered lands, including, as even PacifiCorp indicates, the emergency spillway facility, that has significantly impacted BLM-administered lands and resources through its operation according to the existing license. Through not including this facility in its application for a new Project license and its proposal to not include this facility within the new Project boundary, it is apparent that PacifiCorp is attempting to reduce its obligations to mitigate for the impacts of this facility. Similarly, PacifiCorp's proposal to exclude the BLM Topsy Campground from the new Project boundary ignores the fact that this campground is present solely due to the presence of J.C. Boyle Reservoir, and supports a significant amount of the Project-related recreation use on the reservoir. It is well established that the Licensee is responsible for Project-related recreation, and PacifiCorp's proposed exclusion of this campground from the new Project boundary, combined with its arguments as to the limitation of BLM's authority, would result in less than adequate protection and utilization of the BLM reservation in this area.

Conclusion

To satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. PacifiCorp's alternative condition would unnecessarily limit the requirements. Although PacifiCorp's alternative would cost less to implement, it would not provide for the adequate protection and utilization of the BLM reservation

Equal Consideration of Effects Demonstration

The BLM has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for BLM Modified Condition 1 and PacifiCorp's proposed alternative condition 1:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp indicates that its alternative condition would not have a negative effect on energy supply, distribution, cost or use (PacifiCorp 2006, Page 27). PacifiCorp asserts that the BLM's condition will have "…a relatively greater impact…" on energy supply, distribution, cost or use due to the potential "…diversion of resources to activities and requirements…" required by the BLM condition. The BLM does not accept this conclusion, as any diversion of resources required by the BLM condition would have no effect on energy supply, distribution, cost or use, nor would it adversely affect the operation of the Project in general for electricity production. It is the BLM's conclusion that neither PacifiCorp's alternative condition nor BLM's Modified Condition will have an effect on energy supply, distribution, cost or use.

2. **Flood control**

PacifiCorp identified that their proposed alternative would not affect flood control (PacifiCorp 2006, Page 27). The BLM's Modified Condition would not affect flood control.

3. **Navigation**

PacifiCorp identified that their alternative would have no affect on navigation (PacifiCorp 2006, Page 27). The BLM's Modified Condition would not affect navigation.

4. **Water Supply**

PacifiCorp identified that their alternative would have no effect on water supply (PacifiCorp 2006, Page 27). The BLM's Modified Condition would not affect water supply.

5. **Air Quality**

PacifiCorp identified that their proposed alternative would have no effect on air quality (PacifiCorp 2006, Page 27). The BLM's Modified Condition would not affect air quality.

6. **Preservation of Other Aspects of Environmental Quality**

PacifiCorp identified that their alternative will have no effect on environmental quality (PacifiCorp 2006, Page 27). The BLM's Modified Condition would not affect other aspects of environmental quality.

BLM Condition 2

One alternative condition was provided by PacifiCorp for BLM Preliminary Condition 2 (See PacifiCorp 2006, pages 28-29).

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production.

Answer – The alternative condition would likely cost less to implement, but not significantly less. The alternative condition would not result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would likely cost less to implement since it provides for reduced requirements for when the Licensee would be required to consult with the BLM concerning Project-related activities on some BLM-administered lands. Both the BLM preliminary condition and PacifiCorp's proposed alternative condition are focused on the consultation and reporting processes to be taken by the Licensee concerning activities on BLM-administered lands, and do not specifically identify any activities beyond the consultation and reporting requirements. PacifiCorp's alternative condition does not change these requirements, but limits the scope of applicability of the requirements. As such, this narrowing would likely only result in insignificant cost savings, because the same requirements are inherent to both conditions. For example, both conditions have a requirement to consult with the BLM each year. Similarly, a requirement for a report on the "status of implementing conditions of the license" is in both conditions, whether these respective activities include those that "could affect BLM-administered resources" or, as PacifiCorp's alternative condition provides, those that "take place on BLM reservation lands within the Project boundary" (PacifiCorp 2006, page 28). Therefore, the difference in cost to implement is not significant. PacifiCorp's comparison between "…BLM reservation lands within the Project boundary and to all other lands that could potentially come within BLM Condition No. 2" (PacifiCorp 2006, pages 30-31) is not applicable to the cost of the condition, as both conditions are focused on the same requirements for consultation and reporting, which is not related whatsoever to the quantity of lands involved in the consultation.

PacifiCorp's alternative condition would not result in improved operation of the project works for electricity production over BLM's preliminary condition. PacifiCorp's "diversion of resources" argument is not related to improving operation of the project works for electricity production, but is only related to PacifiCorp's position that the preliminary condition exceeds BLM's authority. Both conditions' requirements to consult with the BLM and provide reports on the status of implementing conditions of the license could, theoretically, lead to some improved operation of the project works for electricity production. However these potential improvements would be of the same magnitude, as the requirements are the same for both conditions.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – In general, the alternative condition unnecessarily limits the scope of the condition to BLM-administered lands in the Project area that meet PacifiCorp's interpretation of what constitutes a "reservation" under the Federal Power Act, and similarly limits BLM's authority to only some BLM-administered lands within the Project boundary for the Project. As presented, PacifiCorp's alternative condition could limit the requirement to consult with the BLM, including consultation for some license conditions that directly involve BLM-administered lands. Thus, a likely result is that some requirements of the license, including activities to take place on BLM-administered lands, would not be implemented in consultation with BLM, but only as the Licensee sees fit to implement them. This result, as envisioned by PacifiCorp's alternative condition, does not provide for adequate protection and utilization of the BLM-administered lands that constitute the reservation.

PacifiCorp's arguments that the BLM does not have authority to impose FPA § 4(e) conditions on certain BLM-administered lands or their assertion that BLM authority is limited to only some BLM-administered lands within the Project boundary are without merit. Because Project facilities are located on BLM-administered lands, including the J.C. Boyle Powerhouse and parts of the J.C. Boyle canal, road and tailrace, the BLM has the authority to submit conditions under FPA § 4(e) for the adequate protection and utilization of the reservation (*See* Criteria 2 for Condition 1).

Another PacifiCorp argument is that the BLM lacks authority to require changes to Project operations through revision of 4(e) conditions. This is addressed in the rationale for BLM Modified Condition No. 9 in Section 2 of this submission.

Conclusion

To satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. PacifiCorp's alternative condition would unnecessarily limit the requirements for consultation. Although PacifiCorp's alternative would cost less to implement, it would not provide for the adequate protection and utilization of the BLM reservation. Conversely, the BLM Modified Condition No. 2 would provide adequate protection and utilization of the resources through consultation of the Condition for all BLM-administered lands.

Equal Consideration of Effects Demonstration

The Department has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for the BLM Modified Condition 2 and PacifiCorp's Alternative Condition 2:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp indicates that its alternative condition would not have a negative effect on energy supply, distribution, cost or use (PacifiCorp 2006, Page 31). PacifiCorp asserts that the BLM's condition will have "…a relatively greater impact…" on energy supply, distribution, cost or use due to the potential "…diversion of resources to activities and requirements…" required by the BLM condition. *Id.* The BLM does not accept this conclusion, as any diversion of resources required by the BLM condition would have no effect on energy supply, distribution, cost or use, nor would it adversely affect the operation of the Project in general for electricity production. It is the BLM's conclusion that neither PacifiCorp's alternative condition nor BLM's Modified Condition will have an effect on energy supply, distribution, cost or use.

2. **Flood control**

PacifiCorp identified that their proposed alternative would not affect flood control (PacifiCorp 2006, Page 31). BLM's Modified Condition would not result in any effect to flood control.

3. **Navigation**

PacifiCorp identified that their alternative would have no affect on navigation (PacifiCorp 2006, Page 31). BLM's Modified Condition would not result in any effect to navigation.

4. **Water Supply**

PacifiCorp identified that their alternative would have no affect on water supply (PacifiCorp 2006, Page 31). BLM's Modified Condition would not result in any effect to water supply.

5. **Air Quality**

PacifiCorp identified that their proposed alternative would have no effect on air quality (PacifiCorp 2006, Page 31). BLM's Modified Condition would not result in any effect on air quality.

6. **Preservation of Other Aspects of Environmental Quality**

PacifiCorp identified that their alternative will have no effect on environmental quality (PacifiCorp 2006, Page 31). BLM's Modified Condition would not result in any change to other aspects of environmental quality.

BLM Condition 3

One alternative condition was provided by PacifiCorp for BLM Preliminary Condition 3 (See PacifiCorp 2006, pages 33-34).

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production.

Answer – The alternative condition would likely cost less to implement, and may be significantly less. The alternative condition would not result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would likely cost less to implement since it limits the Licensee's responsibilities for road management within the Project boundary. While the majority of the alternative condition appears to be centered around the Project boundary as determined by the Commission, it limits actual "operation and maintenance (O&M) activities required for the continued operation of the Project that occur [to only] within the [Licensee's] proposed Project boundary" (PacifiCorp 2006, page 33). In the BLM's view, the Project boundary proposed by PacifiCorp does not contain all of the lands required for Project purposes or all BLM-administered lands affected by the Project. This limitation, as incorporated into the alternative condition, may result in the condition costing significantly less to implement.

The BLM recognizes that the Commission has the sole jurisdiction to determine the Project boundary for the Project. Per 18 CFR § 4.41 (h)(2):

> The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of the environmental resources.

As such, the BLM expects that the Project boundary for the new license, if one is issued, will not be limited to lands proposed by PacifiCorp in its license application, but will include BLM-administered in order to fulfill project purposes such as recreation and the protection of environmental resources.

Beyond this, the alternative condition is not significantly different in cost effect as compared to the BLM's preliminary condition.

PacifiCorp's arguments that the alternative condition would cost significantly less to implement due to the "diminishment" in area to which they assert BLM has conditioning authority is not justified BLM conditioning authority is not limited as PacifiCorp suggests. PacifiCorp uses a comparison of the BLM "Potential Area of Influence" to what it proposed as a Project boundary in its application (or what is within the existing Project boundary) in an attempt to corroborate its assertion of a significant cost difference between the alternative condition and the BLM's preliminary condition. Both cases, where it identifies the significant difference in acreage and miles of road, are immaterial since the BLM never

asserted or envisioned that the Roads Management Plan would include all the acres or miles of road in the "Potential Area of Influence." The "Potential Area of Influence" is to be used in the development of the Inventory Analysis (similar to PacifiCorp's alternative condition), and even the name does not imply that the Licensee was responsible for all of the roads contained therein.

PacifiCorp's alternative condition would not result in improved operation of the Project works for electricity production over BLM's preliminary condition. PacifiCorp's "diversion of resources" argument is not related to improving operation of the project works for electricity production, but is related to PacifiCorp's interpretation that the preliminary condition exceeds BLM's authority. The licensee is responsible for management of roads that are needed for Project purposes, including Project-related recreation. PacifiCorp's alternative condition, to the extent it would divert resources from meeting that responsibility, would likely adversely affect the operation of the Project works for electricity production.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – In general, the alternative condition unnecessarily limits the scope of the condition to BLM-administered lands in the Project area that meet PacifiCorp's interpretation of what constitutes a "reservation" under the Federal Power Act, and similarly limits BLM's authority to only some BLM-administered lands within the Project boundary for the Project.

PacifiCorp's arguments that the BLM does not have authority to impose FPA § 4(e) conditions except on "reservations" or their assertion that BLM authority is limited to only some BLM-administered lands or roads within the Project boundary lack merit (*See* Criteria 2 for Condition 1).

The BLM recognizes that the Commission has the sole jurisdiction to determine the Project boundary for the Project. The Project boundary will include lands and roads that are necessary for operation and maintenance of the Project and for other Project purposes, including Project-related recreation, shoreline control, or protection of environmental resources. As such, the BLM expects that the Project boundary for the new license, if one is issued, will include additional BLM-administered lands from those proposed by PacifiCorp in their license application. The BLM preliminary condition requires the Licensee to take their share of the responsibility for Project-related roads on BLM-administered lands and to ensure that those activities meet BLM land management direction. PacifiCorp's alternative condition would unnecessarily limit these requirements, and therefore

would not provide for the adequate protection and utilization of the BLM reservation.

Another PacifiCorp argument is that the BLM lacks authority to require changes to Project operations through revision of 4(e) conditions. While in this instance PacifiCorp's assertions are related to BLM's reserving the right to require changes to the Roads Plan, the overriding issue is addressed in the rationale for BLM Modified Condition No. 9 in this submission.

Conclusion

To satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. Although PacifiCorp's alternative would cost less to implement, it would not provide for the adequate protection and utilization of the BLM reservation.

Equal Consideration of Effects Demonstration

The Department has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for the BLM Modified Condition 3 and PacifiCorp's proposed alternative condition 3:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp indicates that their alternative condition would not have a negative effect on energy supply, distribution, cost or use (PacifiCorp 2006, Page 39), asserting that the BLM's condition will have "…a relatively greater impact on energy supply, distribution, cost and use…" due to the potential "…diversion of resources to activities and requirements…" required by the BLM condition. The BLM does not accept this conclusion, as any diversion of resources required by the BLM condition would have no effect on energy supply, distribution, cost or use, nor would it even greatly affect the operation of the Project in general for electricity production. It is the BLM's conclusion that neither PacifiCorp's alternative condition nor BLM's Modified Condition will have an effect on energy supply, distribution, cost or use.

2. **Flood control**

PacifiCorp identified that their proposed alternative would not affect flood control (PacifiCorp 2006, Page 39-40). BLM's Modified Condition would not result in any effect to flood control.

3. **Navigation**

PacifiCorp identified that their alternative would have no affect on navigation (PacifiCorp 2006, Page 40). BLM's Modified Condition would not result in any effect to navigation.

4. **Water Supply**

PacifiCorp identified that their alternative would have no affect on water supply (PacifiCorp 2006, Page 40). BLM's Modified Condition would not result in any effect to water supply.

5. Air Quality

PacifiCorp identified that their proposed alternative would have no effect on air quality (PacifiCorp 2006, Page 40). BLM's Modified Condition would not result in any effect on air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp identified that their alternative will have no effect on environmental quality (PacifiCorp 2006, Page 40). BLM's Modified Condition would not change other aspects of environmental quality.

BLM Condition 4

The BLM condition is intended to provide increased base flows and peak flows that are more reflective of seasonal fluctuations typical of a natural hydrograph for the Klamath River. First, a proportional flow (40% of inflow) would be required when inflow to J.C. Boyle Reservoir exceeds 1,175 cfs. Second, a minimum of 470 would be released at J.C. Boyle Dam when the average inflow of the previous three days is between 470 and 1,175 cfs. Third, when the inflow is less than 470 cfs, then dam released flow would equal inflow. Most of the time, the proposed base flows would provide a minimum flow of approximately 700 cfs in the peaking reach, about twice the current base flow. The BLM proposal would provide a seasonal high flow event, for seven full days, between February 1 and April 15, when inflows first exceed 3,300 cfs. During this one week period power generation would be suspended to allow all inflows down the bypass and peaking reaches. During the period between May 1 and October 31, the BLM proposal involves a single peaking event of 1,500 cfs to 3,000 cfs per week, with a priority set for peaking operations on Saturday, Sunday, and Friday in priority order to accommodate whitewater boating. The BLM proposal also includes a maximum ramp rate of two in/hr.

Four proposed alternative conditions were provided to BLM Preliminary Condition 4. Two alternatives were proposed by PacifiCorp for BLM Preliminary Condition 4 (See PacifiCorp 2006a, pages 41-47 [First Alternative Condition] and pages 62-64 [Second Alternative Condition]). An alternative condition was also submitted by the Oregon Department of Fish and Wildlife (ODFW) and another was submitted by the California Department of Fish and Game (CDFG). Both of the States' proposed alternative conditions are very similar.

An additional proposed alternative condition was submitted by PacifiCorp on December 1, 2006 (PacifiCorp 2006d) as an "Addendum" to the Second Alternative Condition. PacifiCorp requested that the proposed "modifications" to the BLM's Preliminary Condition No. 4 be at least considered by Interior when developing its modified conditions. PacifiCorp expressly stated that the filing should not be considered to be a replacement of the Second Alternative Condition

or a withdrawal of its existing proposed alternative (*See* PacifiCorp 2006d at 1). Additional information regarding this proposed alternative condition was submitted on December 29, 2006 (PacifiCorp 2006e). The regulations implementing the EPAct expressly require that any alternative must be filed within 30 days after the deadline for the BLM to file preliminary conditions with FERC (See 43 C.F.R. § 45.71 (a)(2)). Since this proposed alternative condition was submitted months after the time period designated in the regulations, it will not be considered as an alternative condition.

However, consistent with its statutory and regulatory obligation to consider relevant evidence and supporting material that is reasonably available to the agency, the BLM reviewed the "Addendum" to determine whether it set forth "evidence and supporting material" that was relevant to consideration of the Second Alternative Condition and the development of the Modified Condition. See 43 C.F.R. § 45.73(a). To the extent relevant and feasible in the time available, such evidence and supporting material was considered by the BLM in evaluating the Second Alternative Condition and developing the modified condition [*See also* 16 U.S.C. § 823d(b)(4) (information "provided in a timely manner" must be taken into account in preparation of the written statement explaining basis for ultimate decision to accept or reject and alternative)].

PacifiCorp's First Alternative Condition

PacifiCorp's First Alternative Condition proposes to strike/delete the BLM Preliminary Condition in its entirety.

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production?

Answer – The alternative condition would cost significantly less to implement, and would result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would cost significantly less to implement since there would be no condition that requires substantial changes to Project operations and other mitigation measures. For example, increased instream flows, ramping rate restrictions, a seasonal high flow and gravel augmentation would not be required. PacifiCorp's alternative condition would also result in "improved" operation of the Project works for energy production as BLM's preliminary condition will have an effect on the generation ability of the J.C. Boyle Development.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – PacifiCorp bases the majority of its arguments on legal premises that either have no merit or are not relevant to protection and utilization of the BLM reservation. The alternative condition also fails to recognize that the Project has significant effects on BLM-administered lands and resources in the river corridor area below J. C. Boyle Dam, and therefore fails to provide for the adequate protection and utilization of the BLM reservation by not proposing measures to reduce these effects.

PacifiCorp's legal arguments have been addressed above under Criteria 2 for Condition 1 and the Statutory Authorities section above.

PacifiCorp's Second Alternative Condition

PacifiCorp's Second Alternative Condition, in general, modifies BLM's preliminary condition to reflect specific actions proposed in its license application. These actions include minimum instream flows, ramping rates, and gravel augmentation, but lacks a seasonal high flow. Other aspects of the BLM's preliminary condition are included in the Second Alternative Condition, such as gaging locations and instream flow monitoring.

This alternative condition requires significantly less than the Modified Condition in terms of the magnitude of measures to implement in the river corridor. PacifiCorp's Second Alternative Condition (PacifiCorp 2006, Pages 62-64) is as follows:

A. Minimum Stream Flow and Ramping for the J.C. Boyle Development

1. Required Minimum Stream Flow – The Licensee shall, within one year after license issuance, maintain minimum stream flows as specified:

a. A minimum flow of 100 cfs shall be released from J.C. Boyle Dam at all times.

b. A minimum flow of 100 cfs shall be released at J.C. Boyle powerhouse or an additional 100 cfs shall be released at J.C. Boyle dam.

2. Ramping During Controlled Events – The Licensee shall, within one year after license issuances:

a. In the J.C. Boyle Bypassed River Reach, not exceed a flow down-ramp rate of 150 cfs per hour, except for flow conditions beyond the Project's control. This ramp rate is primarily applicable to spill and planned maintenance events. To the extent possible, flow changes in the J.C. Boyle Bypassed River Reach shall occur during night-time hours.

b. In the J.C. Boyle Peaking Reach, not exceed a flow up-ramp rate of 9 inches (in water level) per hour, not exceed a flow down ramp rate of 9 inches per hour for flows exceeding 1,000 cfs, and not exceed 4 inches per hour for flows less than 1,000 cfs (as measured at USGS gage station No. 11510700 downstream of the J.C. Boyle powerhouse). Further, while peaking operation will continue at the J.C. Boyle powerhouse, the Licensee shall ensure that the daily peaking

operation will not exceed 1,400 cfs (as measured at USGS gage station No. 11510700 downstream of the J.C. Boyle powerhouse).

B. Stream Flow Measurement and Reporting: J.C. Boyle Bypassed River and Peaking Reaches

1. Instream Flow Measurement - The Licensee shall, with in one year after license issuance:

a. Continuously measure the stage of water at a minimum of four gaging sites. Three sites are currently gaged. The Licensee shall establish on additional site, using the most current USGS protocol for gage stations installation, maintenance and data collection (USGS 1982 – Measurement and Computation of Streamflow: Volumes 1 and 2, Geologic Survey Water –Supply Paper 2175).

b. Existing gage station shall include the Klamath River below Keno Dam (#11509500), Spencer Creek above the confluence with the J.C. Boyle Reservoir (#11510000), and Klamath River below the H.C. Boyle Powerhouse (#11510700). The Licensee shall operate and maintain the gages at these site if the gages are no longer served by the current operator.

c. The Licensee shall install a new gage on the Klamath River J.C. Boyle Bypassed River Reach below all outlets from the J.C. Boyle Dam and above the springs at RM 225. The location of the gage shall be approved by the BLM n its reasonable discretion prior to installation.

2. Instream Flow Reporting – The Licensee shall, within one year after l license issuance:

a. Provide instantaneous 30-minute real time stream flow data in cfs via remote access that is readily available and accessible to the public.

b. Design and maintain a database similar to the most current version of the USGS National Water Information System (NWIS) for reporting on surface water. The database shall store gage network data and streamflow tracking procedures. BLM shall review and approve in its discretion the data base.

c. The Licensee shall, within tow years after License issuance, submit a report for each water year (i.e. October 1st through September 30th) of stream flow data reported in cfs to the BLM. The report shall be filed wit the BLM within six months of the end of each water year.

C. River Gravel Placement

1. The Licensee shall, within one year after License issuance, place approximately 100 to 200 cubic yards of spawnable gravel in the upper end of the J.C. Boyle Bypassed River Reach.

2. The Licensee shall monitor the initial placement of gravel and shall augment the gravel placement as necessary I the upper end of the J.C. Boyle Bypassed River Reach in order to maintain the effect of the initial placement.

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production?

Answer – The alternative condition would cost significantly less to implement, and would result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would cost significantly less to implement since the condition requires substantially less change to Project operations in, for example, minimum instream flows, ramping restrictions and gravel augmentation requirements. PacifiCorp's alternative condition would also result in "improved" operation of the Project works for energy production as the alternative would have less impact on the generation ability of the J.C. Boyle Development than the BLM preliminary condition. The BLM acknowledges that

the section 4(e) condition is expected to reduce the amount of power that can be generated compared to existing conditions. Hydrologic modeling conducted by the U.S. Bureau of Reclamation calculates that average annual energy production would be 23 percent less under BLM conditions compared to the status quo. Nevertheless, according to the modeling, PacifiCorp would still be able to generate an annual average of 562,790 MWh (California Energy Commission 2006 page 29, Table 2-4).

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – As described more fully below, PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation, and BLM's Condition will provide for the adequate protection and utilization of the reservation.

Justification – PacifiCorp's proposed alternative would perpetuate Project impacts to the river channel, riparian habitat, and fish habitat. The BLM's condition would protect those resources by restoring hydrologic and geomorphic processes that would lead to the improvement of the above resources. PacifiCorp's alternative would provide for more power production and whitewater boating opportunities. However, the BLM's condition would continue to provide for those resources by continuing to allow for an average annual production of 562,790 MWH of electricity from the Project, and by continuing to provide whitewater boating opportunities, particularly on weekends. The following section addresses these issues in more detail:

1. PacifiCorp's alternative minimum instream flows would not result in restoring and improving aquatic habitats, including salmonid spawning habitat; BLM's Condition would restore and improve these resources.

2. PacifiCorp's alternative ramping rate restrictions would not result in reducing the Project's effects to aquatic species; BLM's Condition would reduce those effects.

3. PacifiCorp's alternative does not include a seasonal high flow and would result in continuing adverse effects to aquatic habitats, stream channel complexity and riparian habitat quality; BLM's Condition would improve conditions for these resources.

4. PacifiCorp's limited gravel augmentation program would not improve spawning habitat and other aquatic habitats, increase stream channel complexity or improve the quality of riparian habitat; BLM's Condition would protect these resources.

5. Although some recreational uses would be reduced, the BLM Condition would provide recreational opportunities for boating, fishing, and other recreational uses.

6. Although power production would be reduced, the BLM Condition would allow an average of 562,790 MWh of electricity generation per year.

1) Minimum Instream Flows: PacifiCorp's alternative minimum instream flows would not result in restoring and improving aquatic habitats, including salmonid spawning habitat; BLM's Condition would restore and improve these resources.

a). J.C. Boyle Bypassed Reach Fish Habitat

PacifiCorp asserts that the existing release of 100 cfs will enhance usable fish habitat. The proposed release of 100 cfs does not provide adequate redband trout habitat in the Bypassed Reach. Based on results of PHABSIM modeling provided by PacifiCorp (2006d), data shows that redband trout habitat would be maximized at about 600 cfs release for adults and 800 cfs release for juveniles and fry.

The results of PacifiCorp's WUA curves suggest that there would be meaningful improvements for some important life stages in the Bypassed and Peaking reaches with BLM minimum flows. This is apparent in the table provided by PacifiCorp in the Addendum to the Second Alternative Condition (2006d), which shows that the percentage of maximum trout fry WUA increases from 66% to 83% when flow release is increased from 100 cfs to 470 cfs.

Because juvenile and fry habitat appears to be extremely limited in the Bypassed Reach it may be a significant limiting factor on trout population recruitment. Low numbers of fry and juveniles recruited into the J.C. Boyle peaking reach (hereafter "Peaking Reach") may be indicative of this limitation also being present in the Bypassed Reach. Flow vs. habitat relationships were not presented for spawning habitat for redband trout despite indications that the Bypassed Reach has a high potential for spawning habitat if Project effects on substrate and flow are mitigated (Robison 2006).

Existing flows (same as PacifiCorp's alternative of minimum flow of 100 cfs in the Bypassed Reach) do not provide adequate protection for spawning habitat and in fact adversely affect spawning habitat. The ALJ discussion regarding BLM Issue 14 (ALJ Decision at 75) states:

> "PacifiCorp believes the presence of spawning trout, in the bypass reach, show that current flows provide favorable spawning conditions. (PC PFF 48). However, the only area where trout spawning is observed is directly downstream of the emergency canal spillway. (FOF 14-21). This very limited spawning, in a very unnatural environment, does not demonstrate that the current flow regime provides favorable conditions."

The ALJ also concluded that:

> "The Project's artificial low flow regime contributes to the lack of available spawning gravel in the J.C. Boyle peaking and bypass reaches" (ALJ Decision at 78).

Although no PHABSIM was completed for trout or anadromous fish spawning habitat in the bypass reach, the evidence suggests that spawning habitat for salmonids would increase with flow increases. Maximum spawning habitat availability for suckers in the bypass reach occurs at 650 cfs (PacifiCorp 2005a, page 73). This is an indication that incrementally higher flows are needed to inundate suitable spawning substrate in the peaking reach, as suggested by FERC (1990). A similar pattern of increasing habitat availability with increasing flows would be expected for trout and anadromous species, because higher flows inundate areas in the channel where smaller sized substrate suitable for spawning is located.

However, under the current flow regime, spawning habitat is largely unavailable due to low minimum flows in the peaking reach (FERC 1990; ALJ Findings of Fact 16-1 through 16-6). In addition to indications that higher, more stable flows would improve salmonid spawning habitat, maximum sucker spawning habitat occurs at 700 cfs for the peaking reach (PacifiCorp 2005a) which is similar to the minimum instream flow of 690 cfs required by the BLM Modified Condition.

In addition to the ALJ's findings, which generally focused on spawning habitat and migration, there are several studies which collectively support the conclusion that low base flows lower growth and productivity of the redband trout population in the J.C. Boyle Bypassed Reach.

> (a) Addley et al. (2005) documented that macroinvertebrates have been reduced by dewatering the channel. Macroinvertebrate drift data showed much lower drift density in the dewatered reach compared to the Keno reach above J.C. Boyle Dam.
>
> (b) PacifiCorp (2004b) documented that older larger fish, which need higher intake rates and larger prey to maintain growth, grow more slowly and exhibit reduced fish survival in the J.C. Boyle bypassed reach compared to the Keno reach. The fact that few larger and older fish persist in the Bypassed Reach indicates that low flow conditions in the Bypassed Reach are energetically unfavorable due to lack of food resources and habitat availability.
>
> (c) The City of Klamath Falls (1986) documented that Project operations in the J.C. Boyle bypassed reach negatively impact the redband trout fishery and habitat, including food availability, fish production, and overall fish size.
>
> (d) Oregon Department of Fish and Wildlife (2003) documented that the minimum flows of 100 cfs in the J.C. Boyle Bypassed Reach did not adequately

> provide for a healthy productive fish community, with reduced growth, low relative weights, and low persistence of fish over age 4.

Finally, BLM considers this reach to have high potential for anadromous fish adult holding and spawning habitat due to the presence of deep pools and runs in combination with high volume cold water springs that can offer refugia areas during summer and winter water conditions. There is no evidence that the ALJ's findings for trout habitat in the Bypassed Reach would not also be applicable to anadromous fish habitat. In fact, for FWS/NMFS Issue 7, the ALJ examined the suitability of the Project reaches for providing habitat for anadromous fish including spawning habitat. His final rulings included the following findings which support Robison's conclusions:

> "The record, however, shows that there are approximately 28 miles of suitable habitat for anadromous fish to spawn in the main stem provided gravel is placed in those areas. Such habitat includes areas cooled by springs (thermal refugia) in the J.C. Boyle bypass (Finding of Fact 6-1).

This discussion highlights the impacts of Project operations on aquatic habitats, and points out that 100 cfs flow below the J.C. Boyle Dam will not improve aquatic habitat in the Bypassed Reach, but maintain the poor conditions that currently exist.

b). J.C. Boyle Peaking Reach Fish Habitat

PacifiCorp proposes in its Second Alternative Condition to add 100 cfs either at the J.C. Boyle Dam or at the J.C. Boyle Powerhouse. Based on PacifiCorp's recommendation in its comments on the DEIS (PacifiCorp 2006c, page 2-3), the BLM analysis considers that the additional 100 cfs would be added at the J.C. Boyle Powerhouse. PacifiCorp asserts that because streambed wetted area is increased and PHABSIM weighted usable area (WUA) is nearly maximized, that adding 100 cfs to the existing baseflow of 320 cfs "…would nearly maximize the instream habitat for adult trout" (PacifiCorp 2006 page 65).

PacifiCorp's rationale is based solely on the results of the PHABSIM modeling. Several other studies to supplement the PHABSIM results show that higher flows are needed to protect aquatic resources. Other studies that inform instream flow alternatives analysis are the wetted perimeter analysis contained in PacifiCorp's Instream Flow Addendum Report (PacifiCorp 2005a), a side channel incipient flow analysis (PacifiCorp 2005), a bioenergetics model (Addley et al 2005) and a 2-dimential PHABSIM model which examined a Peaking Reach channel section with a significant side channel (Addley and Allen 2005). In addition to these studies, BLM examined hydrologic methods including an IHA (Indicators of Hydrologic Alteration) analysis (Huntington 2005), and strict applications the Tennant (1976) and Tessman (1980) formulas. This additional information is outlined in the rationale for the BLM preliminary condition (USDI 2006). The results of these analyses indicate that 420 cfs in the Peaking Reach falls short of adequate protection of aquatic resources.

BLM notes that PacifiCorp did not analyze spawning in either the Bypassed or Peaking reaches because the suitable spawning areas identified were insufficient to develop a

model (PacifiCorp 2005a). Since the maintenance and enhancement of spawning habitat for multiple salmonid species is needed, BLM sought other sources of information to make inferences regarding the availability of spawning habitat and the flows required to provide adequate quantities of that habitat. This included a reworking of the transect data from the PHABSIM study (Robison, 2006). These results show that maximum spawning habitat occurs at Dam release flows of approximately 600 cfs in the J.C. Boyle Bypassed Reach for steelhead, with similar results for Chinook (900 cfs) and coho salmon (450 cfs). Under the current flow regime in the Peaking Reach, trout do not presently spawn (ALJ Decision at 44 FOF 16-1) and spawning habitat is essentially unavailable due to low flows (FERC 1990; ALJ Decision at 44 FOF 16-3).

Minimum flows in the J.C. Boyle peaking reach occur as a function of flow releases at J.C. Boyle Dam, combined with J.C. Boyle bypass reach spring accretions, when water is not flowing through the J.C. Boyle Powerhouse. The record of evidence has established that peaking operations, including associated minimum flows, negatively impact the fish populations including redband trout and the forage fish population. The ALJ substantiated this evidence in his Ultimate Finding of Fact for BLM Issue 16, in Findings of Fact 16-1 through 16-6, and in his discussion of these findings (ALJ Decision, page 77-78).

The ALJ also made findings on the effects of low flows on rearing habitat (FOF 16-6). His ruling supports BLM's rationale that higher flows are needed to sustain quality rearing habitat. The ALJ stated "The Project reduces the frequency and extent of inundation of depositional features in the bypass and peaking reach. This hydrologic impact reduces the availability of suitable rearing habitat for juveniles." (ALJ Decision, page 45, FOF 16-6).

PacifiCorp also suggests that "…the addition of 100 cfs would… increase the area of the streambed that is continually wetted, and correspondingly reduce the amount of the streambed that would be subjected to watering and dewatering events…during periods of flow fluctuations." While the first part of this statement is accurate (increased wetted area) there is no evidence that there would be a reduction in the amount of streambed that would be dewatered since there is no proposal to limit the amount of water to be added though the turbines. The wetted perimeter analysis suggests that the channel is not filled at 420 cfs but instead requires approximately 700 cfs to reach a break in channel slope for riffle and runs (PacifiCorp 2005a). It is only after flows exceed the break in slope that there would be a decrease in the amount of streambed area dewatered for a given flow change.

The ALJ substantiated BLM's conclusion that low flows due to Project operations affect the availability of habitat in the Peaking Reach. In his summary the ALJ found:

> "The evidence in the record establishes that current operations have adversely affected the redband trout fishery resource. First, the J.C. Boyle Dam traps sediment necessary for spawning habitat. **Second, the existing flow regime has increased the embedment of fine sediment in spawning gravel, impairs spawning migrations, and causes low flows, which contribute to the lack of**

> **successful spawning.** Third, the peaking operations cause stranding of aquatic organisms, results in downstream displacement of juvenile fish, increases the energetic demands placed upon adult trout, and lowers the production of macroinvertebrate prey. The proposed River Corridor Management Condition would address these negative impacts." [**emphasis added**]

ALJ Decision at 77-78.

> "**The Project's artificial low flow regime contributes to the lack of available spawning gravel in the J.C. Boyle peaking and bypass reaches.** (FOF 16-3 to 16-6). Prior to the J.C. Boyle Dam, trout were observed spawning in the peaking reach. (FOF 16-2). Currently, trout do not spawn in the peaking reach and only limited spawning has been observed in the bypass reach. (FOF 14-21; 16-1). While sediment blockage at the J.C. Boyle Dam has contributed to lack of suitable spawning gravel in both reaches, **low flows reduce access to spawning gravel that remains.** Spawning gravel has been observed along channel margins and on depositional features in the peaking and bypass reach. (FOF 16-3 to 16-6). However, **when low flows occur, portions of this margin-habitat are no longer inundated with water, making the spawning gravel unusable.** (Id.). The proposed conditions would substantially alter the current flows by providing an overall increase in base flows. (FOF 19-8 to 19-10). **Higher base flows allow for greater inundation of habitat suitable for spawning.**" [**emphasis added**]

ALJ Decision at 78

This discussion highlights the impacts of Project operations on aquatic habitats, and points out that an additional 100 cfs flow below the J.C. Boyle Powerhouse, in the absence of other measures such as ramp-rate restrictions, a seasonal high flow and sufficient sediment augmentation, is not likely to improve aquatic habitat in the Peaking Reach.

c). Instream Flow Methodology

BLM and other stakeholders recognized that the 1-dimentional PHABSIM could not be the only study relied upon for making instream flow decisions. This led to several other studies being completed to supplement the PHABSIM study. While the BLM considered the PacifiCorp PHABSIM study, BLM and other fisheries scientists noted several inadequacies in the model that were never fully addressed by PacifiCorp. Detailed explanations of these deficiencies were provided to FERC in DOI's comments on the DEIS (DOI 2006a) and other supporting documents (Li 2006; Robison 2006). These inadequacies result in the PHABSIM study not being reliable for use in isolation from the other studies. BLM used all of the information and studies available to inform its decisions.

The Tennant method is a commonly used, scientifically based method for developing instream flow recommendations. It is a hydrology based method rather than an incremental physical habitat model (Annear et al 2004) and has been accepted for this use by Alaska courts (Estes 1998). According to Tharme (2003) hydrological methods constitute the most used methodology for environmental flow assessment. It is also

common practice to employ multiple methodologies for comparative purposes and to test for applicability and agreement between methodologies (Whiting, 2002).

PacifiCorp asserts that the modified Tennant method has significant limitations and is a much less accurate predictor of the habitat effects of flows than the PHABSIM model as applied to the Project reaches. BLM does not dispute the fact that the modified Tennant method is not an incremental methodology that produces flow versus habitat relationships. BLM does argue that that under the circumstances, the method was properly applied and represents a reasonable and scientifically defensible method that actually lines up with several of the habitat vs. flow relationships determined using PHABSIM methodology (See examples from Robison, 2006 and Li, 2006).

Tennant recommends 30% of unimpaired average annual flow for "for sustaining good survival conditions for most aquatic resources and general recreation." BLM recognized several factors that needed consideration in evaluation of a Tennant based flow recommendation and applicability to the Klamath River. First, upstream uses deplete average annual water yield by approximately 10-15%. Therefore, 30% of "unimpaired" hydrology would be approximately 640 cfs. Secondly, BLM recognized that hydrologic and geomorphic conditions in the Klamath River were not entirely analogous to the intermountain streams upon which Tennant based his recommendation. Therefore, adjustments were made based on review of the available information. With regard to the Bypassed and Peaking reaches, the BLM conducted field visits to visually compare various flow levels, including release flows of about 500 cfs. With respect to the Peaking Reach, the BLM examined PacifiCorp wetted perimeter analysis results for riffle and run habitats and the incipient flow side channel analysis. Finally, BLM examined the results of relevant PHABSIM studies, including the PacifiCorp PHABSIM study, the BLM flow study (Henricksen, et al. 2002), the bioenergetics study (Addley et al 2005), and the 2-PHABSIM side channel results (Addley and Allen 2005), and the reworking of PacifiCorp (2004) habitat transect data for anadromous fish spawning (Robison 2006). Using all of this information and in consideration of recreation and power generation interests, BLM selected 470 cfs or 30% of the current hydrologic conditions. When this amount of flow was checked against relevant geomorphic conditions as Tennant and others suggest, BLM found that there was general agreement among the site specific studies. That is, 470 cfs dam release strikes a reasonable balance in providing side channel habitat, improvements in WUA for several life stages of trout, reasonable responsiveness to wetted perimeter analysis, and general agreement with the bioenergetics model and 2-d side channel PHABSIM results.

PacifiCorp asserts that "In most cases, the modeling showed that riparian and fish habitat would not be materially improved in the reaches if flows were increased" (PacifiCorp 2006, page 78). BLM does not dispute the fact that many of the WUA curves are flat (unresponsive to changes in flow). Therefore, it is not surprising that in some cases the modeling shows only modest increases in available habitat.

In responding to criticism of the hydrological based Tennant/Tessman methods, it is equally important to consider the limitations of PHABSIM results. Numerous authors

have pointed out the high statistical uncertainty, lack of ecological relevance, and user biases of PHABSIM results (Annear et al. 2004, Bovee et al 1998). Importantly, PHABSIM is unable to predict channel responses to changes in flow and sediments (Bovee et al 1998). BLM has established, and the ALJ substantiated, that geomorphic changes resulting from Project dams and operations have altered the channel bed and sediment transport processes. PHABSIM results are predictions based on the present condition of a stream (Bovee et al. 1998). BLM has established that the channel and habitat conditions in the Bypassed and Peaking reaches have the capacity to improve with implementation of an appropriate flow regime and restoration of a sediment supply (ALJ Decision at 87 UFOF 13, 14 and 15). The stream morphology and substrate conditions will change when flow and sediment changes are implemented, which in turn will affect the quantity and quality of habitat in the Bypassed and Peaking reaches. Ultimately, this means that the PHABSIM results that PacifiCorp relied on to make its minimum flow proposal cannot be relied upon to accurately predict the quality and quantity of habitat that would result under a different flow and sediment regime. FERC in the DEIS and the ALJ Decision at 41 FOF 14-4 both recognized that implementation of a coordinated gravel augmentation plan with a seasonal "flushing" flow would likely improve habitat and channel complexity.

Since PHABSIM is not capable of predicting how changes in flow can affect channel form and substrate conditions, a hydrology based approach is a reasonable alternative since a hydrology based approach is not affected by channel impacts. This was a substantial consideration in the decision to not exclusively rely on the PHABSIM results to select between different flow alternatives.

Finally, PacifiCorp asserts that "the Tennant method or the modifications have never been calibrated or tested for the hydrology, topography, geology or ecology of the Klamath River." This argument is without merit since the BLM based its decisions on several site specific studies and modified the flow regime based on the seasonal hydrologic patterns of the Project inflow. With regard to calibration to the ecology of the Klamath River, the same argument could be applied to a PHABSIM study insofar as flow values determined from habitat vs. flow relationships are not correlated in any way to fish abundance or fish biomass.

In summary, the BLM concludes that the Tennant/Tessman methods as applied by BLM in concert with other instream flow study data, is an appropriate methodology to use in informing decisions regarding minimum flows necessary for the adequate protection and utilization of the reservation.

d) Water Quality and Temperature

PacifiCorp asserts that the BLM preliminary condition "will likely only diminish existing water quality…" by having the "…unintended adverse consequence of raising bypassed reach temperatures by impairing or eliminating the cooling effect of natural springs." PacifiCorp asserts that the condition is not necessary, or appropriate and is inadequate for protecting any BLM resource due to the

likelihood that water temperatures would increase. The BLM considered the increased temperature on fish habitat and determined that the effects would not be detrimental due to the cool water from the spring accretions in the Bypassed Reach. The minimum flows will improve riparian and fish habitat in the Bypassed Reach by providing flows more similar to those in which the riparian and aquatic species are adapted. The BLM stipulated that the Bypassed Reach minimum flows required by the condition will raise the water temperatures downstream of the springs located in the Bypassed Reach. *See* Order Granting, in part, the Federal Agencies' Motion to Dismiss Certain PacifiCorp Issues dated July 13, 2006. However, BLM will not make any determination as to whether this fact would result in the impairment of water quality in this reach. As addressed in the State of Oregon Notice of Intervention and Response, (May 9, 2006), the Project's impacts to water quality in the J.C. Boyle reaches will be "subject to evaluation and findings by the Oregon Department of Environmental Quality pursuant to Section 401 of the Clean Water Act, 33 U.S.C. § 1341."

BLM has concluded based on the substanitial evidence in the record that 1) food availability would be greater with the minimum flow requirement; 2) beneficial temperature conditions for resident redband trout may occur with a higher flow release; and 3) lack of immediate, complete mixing of water with different temperatures (dam release flow and spring accretions) would provide for persistence of large areas of cold water (thermal refugia) for fish. The FERC DEIS, comments to the DEIS provided by the Department of Interior, and the findings of fact from the ALJ substantiated several of these lines of evidence.

> 1) Klamath River redband trout have demonstrated their capacity to grow at very high temperatures given an adequate food supply (Addley 2005). As indicated by bioenergetic studies (Addley 2005), trout growth in all Project reaches is more influenced by the food supply than by temperature. With a flow release of 470 cfs, average temperatures would be suitable, if not near "optimal" for salmonid growth, and do not exceed acute levels (PacifiCorp Dec 29, 2006, page 30). In the laboratory studies used to determine optimal temperatures for growth, fish are fed maximum food rations. Higher nutrient levels are expected to increase forage food production which would compensate for less than optimal temperature conditions for growth. Food availability in the J.C. Boyle bypass reach would be greater with higher flow releases, because the water released from J.C. Boyle Dam is higher in nutrients. This would support greater growth of periphyton and, in turn, higher concentrations of macroinvertebrate prey for fish (Gard 2006).
>
> 2) When using general rainbow trout growth and feeding temperature optimums (13ºC to 16ºC, Behnke 1992), Gard (2006) found that despite slightly less than optimal temperature conditions for growth, increased drift would compensate for higher temperature and may result in greater growth rates with the BLM required minimum streamflow of 470 cfs.
>
> Bartholow and Heasley (2005) show that increased flow releases from J.C. Boyle Dam will decrease water temperatures in the bypassed reach above the springs

and increase water temperatures in the bypassed reach below the springs. This is illustrated in Figure 2 (PacifiCorp, page 30, Dec 29, 2006). Under the current flow regime, temperatures approach acute levels **above** the springs. Higher flows can ameliorate temperature concerns in this section of the Klamath River. According to Bartholow and Heasley (2005), upstream of the springs, the maximum stream temperature would be 26.9 ºC under a worst-case climatic scenario for July when flows are 100 cfs. This is in the range of acute mortality for normal rainbow trout, 24 to 27 ºC (Moyle 2002), and close to acute mortality for redband trout (28 to 29 ºC, Behnke 1992). At 450 cfs, which is near the BLM prescribed flow, maximum stream temperatures would be 25.1 ºC, which is below the acute mortality threshold for rainbow trout (Bartholow and Heasley 2005).

According to PacifiCorp, mean water temperatures in the three miles below the springs are only slightly above optimal for trout growth and survival (PacifiCorp 2006, Figure 2, page 30). Maximum water temperatures remain well below acute levels and are always lower than temperatures in the peaking reach, the Keno reach, and the bypass reach above the springs. Thus, in the three miles below the springs, negative impacts to fish due to water temperature are not a concern.

3) In addition to the lack of water temperature concerns for the fully thermally mixed portions of the bypass reach, spring areas will remain available as cold water refugial areas. The ALJ partially addressed this issue when considering PacifiCorp's proposed findings of fact for FWS/NMFS Issue 6. The ALJ rejected all of PacifiCorp's proposed findings with respect to effects of increased flows and temperature, but acknowledged that, "The Federal Agencies concede that increased flow in the J.C. Boyle bypass reach will increase water temperatures in the summer. However, the record evidence is inconclusive as to the degree of temperature change." (ALJ at D-66, Ruling 2-52).

The ALJ's decision rejected PacifiCorp's argument that the BLM flows would degrade the beneficial cooling effect of the springs in the bypassed reach and validated that the BLM minimum streamflow requirement would provide thermal refugia. He stated, "The record evidence demonstrates that the BLM flow conditions would leave approximately a 200-yard thermal refugia area for use of anadromous fish. Further, in the J.C. Boyle bypass reach, springs would continue to offer a thermal refugia area for fish." (ALJ at D-67, Ruling 2-55).

2) Ramp Rates: PacifiCorp's alternative ramping rate restrictions would not result in reducing the Project's effects to aquatic species; BLM's Condition would reduce those effects.

a). J.C. Boyle Bypassed Reach Ramp-Rate Restrictions

PacifiCorp proposes to limit the downramp for releases at J.C. Boyle Dam to 150 cfs per hour, suggesting that this is five-fold less than the current license rate and that this will reduce the potential for stranding associated with spill events. BLM estimates that 150

cfs per hour is equivalent to approximately 2 inches per hour and is therefore similar to the BLM preliminary condition for the downramp rate in the Bypassed Reach. The BLM considers this downramp rate adequate to protect resident trout and other aquatic organisms currently residing in the Bypassed Reach.

Much of the Project impact information on ramp rates in the peaking reach in the record is applicable to the bypass reach. This is particularly true with respect to downramping events following periods of high flow or downramping during the spawning and incubation period (March-June.) The massive stranding event following downramping after a period of high flows in the peaking reach (observed by Dusmoor 2006) indicated that ramping rates can also be a serious concern in the bypass reach. Since the bypass reach also has high flow events during spill (flows greater than 3,300 cfs), followed by downramping to the minimum base flow (100 cfs), stranding events similar to the one observed in the peaking reach could occur in the bypass reach. Further, evidence that stranding has occurred due to Project operations in the bypass reach is apparent from ODFW file reports. These reports provide accounts of numerous fish strandings and die-off events below Link River, Keno, and J.C. Boyle Dams (ODFW 2006). For example, in the bypassed reach a fish mortality and stranding event was reported by ODFW on April 11, 1989 when inflows were reduced to the base flow of 100 cfs after an extended duration of spill.

Although no trout were observed by Dunsmoor in the peaking reach, it has been established that there are extremely low densities of trout fry and juveniles in the peaking reach compared to the bypass reach. Therefore, in addition to the types of impacts observed by Dusmoor in the peaking reach, trout and potentially incubating eggs could be stranded if a similar event occurred in the bypass reach.

FERC recognized the potential for fish stranding, but was unaware of the ODFW finding which documented stranding occurrences in the bypass reach. In the DEIS, FERC stated:

> "When release flows drop from about 1,000 cfs to the 100 cfs minimum flow, dewatering of streambed areas and a few side channels can pose a risk of stranding to small fish"(FERC 2006, 3-238:34-27).

As substantiated by BLM's record of evidence and the ALJ findings of fact for BLM Issue 17 (See ALJ findings below), existing upramp rates in the Bypassed Reach that PacifiCorp does not propose to limit are also impacting fish populations and food resources and are potentially affecting fish populations and growth. Therefore, BLM finds that an equally restrictive upramp rate would be needed to protect aquatic resources in the Bypassed Reach.

PacifiCorp disputes the BLM's rationale for the up-ramping restriction component of the BLM preliminary condition. PacifiCorp asserts that "…there is no evidence demonstrating that current upramp rates are adversely affecting native fish populations..." and that "[a]vailable data shows that peaking operations are not adversely affecting fish populations and that fish do not migrate in response to peaking" (PacifiCorp 2006 page 77).

The BLM has established and the ALJ has substantiated that: "The BLM's proposed upramp rate will improve conditions for fish resources and other aquatic organisms by reducing adverse effects caused by the existing nine inch/hour upramp rate."
ALJ Decision at 87 UFOF 17

The ALJ validated the BLM Condition in the summary of his findings of fact concerning upramping as follows:

> "PacifiCorp's peaking operations cause extreme daily flow fluctuations and create upramp rates as high as nine inches/hour in the J.C. Boyle peaking reach (*FOF 17-1*). BLM conditions propose an upramp rate of no more than two inches/hour (*FOF 17-2*). Upramp rates of two inches/hour are similar to naturally occurring rates and will be protective of fish resources. (*FOF 17-2 to 17-4*). The current peaking operations and their unnatural upramp rates create several conditions that are harmful to the trout fishery."

ALJ Decision at 79.

PacifiCorp itself indicates that an up-ramp or down-ramp rate of two inches per hour would "…protect fall spawning Chinook salmon in the peaking reach…" and would "…provide relatively stable flows to prevent the stranding of emerging Chinook and steelhead fry and migrating juveniles" (PacifiCorp 2006d, page 10 and 11). From this BLM concludes that an equally protective ramp rate would be needed in the Bypassed Reach, particularly since this reach has large volume springs that would benefit spawning, provide temperature refugia, and has a more stable flow regime.

PacifiCorp's Second Alternative Condition does not provide sufficient upramp restrictions for protection of aquatic species in the Bypassed Reach.

b). J.C. Boyle Peaking Reach Ramp-Rate Restrictions

PacifiCorp's Second Alternative Condition would preclude full two-unit peaking. BLM acknowledges that the 1,400 cfs per day limit is an improvement over existing Project operations because it reduces the magnitude of daily flow changes to the extent that two-unit peaking currently occurs. However, the frequency of large magnitude flow changes (a nearly six fold change in flow magnitude) would still occur under this measure. No evidence is provided that would indicate that this measure would significantly alter the existing impacts which include fish and macroinvertebrate stranding, dewatering of spawning and rearing habitat, lowered macroinvertebrate production, lower growth and reduced fish size, and potential downstream displacement of juvenile salmonids. BLM has established in the record that current peaking operations are harmful to the J.C. Boyle

redband trout population (USDI 2006). These impacts were substantiated by the ALJ's findings for BLM Issues 16 and 17 which affirm the harmful impacts of current peaking operations. Current peaking operations are dominated by single unit peaking and the data collected support these findings and was largely collected during and influenced by single unit peaking regimes. Therefore, BLM does not consider this measure to be a substantial increase in protection from existing peaking effects and does not find it adequately protects aquatic resources in the Peaking Reach.

Limiting the upramp rate to 9 inches per hour, and the downramp rate to 4 inches per hour for flows less than 1000 cfs, does not adequately protect aquatic resources in the Peaking Reach. Although the downramp rate change from 9 inches to four inches represents an improvement, downramp rates of greater than 2 inches are known to cause stranding of fish and macroinvertebrates (Hunter 1992). The fact that a downramp rate of approximately 4 inches per hour can cause massive stranding in the Peaking Reach was substantiated by Larry Dunsmoor of the Klamath Tribes (Dunsmoor 2006). In a single downramp event, he observed thousands of fish stranded and an order of magnitude more invertebrates stranded following a period of steady high flow. The ramp rate at the location of the stranding event was approximately 4 inches per hour (Dunsmoor 2006).

The ALJ acknowledged the BLM condition in his decision, stating "Reduced ramp rates can resolve the problem of fish standing. (*FOF 16-13, 16-14*). The BLM proposed conditions calls for a two inch/hour maximum downramp rate, a drop from the four inch/hour ramp rate used at the sites where severe mortality of aquatic organism occurred. (*FOF 16-13, 16-14*). Ramp rates of two inch/hour have been shown to be effective at stopping the occurrence of stranding (*Id*.)" (ALJ Decision, page 79).

The record of evidence upon which the ALJ made his decisions regarding ramp rates and peaking impacts relied on extensive amounts of research demonstrating that high ramp rates cause harm to aquatic life (Finding of Fact 16-7) but also on site specific studies completed in support of the Salt Caves License Application (FERC 1990) and more recent studies specific to the Klamath River. The recent studies substantiate that more moderate ramp rates would reduce stranding mortality (Finding of Fact 16-10), reduce flushing of fry and juveniles (16-15 to 16-20), reduce energetic demands affecting fish growth and survival (16-21 to 16-23), increase macroinvertebrate production (16-24 to 16-25, 17-4 to 17-7), and increase forage fish availability (17-8 to 17-9).

Additionally, anadromous fish reintroduction would result in multiple salmonid species spawning and rearing in the Project reaches. PacifiCorp itself has indicated that an up-ramp or down-ramp rate of 2 inches per hour would be protective of spawning Chinook salmon in the Peaking Reach and would "…provide relatively stable flows to prevent the stranding of emerging Chinook and steelhead fry and migrating juveniles." (PacifiCorp 2006d, page 10 and 11).

PacifiCorp provides a rationale for adequately protective (2 inches per hour) ramp rates which is similar to the rationale in BLM's preliminary conditions.

> "To ensure spawning success, it will be important to maintain water levels that will not dewater redds. It is equally important to avoid fluctuating water levels during fry emergence since this is the weakest swimming life stage for salmonids. In the Northwest, a common reference used to support ramp rate proposals is Hunter, Hydropower Flow Fluctuations and Salmonids: A review of the Biological Effects, Mechanical Causes and Options for Migration [Mitigation] (1992). This report is a review of studies that were conducted on low-gradient, gravel dominated, alluvial streams predominately for anadromous fish. Hunter (1992) concluded that ramp rate of two inches per hour would provide protection for aquatic organism to adjust to changing water levels without excessive mortality due to poor swimming success, entrapment, or stranding. Therefore the 2 inch per hour ramp rate proposed by PacifiCorp will provide adequate protection during these life stages"

With respect to peaking and ramping effects, the ALJ made numerous findings of fact which substantiate the BLM's rationale for the preliminary condition that existing up and down ramp rates of 9 inches per hour cause harm to aquatic resources (See ALJ Decision at 45-46 (FOF's 16-12 to 16-15)). In summary, these findings substantiate that peaking is a widely documented source of stranding resulting in cumulative impacts to fish populations, and that PacifiCorp's peaking operations cause high mortality to fish and macroinvertebrates (the primary food source for trout) in the Peaking Reach. PacifiCorp's modest improvements in ramp rates do not offer significant protection of aquatic resources. The record of evidence which the ALJ considered in making his findings substantiates the need for significantly more protective ramp rates than proposed by in PacifiCorp's Second Alternative Condition.

In addition to finding that existing ramp rates are not protective, the ALJ substantiated evidence in the record that a ramp rate similar to BLM's required 2 inch/hour ramp rate would be protective of aquatic resources. Based on review of information regarding the large stranding event in 2006, the ALJ found that "Reduced ramp rates can resolve the problem of fish stranding" (ALJ Decision at 45 FOF 16-13) and "At a site further downstream where no mortalities of fish were observed, the ramp rate was 2.4 inches/hour, similar to BLM's proposed condition of a 2 inch/hour maximum downramp rate" (ALJ Decision at 46 FOF 16-14).

Evidence that Project flow operations are affecting the health and status of the trout population substantiate that peaking, flow and ramping measures proposed by PacifiCorp are not adequately protective. The ALJ acknowledged that "Flushing of juvenile salmonids downstream is likely in the peaking reach" (ALJ Decision at 46 FOF 16-16) and "Few fry have been captured in the Oregon section of the peaking reach; the section of the peaking reach with the highest ramp rates" (ALJ Decision at 46 FOF 16-17).

Conversely, he also found that "PacifiCorp did not meet its burden to show that peaking flows, in the Oregon portions of the peaking reach, do not result in downstream displacement of juvenile salmonids." ALJ Decision at 80.

High ramping rates associated with peaking operations can adversely impact fish survival by increasing down migration rates and predation pressure on stranded individuals, and by causing energy deficits in fish responding to rapid changes in flow. The existing daily flow patterns have a negative effect on the fishery resource because they affect food availability, available habitat area, and stranding losses. The fact that peaking, including associated ramp rates, is negatively impacting fish populations in the peaking reach was established during the hearing.

Evidence that Project operations are causing fish to incurr energetic costs resulting in fewer and smaller sized trout in the Peaking Reach was also substantiated by the ALJ's findings. The ALJ found that flow fluctuations cause trout movement, induce macroinvertebrate drift, produce a varial zone devoid of benthic food productivity and reduced forage fish abundance. See ALJ Decision at 47 FOF's 16-21 to 16-25; ALJ Decision at 48-49 FOF's 17-3 to 17-9.

The ALJ validated that the upramp rate can also cause chronic macroinvertebrate losses, incur energetic costs for fish, and impact the success and abundance of forage fish species such as suckers and dace. The discussion and findings of fact from the ALJ include:

> "Peaking operations also affect the energetic demands placed on trout and decrease macroinvertebrates prey. Peaking operations force trout to increase movement, which in turn decreases energy available for overall health, growth, and reproduction.[6] (*FOF 16-21*). Peaking operations reduce the production of macroinvertebrates by ten to twenty-five percent. (*FOF 16-24*). Macroinvertebrate drift rates, a measure of food availability for trout, is five to six times greater in the non-peaking Keno reach than in the peaking reach. (*FOF 16-25*). Peaking operations contribute to the lower macroinvertebrate drift rates, which in turn decrease the macroinvertebrate prey available for trout (*Id*.)" (ALJ Decision, page 80 to 81).
>
> "Comparing growth of trout in the non-peaking Keno reach to the trout in the J.C. Boyle peaking reach provides insight into the effects peaking has on trout growth. Growth rates are greater in the peaking reach through age two. (*FOF 16-26*). Growth rates are similar in both reaches between ages two and three. (*Id*.). Growth rates are greater in the non-peaking Keno reach after age three, and the Keno reach trout are older. (*FOF 16-26, 16-30*). Since larger fish operate closer to the energetic margins than smaller fish, it makes sense that lower energetic demands in the non-peaking reach would result in larger adult trout. (*FOF 16-23*). Mature fish grow larger when they prey on forage fish, a higher energy

[6] PacifiCorp's radio-telemetry study indicated that peaking operations did not induce any significant trout movement. (*PAC PFF 75*). However, PacifiCorp's radio-telemetry study only detects upstream-downstream fish movement, so it would not detect all fish movement that would increase energetic costs. (*PAC-Ols-D-20 at Sec. 5, 5-8, 5-9*). High water flows force trout to swim faster to stay in place. (*BLM-Simons-Ex. 0 at 5:8-6:7).* Fish also move laterally with changes in flow; fish move from the center of the channel at low flows to the edges of the channel at high flows. (KTR-*LKD-DT-BLM 16 at 7:13-17; KTR-LKD-Ex. 10 at 26*).

source than invertebrate drift. (*FOF 16-31*). The Project-caused impacts to forage fish (via stranding and displacement) help explain the lower growth rates and absence of larger trout in the peaking reach.[7] (*FOF 16-32*). High growth rates of younger trout in the peaking reach indicate that peaking effects on macroinvertebrate prey are not substantial. Since younger fish prey mainly on macroinvertebrate, if peaking operations were having a substantial effect on macroinvertebrate prey, a lower growth rate in younger fish would be expected. By comparing the growth of trout in the non-peaking Keno reach to the growth of trout in the J.C. Boyle peaking reach, it has been established the peaking operations decrease growth rates for mature trout…" (ALJ Decision, page 81 to 82).

PacifiCorp also asserts that its proposed ramping rates also provide whitewater boating and angling opportunities because one unit can provide raftable flows and anglers will have larger time windows for angling opportunities. While it is reasonable to suggest that the general peaking pattern would continue to provide for whitewater boating, it is not clear how one unit peaking would extend the "window" for angling over a two unit peaking scenario. Since angling generally occurs during off-peak periods, two-unit peaking would provide a longer angling window because it would use up available peaking storage in less time than single unit peaking.

In summary, the evidence clearly shows that a substantial reduction in ramping and peaking is needed to reduce aquatic resource impacts.

3) Seasonal High Flow and Sediment Augmentation Program: PacifiCorp's alternative does not include a seasonal high flow and would result in continuing adverse effects to aquatic habitats, stream channel complexity and riparian habitat quality; BLM's Condition would improve conditions for these resources.

PacifiCorp's Second Alternative Condition does not provide for a seasonal high flow (or "flushing flow" as PacifiCorp terms it.) The BLM provided substantial justification in its rationale for the preliminary condition in support of the measure (USDI 2006) to which PacifiCorp disputed several material facts used by the BLM. In PacifiCorp's rationale for its Second Alternative Condition, several assertions are made regarding the seasonal high flow, and in some cases, in combination with the sediment augmentation measure.

a). Feasibility

PacifiCorp first asserts that the "flushing flows" required by the BLM's preliminary condition are not feasible, but does not provide rationale as to why, other than to assert that the J.C. Boyle Project "does not have the storage capacity to significantly alter the frequency and impact of larger floods." This assertion is irrelevant to the feasibility of

[7] PacifiCorp cites a study it sponsored which asserts that Keno trout are larger because they have access to a minnow forage base and reservoirs. (*PAC Reply Brief Appendix at 28*). Such conditions may contribute to the increased size of Keno reach trout, however PacifiCorp has failed to adequately discount the effects that stranding and downstream displacement will have on forage fish supply.

providing a "seasonal high flow" into the Bypassed Reach at J.C. Boyle Dam when inflows to the reservoir exceed 3,300 cfs, as required in the BLM preliminary condition. The seasonal high flow is feasible, as it can be accomplished entirely through spill at the dam.

b). Channel Geomorphology

PacifiCorp asserts that the "flushing flows" required by the BLM's preliminary condition are not necessary since it disputes that "channel geomorphic changes in the J.C. Boyle Bypassed Reach caused by Project conditions have resulted in detrimental effects on aquatic and riparian habitats, including channel narrowing, increased bank erosion, and reduced channel migration" (PacifiCorp 2006 page 66).

Project induced physical processes have significantly altered the geomorphic function and biological productivity of the J.C. Boyle Bypassed Reach. First, the largest magnitude floods have continued by Project diversion but without sediment load, which is trapped in the reservoir. This has progressively stripped sediment from the relatively small but important pockets, pools, bar tops, and channel margins over the past 50 years. Second, the frequent annual floods have been reduced in magnitude and frequency by Project diversions, and a persistently very low summer base flow results from Project operations. Third, the design and operation of the J.C. Boyle emergency spillway has resulted in massive hillslope erosion and delivery of unsorted hillslope debris to the channel. Infrequent floods combined with repeated debris delivery have resulted in the accumulation of unsorted sediment in the channel at the outlet of the emergency bypass spillway. This body of sediment attracts fish for spawning, but it is embedded with fines and inherently unstable.

<u>Coarsening of the Streambed</u>
According to PacifiCorp (PacifiCorp 2004d) and the written testimony from Brian Cluer during the EP Act hearing, Project dams have caused coarsening of the bed:

> "The WR FTR (PacifiCorp 2004d, page 6-111, BLM Cluer Ex. 5) states: "Project dams have trapped significant quantities of bed load sediment over the course of Project operations. This has resulted in some coarsening of the bed downstream of Project dams. As a result, the channel classifications presented in this report may indicate that in certain reaches (e.g., the J.C. Boyle peaking reach at the USGS gauge, and downstream of Iron Gate dam at the fish hatchery), the channel is in the process of adjusting to a reduced sediment supply from upstream reaches" (Direct Testimony of Brian L. Cluer, BLM Cluer Exhibit 0, page 6:14-20).
>
> "…the authors of the WR FTR concluded that a finer bed material existed before the project. They used this conclusion, supported with multiple lines of evidence, in developing the sediment budget and the incipient motion calculations. Not explicitly stated by PacifiCorp is the corollary conclusion that the Project has diminished fine grained deposits that would have supported increased size, number, and qualities of invertebrate habitat, fish habitat, and potentially riparian

habitat" (Direct Testimony of Brian L. Cluer, BLM Cluer Exhibit 0, page 7:24 to page 8:4).

FERC concluded in the Draft Environmental Impact Statement (DEIS) for the Project that Project dams have multiple effects on physical processes and riparian and fish habitat. According to FERC, these include:

> "In the Oregon portion of the reach [J.C. Boyle peaking reach], habitat includes cascades, deep and shallow rapids, runs, riffles, and occasional deep pools. Substrate is heavily armored and consists primarily of boulders and large cobbles, with a few small pockets of gravel behind boulders" (FERC 2006, page 3-172: 4-6).

The ALJ Decision concerning the Project's effects on the Bypassed Reach substantiates the BLM's rationale for the seasonal high flow measure in the BLM preliminary condition. Several findings by the ALJ established that the Project has caused geomorphic changes in the Bypassed Reach that does indeed result in impacts to aquatic and riparian habitats. Project dams, in particular J.C. Boyle Dam, have trapped significant amounts of sediment, causing a reduction of sediment deposits in the Bypassed Reach. This has diminished the quantity and quality of fish habitat and resulted in smaller alluvial features. The findings of the ALJ conclude that sediment trapping by J.C. Boyle Dam is the primary cause of low sediment availability in the Bypassed Reach (ALJ Decision at 41 FOF 14-2) and that J.C. Boyle Dam has captured an average of 6,124 tons/year of channel bedload and thus has blocked its transport into the Bypass and Peaking reaches (ALJ Decision at 40 FOF 11-1). Overall, the bed material in the J.C. Boyle Bypassed and Peaking reaches has coarsened due to the J.C. Boyle Dam limiting the sediment supply. In addition, the sediment that is delivered to the channel or was in the channel at the time of Project construction is transported downstream during Project spill events in the Bypassed Reach and during peaking flows in the Peaking Reach (ALJ Decision at 40 FOF 11-3). In the Bypassed Reach, the channel bed is dominated by 64 percent boulders and 28 percent cobble. A reduction in fine grain deposits diminishes the quantity and quality of fish habitat (ALJ Decision at 41 FOF 14-1).

The ALJ validated the BLM's conclusions regarding Project effects when he acknowledged that additional changes to channel geomorphology, including that if Project-related "…coarsening of the bed had not occurred, it is likely that active features (e.g., point bars, islands) would have been characterized by finer sediment…" (ALJ Decision at 41 FOF 11-9) and that low base flows combined with sediment being blocked by J.C. Boyle Dam result in smaller alluvial features (ALJ Decision at 40 FOF 11-5). The ALJ found, as BLM had identified in its rationale for the preliminary condition, that there is a relationship between the physical changes in the channel and the resulting effect to aquatic and riparian habitat. As the Project reduces the frequency and extent of inundation of depositional features in the Bypassed and Peaking reaches, this hydrologic impact reduces the availability of suitable rearing habitat for juveniles (ALJ Decision at 45 FOF 16-6) and that implementation of coordinated sediment delivery with seasonal high flows (as provided in the BLM condition) can result in deposition of gravel in

velocity pockets on the bed and fine sands on the banks. These deposits have ecological benefits including creating spawning pockets around boulders and in pools (ALJ Decision at 41 FOF 14-4).

In addition to findings from the ALJ, FERC stated in the DEIS that, "[m]ore-frequent flushing flows would refresh spawning gravels and disperse sediment across the channel (and potentially onto the floodplain, depending on the magnitude of the flow), benefiting aquatic and riparian habitats" (FERC 2006, page 3-35: 17-31).

According to testimony from Cluer for the hearing, seasonal high flows in the Bypassed Reach would be beneficial to flush accumulations from the bed and redistribute them to higher elevations, useful to riparian plants. He stated, "In the bypassed reach, because of the prolonged duration of low base flows consisting of high concentrations of suspended solids during summer months, accumulations of fines and organic matter can build up in the bed. Seasonal high flows in the bypassed reach would be beneficial by annually flushing accumulations from the bed. Rather than accumulating and moving along the bed, fines can be redistributed to higher elevations by a seasonal high flow, where riparian plants can benefit from those nutrients" (Direct Testimony of Brian L. Cluer, BLM Cluer Exhibit 0, page 15:8 to page 16:4). The ALJ substantiated this benefit in his findings, "Seasonal high flows, in combination with the BLM's proposed gravel augmentation program, will likely create a more dynamic channel with a wider range of sediment deposits which will be deposited higher on the channel margin, serving an ecological benefit" (Finding of Fact 10-5).

<u>Hillslope Erosion and Debris Delivery to the Channel</u>
In contrast to the overall coarsening and reduction in channel-stored sediment downstream from J.C. Boyle Reservoir, focused hillslope erosion at the emergency overflow spillway, aggravated by decreased flood flow frequency, magnitude and duration, has resulted in a localized accumulation of hillslope debris in the channel.

In written testimony for the hearing, Cluer cited the PacifiCorp Water Resources Final Technical Report (PacifiCorp 2004d):

> "….Perhaps the most visible geomorphic change is downstream of the emergency overflow spillway near RM 222. Erosion at the spillway has significantly increased the rate of fine and coarse sediment delivery in this area, and bedforms have developed and changed through time as a result of this change in sediment supply. Project facilities and operations in this reach may have significantly affected underlying geomorphic processes in the reach" (Direct Testimony of Brian L. Cluer, BLM Cluer Exhibit 0, page 8:13-25).

Cluer also stated:

> "Sediment input at the emergency spillway erosion site provides relevant empirical evidence about the retention and value of sediment in the bypass reach. Since dam operations began in 1958, approximately 69,000 cubic yards of hillslope sediment has been delivered to the stream from the washout with an additional 10,000 cubic yards from associated erosion of the opposite bank (WR

> FTR pg 6-117, BLM Cluer Ex. 5). This gives an average annual sediment input from the emergency spillway and associated bank erosion of 2345 tons/year (from Master Sediment Budget spreadsheet, BLM Cluer Ex. 8). It is visibly obvious that a large quantity of this introduced sediment has accumulated in the Klamath River channel (See BLM Cluer Ex. 9)" (Direct Testimony of Brian L. Cluer, BLM Cluer Exhibit 0, page 8:13-25).

Erosion from the spillway, coupled with low base flows in the reach, cause sediment inputs to be greater than the river's ability to transport it at these flows. In the environmental consequences section of the DEIS, FERC describes impacts due to the J.C. Boyle canal emergency spillway as follows:

> "…project operations have increased sediment supply from point sources of erosion and fill encroachment on the river channel" (FERC 2006, page 3-29: 12-13).

This Project impact was further discussed by FERC:

> "With nearly 70,000 cubic yards of sediment eroded below it, the J.C. Boyle canal emergency spillway is the single largest point source of sediment in the project area. Currently, if the J.C. Boyle powerhouse trips offline, there is no bypass through the powerhouse to accommodate the water in the canal. Instead, it is spilled through the relatively low gradient concrete emergency spillway. Once water reaches the end of the concrete, it freefalls onto the canyon slope below, and flows to the river, eroding the hillslope in the process. The headward erosion of this hillslope may ultimately threaten the adjacent roadway, or even the canal itself. Given the nature of bypassed flows in the reach, sediment input from the spillway to the channel far outpaces the river's ability to transport it" (FERC 2006, page 3-29: 26-33).

<u>Distribution of Accumulated Sediment</u>

The threshold for sediment mobilization in the J.C. Boyle bypass reach is not as clearly understood as is necessary for describing the hydrologic effects of the Project, or the effectiveness of the proposed seasonal high flows on the debris deposit at the J.C. Boyle emergency spillway. PacifiCorp's study contained several biases. The tracer particles used in the study at the bypass reach were placed in the steepest section of the river and were limited to the center of the channel. Both of these actions bias the study toward a finding that a given flow can greatly mobilize particles (ALJ Decision at 71). The ALJ acknowledged that coarse sediment could be mobilized in the bypass reach with flows of 1,700 cfs and greater (Finding of Fact 10-2).

The FERC DEIS discussed some of the current limitations to understanding the flows required for mobilization of coarse sediment:

"All of PacifiCorp's tracer gravel work was completed within the J.C. Boyle bypassed reach (one site) or the J.C. Boyle peaking reach (two sites.) During the study, the site in the bypassed reach downstream of the emergency spillway experienced a peak flow of 1,700 cfs and had 4 tracers out of 16 total tracers undergo some movement. All tracers at the site ranged from 32 to 128 mm, and 2 tracers each from both the 32 to 64

mm class and the 64 to 128 mm class moved. Because 2 tracers in the 64 to 128 mm class moved at flows below 3,800 cfs, the calculated threshold estimate of roughly 3,800 cfs needed to move a 128 mm particle is probably an overestimate, and lower flows are likely capable of mobilizing spawning-sized sediment in this reach. Overall, these tracer gravel results and the results from the other sites, suggest that the reliability of PacifiCorp's hydraulic threshold of mobility calculations is variable when compared to empirical data.

The estimates of discharge at the threshold of bed mobility have substantial uncertainty. Sources of uncertainty include the Shield's numbers (a dimensionless value of critical shear stress) used in the calculations for each study reach cross section, which PacifiCorp based on a limited set of tracer gravel movement observations…. For the without-project estimates, PacifiCorp used an experimentally derived Shield's number obtained from studies on gravel-bed systems. Aside from arbitrary judgment, we have no further basis or available information upon which to quantitatively modify these parameters. Further, the Manning's roughness coefficient that PacifiCorp used to estimate the discharge associated with the depth of flow at the threshold of bed mobility was also calibrated at a limited number of study reach cross sections and then applied to the remaining study sites" (FERC 2006, page 3-38:1 to 3-39:10).

However, this mobilization threshold, as determined by PacifiCorp in the FLA and analyzed in the FERC DEIS, is valid only very locally on a steep portion of the debris deposit, because of sampling location biases. The mobilization threshold flow required for significant mobilization and downstream distribution of sediment to occur is substantially greater than 1,700 cfs. The emergency spillway deposit would not have accumulated to its present extent if this were not true, and recent prolonged high flows in the bypass reach would have been more geomorphically effective at eroding the deposit.

BLM has taken a conservative approach in the Modified Condition. This approach requires that the Licensee reexamine the flows necessary for mobilization and distribution of the augmented sediment as the effects of the Project on channel form, riparian vegetation, and aquatic habitats (notably salmonid spawning beds) are a function largely of the flows needed to mobilize the bed, the effects that Project operations have on these flows, and the frequency and duration of bed mobility and sediment transport given the lack of sediment recruitment from above the dams (FERC 2006, page 3-34: 15 to 3-35: 2).

c). Impoundment Impacts

PacifiCorp points to the Department's summary of impoundment impacts as "…another basis for flushing flows…" citing that "…DOI also asserts that Project effects such as the maintenance of high nutrient levels and lack of peak flushing flows may be contributing to increased densities of anadromous fish parasites" (PacifiCorp 2006 page 67). While PacifiCorp disputed this assertion, and proclaimed that the Project "actually decreases nutrient loads below Iron Gate Dam…"; that "[f]lushing flows are not controlled by the Project but are controlled by BOR…"; and that, "…as demonstrated by the presence of C. Shasta in the

Cowlitz River-which experiences flash, high flows-it is premature to draw the connection between a lack of flushing flows and the presence of parasites in the river…", (PacifiCorp 2006 page 67) the simple answer is that the BLM did not use any of the above as a basis for the "seasonal high flow" required by the preliminary condition. While some of these disputed facts resulted in findings by the ALJ with respect to FPA Section 18 prescriptions, they were not part of the rationale BLM used in the development of the BLM condition.

d). Riparian Habitat and Wildlife Species

Riparian Habitat

PacifiCorp asserts that in "the bypassed reach, spill flows during peak spring runoff are sufficiently large to promote and maintain riparian vegetation throughout the reach…" and that PacifiCorp's proposed flow regime for the new license "will maintain sufficient riparian vegetation to support existing wildlife" (PacifiCorp 2006 page 67).

In the rationale for the BLM's preliminary condition, the BLM described that Project operations, including the reduced frequency, magnitude, and duration of a riparian maintenance flow; fluctuating flows from peaking operations; low base flows in the J.C. Boyle bypassed reach; and the lack of fine sediment, all contributed to detrimental impacts to riparian habitat. In the preliminary condition, the BLM indicated that these impacts resulted in increases in reed canary grass (an undesirable riparian plant species), decreases in desirable riparian woody species such as coyote willow, and effects on the movement and migration of wildlife species, including riparian focal species. PacifiCorp disputed these effects, and the facts associated with them, and they were determined through the hearing process.

The findings of the ALJ substantiate the Project impacts to riparian habitat described by BLM in the preliminary condition. The ALJ cites to evidence that Project operations have caused reed canary grass to encroach in the J.C. Bypassed Reach channel where low flows expose the channel and that grasslands dominated by riparian vegetation now comprise approximately two-thirds of the riparian plant community (ALJ Decision at 38 FOF 10-6; ALJ Decision at 39 FOF 10-8). He concluded from this that channel encroachment "may be adversely affecting the abundance and quality of fish and terrestrial habitat." (ALJ Decision at 38 FOF 10-7). Further he found that the problem is exacerbated by lack of seasonal high flows stating "By decreasing the frequency of larger flows, the Project operations have reduced the number of flow events that can scour established reed canary grass." (ALJ Decision at 41 FOF 11-8).

The ALJ, in general, validates the rationale for the BLM Modified Condition as contained in the rationale for the BLM preliminary condition, with the exception that there is not the expectation that woody riparian vegetation would increase which in turn would benefit riparian focal bird species. The ALJ's findings of fact related to riparian habitat include that about eighty ("80") percent of the J.C.

Boyle bypass reach (an area of 4.3 miles in length) is confined by steep canyon walls. Thus, only twenty ("20") percent of the bypass reach (less than one mile in length) has potential for "riparian restoration" (Finding of Fact 10-1); Willow is a desirable riparian plant that germinates and establishes itself on freshly deposited alluvium (material transported and deposited by river flows) (Finding of Fact 11-10); Reed canary grass is adapted to survive in frequently inundated coarse substrate and is capable of out-competing woody riparian vegetation (Finding of Fact 11-12); and High flows can scour (uproot and dislodge) reed canary grass. Moderate flows are likely to scour plants with less well-established root mats. Larger flow events are likely to scour older plants with more well-established root mats (Finding of Fact 11-6).

The ALJ's ultimate finding of fact and conclusion of law for BLM Issue No. 11 summarizes these findings:

> Project operations have adversely affected riparian resources in both the bypass and peaking reaches by supporting the perpetuation of reed canary grass and by affecting the structure, size, and nature of depositional features. However, the extent of any loss to riparian-focal bird species is indeterminate, based upon evidence that woody riparian vegetation has not decreased noticeably (ALJ Decision, page 87).

In the DEIS, FERC, while not acknowledging the ALJ findings, notes similar conclusions that Project dams prevent sediment movement downstream, which may adversely affect establishment of riparian vegetation. More specifically, FERC explains that most of the J.C. Boyle bypassed reach is comprised of coarse sediment which does not support establishment of desirable riparian vegetation:

"Project dams interrupt the natural movement of sediment on the Klamath River, resulting in the potential for adverse effects on aquatic habitat (decreased spawning substrate and increased algal growth) and riparian vegetation…." (FERC 2006, Page 3-33: 34-36).

"Project dams prevent the downstream transport of sediment, which may result in a diminished supply of spawning gravel and other altered geomorphological processes (including sand and silt starvation) that may influence aquatic habitat and adversely influence the establishment of riparian vegetation" (FERC 2006, Page 3-39: 34-37).

"Conditions for riparian vegetation in the J.C. Boyle bypassed reach are naturally limited by the narrow width of the valley bottom and the amount of that bottom width occupied by the channel. Despite this fact, scattered areas of fine sediment deposition along the channel margin do support a relatively narrow fringe of riparian vegetation. Through the reach below the canal and emergency spillway, substantial portions of the right bank are comprised of coarse material from the road upslope. The material has constricted the channel and has altered the riparian vegetation along much of the reach. Riparian vegetation (such as willows, alder, cottonwood, sycamore) does not become established in the coarse (cobble, boulder, and larger) material coming from upslope; frequently it is displaced by reed canary grass, an ecologically undesirable species that provides little habitat for native fauna. Further, sediment supply to the reach is largely eliminated by J.C. Boyle Dam, and few sources of sediment (aside from the coarse fill

encroachment) occur upstream of the emergency spillway blowout" (FERC 2006, page 3-51: 21-31).

According to FERC in the DEIS, there are sediment size and flow regime requirements for establishment and survival of riparian vegetation. The timing, magnitude, and duration of flows are important for recruitment, growth, and seed viability. FERC describes the conditions needed for riparian vegetation as follows:

"Fluvial processes can play a major role in generating floodplains of different heights suitable for establishing woody riparian species (Stromberg et al., 1991; Johnson, 1992; Scott et al., 1993; Rood and 31 Mahoney, 2000). Flow regimes also are a potentially more important aspect governing the recruitment of riparian vegetation, regardless of geomorphic setting (Mahoney and Rood, 1998; Friedman and Auble, 1999)…. Fluvial geomorphic conditions affecting riparian vegetation recruitment and sustained growth include proper substrate and flow regime requirements, including (a) the timing, shape, and duration of descending limb of hydrograph, and (b) the timing, magnitude, and duration of peak flows. Riparian trees, as pioneer species, are poor competitors that require bare, open sites with moist, fine-grained mineral soil with no organic duff for establishment. Recently scoured point bars or isolated patches of alluvial soil deposition along a river provide such conditions. Riparian seed viability is generally short, lasting about 2 to 4 weeks. Hence, these substrate conditions must coincide with both seed dispersal and a favorable rate of decline in soil moisture (water table elevation), discussed further in this section" (FERC 2006, page 3-23: 29-43).

"In terms of recruitment, spring peak flows and the descending limb of the annual hydrograph relative to seed dispersal are the most important aspects of riparian establishment. Riparian seedlings are intolerant of drought. The timing and rate of drop of the descending limb with respect to the elevation of the seed is important. If river water levels decline too rapidly, tree seedlings will not be able to grow roots fast enough to follow the coincident decline in soil moisture (caused by the drop in the water table), and the seedling will die of desiccation. PacifiCorp assumed that coyote willow seed disperses in May and June and collected data accordingly. However, because only incidental observations of coyote willow seed dispersal were made in late May or early June 2002, these observations may not reflect the time period where the majority of willow seed dispersal occurs. Although riparian seedlings are drought intolerant, they do tolerate flooding. This adaptation allows seedlings to handle short-duration flooding during the year of their establishment, or in the spring of subsequent years. However, despite this adaptation to inundation, seedlings can still be eliminated by physical scour or sediment deposition. Hence, establishment must occur at an elevation range high enough to escape peak flows that could scour or bury seedlings, but still low enough to maintain contact with a declining water table" (FERC 2006, page 3-26: 1-15).

FERC notes that in the J.C. Boyle peaking reach, riparian vegetation is absent from the channel margins inundated by peaking operations. Further, flows in the Project reaches have mobilized and winnowed away the fine sediment needed for establishment of riparian vegetation. FERC describes these impacts in the DEIS as follows:

"However, riparian vegetation on bars and channel margins of this reach [J.C. Boyle peaking reach] appears to be affected by peaking operations. For instance, the sediment composition of most alluvial bars appears amenable to riparian vegetation recruitment and growth, but the bars are unvegetated to the margin of inundation during peaking. Similarly, vegetation is generally absent from channel margins within the same area of peaking inundation" (FERC 2006, page 3-26: 34-38).

"Relatively fine substrate is necessary for the recruitment of riparian vegetation (Mahoney and Rood, 1992)….Although flows in many reaches may not be able to mobilize the D50 sediment size, flows have likely been more than sufficient to mobilize and winnow away the finer (sand, silt, and clay) particle sizes—the particle sizes that are important for colonization by many species of riparian vegetation" (page 3-51: 14-15, 17-20).

Wildlife Species

PacifiCorp states that "[m]any riparian-associated populations, including several threatened and endangered species, are present in relatively high abundance in the bypassed and peaking reaches as compared with abundance in other habitats in the area" (PacifiCorp 2006 page 68). There are only two threatened or endangered wildlife species known to occur in the Project area (FERC 2006, pages 3-370 through 3-376) and only one of them (northern bald eagle) can normally be considered "riparian associated." It is logical to assume that riparian-associated populations would be present in relatively high abundance as compared with abundance in other non-riparian habitats in the area.

In its rationale for the preliminary condition, the BLM stated that "Project-related impacts on the distribution and type of riparian vegetation present in the riparian area affect the movement and migration of **wildlife** species that utilize that habitat"[emphasis in original] (DOI 2006 page A-31). This was based on PacifiCorp's statement that the "patchy distribution of riparian habitats and unnatural distribution of riparian plant species may decrease the linear movement of several avian, reptile, amphibian, and mammalian species" (PacifiCorp 2004c, page 6-54). Concerning wildlife species, the ALJ found that "[a] relative increase in early woody riparian vegetation and a relative decrease in reed canary grass will likely increase abundance of riparian-focal bird species in the J.C. Boyle bypass reach" (ALJ Decision at 39 FOF 10-15). However, he also found that the BLM proposed flows would not increase woody riparian habitat. (ALJ Decision at 40 FOF 10-16). Therefore, it is unlikely the BLM preliminary condition would result in an increase in abundance of riparian-focal bird species since it would not increase woody riparian habitat. To the limited degree that BLM relied on potential Project effects to riparian-focal bird species as rationale for the condition, the facts do not support this rationale. It is therefore not established that either the BLM preliminary condition or PacifiCorp's Second Alternative Condition will have any significant effects to riparian-focal bird species.

e). Redband trout spawning habitat

PacifiCorp disputes the rationale provided by the BLM for the preliminary condition requiring the need for "flushing flows" and gravel augmentation to restore spawning gravel to portions of the river channel and to "provide spawning substrate for both resident and anadromous fish and other aquatic life, and that seasonal high flows are needed to maintain stream channel and riparian processes that provide fish habitat." (PacifiCorp 2006 page 69-70). The ALJ Decision contains numerous findings relating to these issues that substantiates not only that the Project had the effects on spawning habitat as described in the BLM's rationale, but that the BLM's preliminary condition would result in an increase in usable spawning habitat. These findings are based on evidence concerning the hydrologic and geomorphic effects of existing Project operations and the beneficial effects of the BLM seasonal high flow measure in combination with the sediment augmentation measure.

The ALJ supported BLM's conclusion that existing flows and sediment blockage do not provide for quality spawning conditions in the Bypassed Reach. The ALJ ruled "The J.C. Boyle bypass reach channel bed consists mainly of course material not suitable for trout spawning. (*FOF 14-1*). On average, 6,124 tons of channel bedload is blocked a year at the J.C. Boyle Dam. (*FOF 11-1*). This blockage is the primary factor in the coarsening of the channel. (*FOF 14-2*)…." (ALJ Decision, page 75).

The ALJ acknowledged that Project impacts have resulted in the only observed trout spawning activities, including the presence of redds, occurring in the Bypassed Reach just downstream of the emergency spillway (ALJ Decision at 43 FOF14-21) and that the redds at this location are inherently unstable since the spillway could be used at any time and the very steep slope of the channel increases the effects of flood flows (ALJ Decision at 44 FOF 14-23). "If the gravel at the emergency spillway were transported downstream by seasonal high flows, they would be more valuable fish habitat because the gravel would be transported to more stable locations and better sorted into spawning sizes…" (ALJ Decision at 44 FOF 14-25). The ALJ also substantiated that an annual "flushing flow" can clean and redeposit gravel to provide quality spawning habitat (ALJ Decision at 42 FOF 14-8) and that BLM high flows, as compared to current conditions, will mobilize and transport sediment more frequently (ALJ Decision at 38 FOF 10-4). The ALJ found that:

> "Implementation of coordinated sediment delivery with seasonal high flows can result in deposition of gravel in velocity pockets on the bed and fine sands on the banks. These deposits have ecological benefits including creating spawning pockets around boulders and in pools…"

ALJ Decision at 41 FOF 14-4.

The value of sediment input to the J.C. Boyle bypassed reach is described by Cluer in his testimony from the hearing.

> "The ecological importance of sediment introduced to the bypassed reach is illuminated in a response to comments from the U.S. Fish and Wildlife Service on

> March 27, 2006 (See BLM Cluer Ex. 10). PacifiCorp stated "Sediment delivered to the channel from operation of the J.C. Boyle overflow emergency spillway may actually provide needed sediment. The J.C. Boyle bypass reach is sediment-limited. Gravel delivered to the reach immediately downstream of the emergency overflow spillway increases channel complexity and aquatic habitat. Redband trout spawners have been observed using these gravels" (BLM Cluer Ex. 9 at 19).

One of the benefits of the seasonal high flow in the BLM Modified Condition is more efficient mobilization of the mixed sediment debris accumulated in the channel at the emergency overflow spillway. Although there is evidence of fish utilization of this deposit, it is highly embedded with fines and inherently unstable, so its ecological value is depressed from its potential.

The ALJ affirms that the location of the trout redds near the J.C. Boyle emergency spillway is unstable, and that if gravel from the spillway was transported downstream, it would provide more stable and better sorted spawning habitat. The findings that support these conclusions include FOF 14-21, 14-23, and 14-25.

FERC noted that the J.C. Boyle bypassed reach has substantial capacity to transport sediment, the sediment input from erosion at the spillway is greater than the sediment transport capacity of the river, except during the high flows associated with spill events.

> "….Although erosion caused by operation of the emergency overflow spillway contributed a large volume of sediment to the lower third of the reach…this section of the river also has substantial capacity to transport sediments due to its high stream gradient (2.3 percent) in the vicinity of the emergency overflow spillway" (FERC 2006, Page 3-171:6-10).

PacifiCorp's Fish Resources FTR, Appendix 4F (BLM Cluer Ex. 10) (Allen et al. 2004, pg 19) summarizes fish redds observed in the bypassed reach (BLM Cluer Ex. 11). They found 66 redds total, 43 in and around the emergency spillway deposit, 19 within 3,500 feet downstream, and only 4 redds scattered upstream to the J.C. Boyle dam. The observed 66 redds were found in 44 separate gravel patches, 36 of which were defined as pockets. Only 5 were found along the banks, and 1 in a classic pool tail / riffle crest location. Approximately 82% of the gravel patches with redds were 10 by 10 feet or less, and 2/3 of the observed spawning fish used patches less than 35 ft2.

Above and below the emergency spillway, channel slopes and widths are not substantially different (ODFW 1998) (BLM Cluer Ex. 11); the differences tend to cancel out in their effect on sediment transport (BLM Cluer Ex. 12). The greatest difference is the input of significant quantities of sediment from the erosion of the hillslopes. Fisheries and geomorphic observations at and around the sediment deposit at the Project's emergency spillway in the J.C. Boyle bypass channel establish some important points. (1) Coarse sediment delivered to the bypass reach has accumulated in the channel during Project operations. (2) Once mobilized and sorted by flow, fish utilize that

sediment, and therefore it has demonstrated ecological value. (3) Gravel pockets, although small, are currently utilized spawning habitat.

The large proportion of redds found in the proximity of the emergency spillway deposit is indicative of the natural proclivities of fish to find and use sediment in a setting where a limited amount of spawning gravel is available. From a geomorphic perspective this location is relatively unstable for two reasons. First, the spillway can be used at any time and its use probably destroys or buries redds and spawning gravel patches. Second, the slope in the bypass reach channel attains the highest value on the downstream face of the spillway deposit (WR FTR pg 6-54, Figure 6.7-19, BLM Cluer Ex. 5 at 54).

Because sediment mobilization is related to slope by a power function (for a given increase in slope there is a much higher increase in sediment mobilization potential) this locale is inherently unstable during flood flows in the bypass channel or discharge from the emergency spillway" (Direct Testimony of Brian L. Cluer, BLM Cluer Exhibit 0, page 9:1 to page 10:8).

According to testimony from Mark Gard, deposition of fine sediments occurs in the specific microhabitats where rainbow trout spawn. Thus, seasonal high flows could increase the quality of trout spawning habitat in the bypass reach.

> "Hampton (1988, BLM Gard Ex. R1) found that embeddedness greater than 10% results in a substantial reduction in the suitability of steelhead spawning habitat. As noted in my direct testimony, the two spawning gravel patches I observed in the bypass reach were 50% embedded. In addition, data in Thomas R. Payne and Associates (2003, BLM Gard Ex. R2) as summarized in a frequency graph (BLM Gard Ex. R3), indicates that 30% of the redds had percent fines greater than 10%, with the percentage of fines being as high as 40%. Thomas R. Payne and Associates (2003, BLM Gard Ex. R2), does not state where these measurements were taken, although they are typically taken in the tailspill. In constructing their redds, salmon will reduce the percent fines in the substrate. As a result, the percent fines in the tailspill will typically be much less than was present before the redd was constructed. Accordingly, the data in Thomas R. Payne and Associates (2003, BLM Gard Ex. R2) likely underestimates the degree of embeddedness in trout spawning habitat in the bypass reach. In conclusion, while the bypass reach as a whole is not a depositional zone, deposition of fine sediments does occur in the specific microhabitats where rainbow trout spawn and thus seasonal high flows could provide a benefit for increasing the quality of trout spawning habitat in the bypass reach" (Direct Testimony of Mark Gard BLM Gard Exhibit 0, page 1:20 to page 2:9).

The ALJ supported this conclusion in his findings stating that a seasonal high flow of adequate duration and frequency can improve quality spawning habitat by mobilizing and redistributing fine sediment, especially in areas that are currently embedded. The Findings of Fact that validate this include 14-7 and 14-8.

PacifiCorp disputes BLM's rationale for the time period of February 1 to April 15 each year when the seasonal high flow, as required in BLM's preliminary condition, would occur. PacifiCorp asserts that this timing "…would adversely effect redband trout spawning and delay spawner migration to Spencer Creek, thereby defeating BLM's objective of enhancing spawning habitat and benefiting redband trout. PacifiCorp goes on to pose the argument that "[i]f BLM's flushing flow condition would have the unintended effect of adversely impacting spawning beds and delaying redband trout migration, the condition is not protective of redband trout, a population that BLM asserts it flushing flow is designed to protect…" (PacifiCorp 2006 page 72). Besides the findings made above by the ALJ, several other findings again validate the BLM's rationale for the seasonal high flow concerning this issue. The ALJ substantiated that salmonids will hold during high flows and resume spawning once the flows have dropped and that the one week seasonal high flow will still leave 21 weeks for rainbow trout to spawn (ALJ Decision at 42 FOF 14-13). While BLM's proposed flushing flow would always occur during spawning season (ALJ Decision at 42 FOF 14-14), and flushing flows scheduled during or immediately after fish spawning could dislodge eggs and result in reduced recruitment, flushing flows released just prior to spawning would produce more beneficial effects. (ALJ Decision at 43 FOF 14-15).

The timing of the BLM seasonal high flow condition reflects the natural hydrologic flow regime under which redband trout evolved and would be implemented during the normal peak flow period (ALJ Decision at 43 FOF 14-17). Concerning migration, historically, redband trout rearing in the Oregon portion of the Klamath River downstream of the J.C. Boyle Dam migrated upstream to spawn in Spencer Creek. Redband trout rearing below J.C. Boyle Dam moved upstream in two peak spawning migrations, one in the spring and one in the fall, both of which were associated with increases in the river flow (ALJ Decision at 43 FOF 14-18). Spring and fall freshets attract spawning rainbow trout upstream past J.C. Boyle Dam and juvenile trout migrate downstream to rearing areas below J.C. Boyle Dam (ALJ Decision at 43 FOF 14-19). However, soon after the installation of J.C. Boyle Dam, upstream spawning migrations of redband trout were reduced and recent data shows little successful migratory movement occurs from downstream to upstream of J.C. Boyle Dam (ALJ Decision at 43 FOF 14-21).

The ALJ's UFOF for BLM Issue 14 concludes that:

> "[t]he BLM seasonal high flows will assist in the creation of redband trout spawning habitat, decrease fine sediment embedment in spawning gravel, and improve redband trout migration. These benefits provide for a net positive effect to redband trout spawning; overcoming the possible scouring effects high flows will have on spawning trout"

ALJ Decision at 87 UFOF 13.

PacifiCorp asserts that its Second Alternative Condition "…would support existing conditions and adequately protect the trout fishery resources." It appears that PacifiCorp believes that if redband trout are in existence in the Project reaches, no further mitigation is necessary. The redband trout fishery has been affected by the Project, resulting in

reduced growth rates of older age classes, lower proportions of older age classes, reduced fish size in the migratory population, and reduced migration to suitable spawning areas. The ALJ made several findings of fact that substantiates the Project's effects on redband trout as presented in BLM's rationale for the preliminary condition. These are best summarized in the ALJ's discussion for BLM Issue 16 and by the ALJ's UFOF for BLM Issue 16:

> "The evidence in the record establishes that current operations have adversely affected the redband trout fishery resource. First, the J.C. Boyle Dam traps sediment necessary for spawning habitat. Second, the existing flow regime has increased the embedment of fine sediment in spawning gravel, impairs spawning migrations, and causes low flows, which contribute to the lack of successful spawning. Third, the peaking operations cause stranding of aquatic organisms, results in downstream displacement of juvenile fish, increases the energetic demands placed upon adult trout, and lowers the production of macroinvertebrate prey. The proposed River Corridor Management Condition would address these negative effects." [footnote omitted]

ALJ Decision at 77-78

Overall, the ALJ summarizes the benefits of BLM's seasonal high flow requirement as follows:

> "BLM Condition 4.A.1(c) [the BLM seasonal high flow] will provide a net positive effect on redband trout spawning. Specifically, the proposed flows will assist in the distribution of gravel used for spawning, will clean established spawning beds, and will assist in migratory movement of trout. (*FOF 14-1 to 14-8, 14-17 to 14-21*). Negative effects include a loss of spawning habitat below the emergency spillway and the possible scouring of trout eggs. (*FOF 14-14, 14-15, 14-24, 14-25*). PacifiCorp has not met its burden to show that the negative effects outweigh positive effects."

ALJ Decision at 73-74.

> "BLM ISSUE 16: Current Project operations, particularly sediment blockage at the J.C. Boyle Dam, the flow regime, and peaking operations, negatively affect the redband trout fishery. The proposed River Corridor Management Conditions would improve fishery resources."

ALJ Decision at 87 UFOF 14.

The positive ecological benefits resulting from the seasonal high flow significantly outweigh spawning effects--resulting in a net positive benefit to redband trout habitat, as well as habitat for other aquatic species. The objectives of the seasonal high flow are not to maintain the existing unsustainable and marginally suited spawning areas resulting from the emergency spillway, but rather are to support multiple riparian, ecological, and geomorphic processes that would lead to greater benefits to redband trout than the current flow regime or PacifiCorp's Second Alternative Condition provides.

The BLM concludes that the seasonal high flow, delineated in the BLM condition is necessary to improve the quality and quantity of spawning habitat in the J.C. Boyle Bypassed Reach. This will improve spawner migration to Spencer Creek. PacifiCorp's Second Alternative Condition does not contain a seasonal high flow, and therefore does not provide the spawning habitat benefits of the BLM Condition.

f). ESA Biological Opinions

PacifiCorp asserts that the seasonal high flow contained in the BLM preliminary condition could result in violation "…of the terms and conditions of the Biological Opinions issued by FWS with respect to elevations in Upper Klamath Lake for ESA-listed sucker fish and by NMFS with respect to Klamath River flows below Iron Gate Dam for coho salmon…" Notwithstanding the ESA §7 formal consultation for the Project that has yet to be completed, there is no information establishing that requiring that all inflow to J.C. Boyle Reservoir being routed into the Bypassed Reach for a minimum of seven days once inflow reaches 3,300 cfs would affect Upper Klamath Lake or flows below Iron Gate Dam. Similarly, PacifiCorp fails to explain how the condition could cause a failure "to meet BOR refill objectives for Upper Klamath Lake" (PacifiCorp 2006, page 71) and there is no information to support this conclusion. The upstream federal actions addressed by the biological opinions help to determine when and how much water flows into PacifiCorp's Project, but do not set any preconditions or otherwise dictate how PacifiCorp manages water through the Project. PacifiCorp can only manage water within the limits of its license and its water rights. The seasonal high flow element of the BLM preliminary condition addresses only whether PacifiCorp runs water through the J.C. Boyle power canal or through the Bypassed Reach--it does not in any way require PacifiCorp provide flood water that would not otherwise be flowing into the Project.

The seasonal high flow is solely based on inflow to J.C. Boyle Reservoir, and is not dependent on requirements or agreements that may be in place for Upper Klamath Lake or below Iron Gate Dam. Annually, the first time inflow reaches the 3,300 cfs threshold from February 1st through the April 15th time period (if it occurs in a given year), all flow will be provided to the Bypassed Reach – instead of being at least partially routed through the J.C. Boyle power canal and powerhouse to reenter the Klamath River at the head of the Peaking Reach. PacifiCorp goes on to assert that "Endangered Species Act and Upper Klamath Lake refill objectives could be at risk in dry years under BLM's seasonal flow condition" (PacifiCorp 2006, page 71). This assertion is also in error, because, if during a dry year flows to J.C. Boyle Reservoir do not reach 3,300 cfs during the time period required in the condition; there would be no seasonal high flow.

4) Sediment Augmentation: PacifiCorp's limited gravel augmentation program would not improve spawning habitat and other aquatic habitats, increase stream channel complexity or improve the quality of riparian habitat; BLM's Condition would protect these resources.

The limited amount of proposed gravel placement (100-200 cubic yards of spawnable gravel) in the upper end of the Bypassed Reach may provide a slight increase in potentially usable spawning areas for trout. However, the lack of a seasonal high flow in PacifiCorp's Second Alternative Condition would likely result in this habitat becoming embedded with fine sediment, as is the case with the spawning gravel presently in the reach. This is substantiated by the ALJ's findings that trout spawning gravel in the Bypassed Reach is embedded with fine silt (ALJ Decision at 42 FOF 14-7) and that an annual flushing flow can clean and redeposit gravel to provide quality spawning habitat. (ALJ Decision at 42 FOF 14-8).

The limited amount of only spawning-sized gravel, as proposed by PacifiCorp's Second Alternative Condition, also does not address the other objective for the sediment augmentation program, i.e. the need to improve channel complexity. This objective is also part of the stipulation by PacifiCorp and BLM contained in the ALJ's order of August 2, 2006. The stipulation clarifies, in pertinent part, that the "1,226 tons/year minimum and 6,134 tons/year maximum quantities specified in the River Corridor Management Condition were not intended to be limited to spawnable gravels but also include a range of sediment particle sizes and intended to address channel complexity." PacifiCorp's Second Alternative Condition would only provide a limited amount of spawnable sized gravel and would not accomplish the objective to improve channel complexity.

In the BLM Modified Condition, the Sediment Management Plan is clarified, such that a range of sediment sizes would be provided to meet the additional objective to provide smaller sized sediment to improve stream channel complexity. The Modified Condition also recognizes the likely need for an initial large placement of gravel to replenish five decades of sediment blocked by the Project since the dam has been in place. After the first augmentation, monitoring and adaptive management will occur to determine subsequent augmentation needs. The Modified Condition recognizes the finding of the ALJ regarding the BLM's preliminary condition that "…proposed a gravel management plan in which 1,226 to 6,134 tons of sediment per year would be added to the Klamath River below J.C. Boyle Dam" (Finding of Fact 14-3) and the stipulation that there are multiple objectives for the sediment augmentation program. By establishing the objectives of the program, the specific sediment augmentation amounts to meet the objectives can be determined through the adaptive management aspects of the program.

Determining the area of the bed that could trap coarse sediment can be used to estimate the volume of sediment that could be stored in deposition zones. This quantity is useful because it provides a measure of the initial sediment augmentation necessary to return a system to geomorphic and biologic function. The area of the bed that could trap coarse sediment was estimated by Cluer for the hearing.

> He (a) examined the detailed cross sections and maps presented in Appendix 6A of the WR-FTR, (b) examined the fisheries habitat field studies of ODFW (1998)

and FR-FTR Appendix 4 (b), (c) personally examined the entire reach on May 5 and July 13-14, 2006, (d) took several photographs from different vantage points overlooking long sections of channel, and (e) conducted spatial analysis on selected photos. The results combining both the pool and steeper areas together gives an estimate of the total channel area with potential to trap coarse sediment is approximately 36%. This estimate agrees favorably with the habitat information presented by PacifiCorp and ODFW (1998) field measurements. It is clear that about 1/3 of the channel area in the bypass reach has potential to trap coarse sediment. The bypass reach is 4.7 miles long (24,800 feet) and the average low-flow channel width is 88 feet (derived from the average wetted width of the cross sections in ODFW (1998) at minimum base flow of about 100 cfs). Although coarse sediment would be mobile only during flood flows, when the wetted channel width is greater than 88 feet, using the channel width at minimum base flow is reasonable because coarse sediment deposits would be concentrated in the bottom of the channel. Therefore, assuming 88 feet average width, the low-flow channel area is 2,182,400 square feet, and the potential trapping area is approximately 80,000 square yards.

By assuming an average thickness of coarse sediment accumulation in potential deposition zones it is possible to estimate the storage volume for bed sediment by assuming one foot average depth of coarse sediment. One foot is the minimum height of boulders above the bed (0.3 meters, illustrated in WR FTR Appendix 6A). Given that spawning is a common goal, one foot gravel depth is also the minimum necessary for successful salmonid redds; supported by literature compiled and summarized in Groot and Margolis (1991). This depth of coarse sediment over 80,000 square yards equals approximately 26,600 cubic yards, or 39,000 tons assuming a bulk density of 1.485 tons/yard (density value from PacifiCorp's Master Sediment Budget). This result is approximately six times the average annual load of bed material trapped by J.C. Boyle dam. This method and the results were recognized by PacifiCorp's expert witness in fluvial geomorphology, Dr. Mark Tompkins, as reasonable (Tompkins Rebuttal Testimony, page 3: 11-13). [For further detail on this method, See Direct Testimony of Brian L. Cluer, BLM Cluer Exhibit 0, page 10:14 to page 13:14].

In the DEIS, FERC confirmed that functioning river systems transport sediment at rates equivalent to sediment inputs over time, therefore maintaining channel morphology and habitat.

> "Natural river reaches export fine and coarse sediment at rates approximately equal to sediment inputs. Although the amount of and mechanism for sediment storage within any particular river reach fluctuates from one year to the next, it sustains channel morphology and habitat attributes in a dynamic quasi-equilibrium when averaged over the course of longer time periods such as a series of wet and dry years (on the order of 5 to 10 years or more)" (FERC 2006, page 3-29: 2-13).

The BLM Modified Condition applies this scientific principle, as described below, in the Sediment Management Plan. Based on conclusions in the DEIS, FERC supports the same framework for a Sediment Augmentation Plan as the BLM in the Modified Condition. The Sediment Management Plan would include mapping areas suitable for sediment deposits before and after placement to determine sediment amounts, locations, and sizes needed to meet plan objectives. Subsequently, reporting of these results to FERC and stakeholders would allow for consultation during the adaptive management process of the plan. FERC outlines this process as follows:

> "We also conclude that mapping of gravel before and after gravel placement would be useful to help quantify the measure's benefits and to guide further gravel augmentation efforts. Accordingly, we include in the Staff Alternative the approach to gravel augmentation…which would begin with developing a gravel augmentation plan, mapping existing spawning gravel deposits and alluvial surfaces suitable for riparian recruitment and, based on the results of that mapping, developing sediment augmentation volumes, locations, and sizes that meet plan goals. We expect that during some years it may not be necessary to provide any augmentation if previous gravel has remained at locations that would provide appropriate spawning habitat (e.g., during relatively dry years). During wet years, larger quantities of gravel may be needed to augment gravel washed downstream from suitable spawning areas. The reporting aspects specified by the resource and land management agencies and the Hoopa Valley Tribe for gravel augmentation would provide for coordination and review of the program by the Commission and stakeholders, and allow for consultation regarding any proposed changes to implementation and monitoring. This approach would facilitate any future augmentation necessary to meet habitat objectives in these reaches" (FERC 2006, page 5-20: 42 to page 5-21: 8).

Many of the findings of fact by the ALJ validate the evidence contained in BLM's rationale for the condition regarding the benefits of the seasonal high flow and gravel augmentation program components of the BLM's preliminary condition. These are summarized by pertinent parts of the ALJ's UFOF's for BLM Issues 10, 11, and 14:

> "BLM ISSUE 10: The seasonal high flows will contribute to improving the quality of riparian habitat in the J.C. Boyle bypass reach by increasing the sediment deposit within the channel and decreasing reed canary grass…"

ALJ Decision at 86 UFOF 11.

> "BLM ISSUE 11: Project operations have adversely affected riparian resources in both the bypass and peaking reaches by supporting the perpetuation of reed canary grass and by affecting the structure, size, and nature of depositional features…"

ALJ Decision at 87 UFOF 12

> "BLM ISSUE 14: The BLM seasonal high flows will assist in the creation of redband trout spawning habitat, decrease fine sediment embedment in spawning gravel, and improve redband trout migration. These benefits provide for a net positive effect to redband trout spawning; overcoming the possible scouring effects high flows will have on spawning trout."

ALJ Decision at 87 UFOF 13.

FERC made similar conclusions in the DEIS stating that Project dams have multiple effects on physical processes and riparian and fish habitat. According to FERC staff, these include:

"The sediment that makes up the bed and banks of the Klamath River ranges in size from silt and sand to gravel, cobbles, and boulders with outcrops of bedrock. Since their construction, project dams have trapped most sediment that was previously delivered to downstream reaches and altered the flows necessary to transport sediment in reaches of the river. Together, these changes have altered natural sediment transport processes, reduced gravel bar and pocket gravel deposits, and reduced salmonid and lamprey spawning and rearing habitat. Additionally, project operations have increased sediment supply from point sources of erosion and fill encroachment on the river channel." (FERC 2006, page 3-29: 7-13).

"….Gravel is scarce, in part because recruitment from upstream areas is blocked by the presence of J.C. Boyle dam…." (FERC 2006, Page 3-171:5-6).

"Project dams prevent the downstream transport of sediment, which may result in a diminished supply of spawning gravel and other altered geomorphologic processes (including sand and silt starvation) that may influence aquatic habitat and adversely influence the establishment of riparian vegetation" (FERC 2006, Page 3-39: 34-37).

"Project dams interrupt the natural movement of sediment on the Klamath River, resulting in the potential for adverse effects on aquatic habitat (decreased spawning substrate and increased algal growth) and riparian vegetation…." (FERC 2006, Page 3-33: 34-36).

"...the project consistently increases the estimated discharge required to mobilize the bed. Project operations reduce the frequency of bed-mobilizing events from roughly an annual or semi-annual basis to about two times less frequent. This indicates that, without project operations, spawning gravels would be more-frequently mobilized, flushed, and replenished from upstream….More-frequent flushing flows would refresh spawning gravels and disperse sediment across the channel (and potentially onto the floodplain, depending on the magnitude of the flow), benefiting aquatic and riparian habitats" (FERC 2006, page 3-35: 17-31).

The BLM concludes that the seasonal high flow, in combination with a more robust sediment augmentation program, is necessary for the restoration of geomorphic processes, improvement in riparian habitat quality and aquatic habitats including trout spawning habitat.

5) Recreation: Although some recreational uses would be reduced, the BLM Condition would provide recreational opportunities for boating, fishing, and other recreational uses.

Based on recreation use estimates and surveys conducted during relicensing (PacifiCorp 2004k, Section 3.7.2 pages. 3-36 to 3-49), boating and fishing are common recreation activities in these two reaches, and total recreation use in these areas probably exceeds 12,000 "recreation days" (one person visiting for any portion of a day) per year. Of that total, about 4,000 to 5,000 recreation days are specifically associated with commercial rafting (which BLM tracks via special use permits with outfitters.) Other users to the area reported activities such as camping, relaxing, fishing, hiking, sightseeing, and wildlife viewing (*Id*. at page 3-17, Table 3-7.11).

a). Whitewater Boating

Under the status quo and the PacifiCorp Second Alternative Condition, flows are optimized for power production. Whitewater boating takes place on the river between the J.C. Boyle powerhouse and the California-Oregon border, or in the Peaking Reach. This reach has been commercially rafted since 1979, and rafting use has adapted to the available flow regime. The BLM Condition was designed to provide flows that are more reflective of seasonal fluctuations, typical of a natural hydrograph for the Klamath River, for the protection of natural resources while also providing for whitewater opportunities.

The BLM Condition was designed to meet multiple objectives and balance resource protection with use. The BLM Condition will reduce the frequency and timing of high flows preferred by whitewater recreationists and result in fewer and differently-timed whitewater boating opportunities. However the Modified Condition was developed to minimize these reductions. Since approximately 65% of the visits occur on the weekend (ALJ Decision at 52 FOF 19-22), the BLM Condition emphasizes providing weekend boating opportunities.

The BLM produced a model to evaluate and minimize the impacts of the change to an increased base flow and flows more reflective of seasonal events, including high and low flows, on boating opportunities. As part of the effort to understand how manipulation of river flows affects various flow-dependent resources, the BLM evaluated how specific aspects of the flow regime (the magnitude, duration, frequency, timing, and rate of change of streamflows) affect flow-dependent resources, including recreation (primarily angling and commercial and private boating), fish and wildlife habitat, water quality, power generation, cultural resources, and aesthetics. The ALJ relied on the BLM model as the basis for his findings, including the ultimate finding that "The BLM's proposed flows will substantially reduce the frequency and quality of whitewater boating in the J.C. Boyle peaking reach." ALJ Decision at 87 UFOF 16.

The ALJ employed the BLM model to find that "Under the flows proposed by BLM, in an average year (such as 2000), the approximate decreases in raftable days would be as follows: total number of days would decrease forty-four ("44") percent (from 183 days to 102 days); the total number of weekend days would decrease eighteen ("18") percent

(from 78 to 64); the total number of days in the July-August period would decrease seventy-one ("71") percent (from sixty-two ("62") to eighteen ("18"); and the total number of weekend days in July-August would decrease thirty-five ("35") (from twenty-six ("26") to eighteen ("18"))…" ALJ Decision at 52 FOF 19-27.[8]

Therefore, while whitewater boating would be reduced, it is not the case, as PacifiCorp asserts, that the BLM preliminary condition "obliterates" whitewater rafting (PacifiCorp 2006, page 53). To the contrary, in an average year, under the BLM Condition, there would still be 102 days of opportunity, with 18 days occurring on weekends in July through August. There would be fewer opportunities in a dry year and more in a wet year. ALJ Decision at 53 FOF 19-32.

The effects quantified by the BLM model for commercial whitewater boating do not extend to other boating opportunities. Under the BLM Condition base flow during the summer would be about 700 cfs (ALJ Decision at 51 FOF 19-11). Kayaking can occur at lower flows (e.g. 400 to 500 cfs) with "technical" trips begin about 700 cfs (ALJ Decision at 52 FOF 19-17).

b). Fishing

The ALJ concluded that the "ability to fly-fish in the J.C. Boyle peaking reach will be reduced; the extent of this reduction has not been established" ALJ Decision at 87 UFOF 16. Under the BLM Modified Conditions there will be a diminishment in the ability to wade because of higher base flows, however the amount and related effect is unknown (19-51). Wading becomes more difficult as the depth and velocity through this section of river increases, thus implementation of the BLM Modified Condition will make wading more difficult (19-49). However it is expected that anglers will adjust their tackle and techniques (19-51) because the redband trout population will increase (19-54). Greater base flow may reduce ability of fishermen to successfully cast and maintain their flies leading to other variations of fishing and adaptations by fishermen to increase angler success (example: fishing while boating or other inflatable devices) (19-14).

The number of days with preferred flows for wading are not expected to increase with increased base flows, as preferred fishing time is during morning and evening when base flows occurr. During the summer months, base flows are available every day except in very wet years. However, under BLM Modified Condition higher (peaking) flows could be present during many summer weekends, possibly beginning on Friday morning/afternoon, and continuing through Sunday mornings. In an average year during the summer the amount of peaking on weekends would decrease by 18% (19-27). Thus there would be increased low flow conditions, but the flow would be sub-optimal for fly-fishing. While the predicted base flow of 700 cfs is termed sub-optimal, it is well within the acceptable range (400 to 1,200 cfs) as displayed in Table 2.7-29: Flow evaluation

[8] Although these numbers are based on modeled opportunities and approximate what might occur, the model might overestimate the number of days and hours whitewater boating opportunities will be available (ALJ Decision at 54 FOF 19-34, 35, 36, and 37).

curves for fishing opportunities on the Hell's Corner reach based on Phase II closeout survey information (PacifiCorp 2004k, p.2-94).

Wading access, as set out in the fishability study conducted by PacifiCorp, is only one component of assessing flow needs for fishing opportunities. Other components include fishing success or effects on the fishery (ALJ Decision at 55 FOF 19-52). The proposed flows will increase the population of the redband trout fishery (ALJ Decision at 55 FOF 19-54). Further, if anadromous fish are reintroduced in the Upper Klamath River and recover to harvestable levels, there will likely be anglers who will fish for these stocks, which would be an improved opportunity for recreational fishing.

c). Other Recreation

Other recreational uses such as camping, relaxing, hiking, sightseeing, and wildlife viewing are not likely to be significantly affected by changes to the flow regime. Tent camping ranked as the second most popular recreational activity in the Upper Klamath WSR (PacifiCorp 2004k, page 3-18). Opportunities for camping and hiking would be improved though additional or improved hiking trails, improved recreation sites and road maintenance in the Upper Klamath WSR.

In summary, under the BLM Condition whitewater boating opportunities will be substantially reduced, although whitewater boating opportunities will persist. With regard to the impacts to fly fishing, the BLM expects that the condition will negatively affect wading access, but will improve conditions for fish habitat during a new license term and will result in an improved fishery, although with different windows for fishing access and different flow conditions.

6) Power: Although power production would be reduced, the BLM Condition would allow an average of 562,790 MWh of electricity generation per year.

The BLM manages under the principles of multiple use, and in accordance with land use plans developed for an area. To accomplish this, there is often a requirement for balancing the uses (including hydropower generation) of the resources present in an area.

The BLM acknowledges that the section 4(e) condition is expected to reduce the amount of power that can be generated compared to existing conditions. Hydrologic modeling conducted by the U.S. Bureau of Reclamation calculates that average annual energy production of the Project would be 23 percent less under BLM conditions compared to the status quo. Nevertheless, according to the modeling, PacifiCorp would still be able to generate an annual average of 562,790 MWh (California Energy Commission 2006 page 29, Table 2-4).

Beyond the reduction in generation, PacifiCorp also asserts a loss in peaking value. No such loss would be incurred however, for two reasons. First, there is limited peaking value at the facility today. Changes in river management over the last two decades have reduced PacifiCorp's generation flexibility. At least 60 percent of Klamath's output

appears to be base load run-of-river generation whose amount and availability is not subject to control by PacifiCorp. Second, the BLM alternative would have a minimal impact on the ability to generate during peak load hours according to the Reclamation model runs. The 23 percent reduction in total generation is evenly spread across all time periods (California Energy Commission 2006, Page 30). Based on historic conditions, about 70 percent of total generation occurs in the 58 percent of the hours defined as "peak load." The remainder is generated in off peak hours due to high flows, particularly during the winter, that cannot be stored overnight or across seasons to be released during peak hours, or regulatory requirements to meet downstream flow objectives.

In summary, under the BLM condition total power production would be maintained at an annual average of 562,790 MWh and peak power production would be minimally affected.

Oregon Department of Fish and Wildlife's Alternative Condition

The Oregon Department of Fish and Wildlife (ODFW)'s alternative condition only modifies BLM's preliminary condition with respect to the minimum instream flows to be required below J.C. Boyle, ramp-rate restrictions, and that the J.C. Boyle development be operated as a run-of-river facility with no peaking operations. The alternative condition also adds the requirement for a flow continuation measure at the J.C. Boyle canal and powerhouse to provide continuous flow under powerhouse shutdown conditions. Other aspects of the BLM's preliminary condition would remain the same, such as seasonal high flow, streamflow measurement and reporting, a river gravel management plan, and an adaptive management plan.

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production?

Answer – The alternative condition would not cost significantly less to implement, and would not result in improved operation of the project works for electricity production.

Justification – ODFW's alternative condition would cost more to implement than BLM's preliminary condition since the condition requires more minimum instream flows, a more restrictive ramp rate and the J.C. Boyle development to be operated as a run-of-river development with no peaking operations. The ODFW's alternative condition would not improve operation of the Project works for energy production as the alternative has a substantially greater effect on the generation ability of the J.C. Boyle Project facility than the BLM preliminary condition.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – ODFW's alternative condition would provide for the adequate protection and utilization of the reservation.

Justification – In general, the alternative condition would provide for, as ODFW asserts, further improved aquatic habitat conditions than the BLM's preliminary condition. However, even ODFW acknowledges that "these [BLM's] preliminary conditions…would mark a significant improvement over the …flows, and ramping restrictions existing at the J.C. Boyle component of the Project and proposed by PacifiCorp for relicensing." (*Id*. page 2). The ODFW also acknowledges that the "BLM condition of a base flow of 470 cfs (or 40% of inflow) and a weekly rather than daily peaking strategy will provide an increased level of protection to anadromous and resident fish and wildlife that are currently adversely affected by Project operations of extreme low flows and high ramp rates." (*Id.* page 12). However, the State then goes on to assert that the BLM's preliminary conditions do not provide for the adequate protection of aquatic resources through requiring "lower minimum flows in the bypass reach than necessary to adequately support aquatic habitat, and allow higher ramping rates in both reaches thereby posing greater adverse impacts to aquatic habitat and fish."

While aquatic resources are a primary resource of interest to the BLM, it is not the only resource that the BLM needs to consider. The BLM manages lands under the principles of multiple use, and in accordance with land use plans developed for an area. To accomplish this, there is often a requirement for balancing the uses of the resources present in an area. The BLM has concluded that the BLM's preliminary condition, in combination with other BLM preliminary conditions, sufficiently balances the use of these resources in the river corridor in order to meet the land management direction for the area.

The State's alternative condition's requirement for a flow continuation measure at the J.C. Boyle canal and powerhouse to provide continuous flow under powerhouse shutdown conditions has merit. As identified by the State, a flow continuation measure or a synchronous bypass valve that would reduce or "…eliminate rapid water level fluctuations caused by load rejection at the Project…" and that would "protect fish and wildlife and their spawning grounds and habitat…" below the J.C. Boyle Powerhouse. This measure was added to the BLM Modified Condition.

<u>California Department of Fish and Game's Alternative Condition</u>

California Department of Fish and Game (CDFG)'s alternative condition only modifies the BLM's preliminary condition with respect to the minimum instream flows to be required below J.C. Boyle Dam, ramp-rate restrictions, and that the J.C. Boyle development be operated as a run-of-river facility with no peaking operations. Other aspects of the BLM's preliminary condition would remain the

same, such as seasonal high flow, streamflow measurement and reporting, a river gravel management plan, and an adaptive management plan.

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production?

Answer – The alternative condition would not cost significantly less to implement, and would not result in improved operation of the project works for electricity production.

Justification – The CDFG's alternative condition would cost more to implement than BLM's preliminary condition since the condition requires more minimum instream flows, a more restrictive ramp rate and the J.C. Boyle development to be operated as a run-of-river development with no peaking operations. CDFG's alternative condition would not improve operation of the Project works for energy production as the alternative has a substantially greater effect on the generation ability of the J.C. Boyle Project facility than the BLM preliminary condition.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – CDFG'c alternative condition would provide for the adequate protection and utilization of the reservation.

Justification – In general, the alternative condition would provide for, as CDFG asserts, further improved aquatic habitat conditions than the BLM's preliminary condition. However, even the State acknowledges that "these [BLM's] preliminary conditions…would mark a significant improvement over the …flows, and ramping restrictions existing at the J.C. Boyle component of the Project and proposed by PacifiCorp for relicensing." (*Id*. page 2). The State also acknowledges that the "BLM condition of a base flow of 470 cfs (or 40% of inflow) and a weekly rather than daily peaking strategy will provide an increased level of protection to anadromous and resident fish and wildlife that are currently adversely affected by Project operations of extreme low flows and high ramp rates." (*Id.* page 12). However, the State then goes on to assert that the BLM's preliminary conditions do not provide for the adequate protection of aquatic resources through requiring "lower minimum flows in the bypass reach than necessary to adequately support aquatic habitat, and allow higher ramping rates in both reaches thereby posing greater adverse impacts to aquatic habitat and fish."

While aquatic resources are a primary resource of interest to the BLM, it is not the only resource that the BLM needs to consider. The BLM manages lands under the principles of multiple use, and in accordance with land use plans developed for an area. To accomplish this, there is often a requirement for balancing the

uses of the resources present in an area. The BLM has concluded that the BLM's preliminary condition, in combination with other BLM preliminary conditions, sufficiently balances the use of these resources in the river corridor in order to meet the land management direction for the area.

Conclusion

As noted above, to satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. Here, as discussed above, the BLM concludes that the components contained in PacifiCorp's Second Alternative Condition are inadequate for the protection and utilization of the reservation. The lack of sufficient minimum instream flows and ramping rates, the lack of a seasonal high flow, and the lack of a sufficient sediment augmentation program all leave the condition less than adequate for the protection and utilization of the BLM reservation. Therefore, the BLM concludes that the proposed Alternatives fail to satisfy the standards of Section 33 and should not be accepted, even though the BLM assumes for purposes of the analysis that the PacifiCorp alternatives would be significantly less costly to implement. While the states of Oregon and California's alternatives would provide adequate protection of BLM-administered resources, they too fail to satisfy the standards of Section 33 and should not be accepted because they are not significantly less costly to implement than the BLM condition.

Equal Consideration of Effects Demonstration

The Department has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for the BLM Modified Condition No. 4 – River Corridor Management and PacifiCorp's First Alternative Condition, Second Alternative Condition, the ODFW's alternative condition and California Department of Fish and Game's alternative condition.

1. **Energy supply, distribution, cost, and use**

Neither the BLM Condition nor the proposed alternative conditions have a significant impact on energy supply, distribution, cost or use.

Supply: Although the BLM Condition will reduce the generating capability of the Project, the impact is insignificant when compared to the total customer requirements, and is *de minimis* in the context of regional energy supply. The Project is a system resource, and has no function other than the provision of electric energy to the applicant's system as a whole. Hydrologic modeling by the Bureau of Reclamation estimates that the BLM condition would reduce total generation by 23 percent of the modeled 727,926 megawatt hours (MWh) average annual power generation from Klamath, or approximately 165,000 MWh annually. This amount is 0.25 percent of the total MWh supplied by PacifiCorp in 2004, the latest year for which data were available. As a

comparison, PacifiCorp's transformer and line losses in 2004 were 3,741,391 MWh, which were considered acceptable, predictable and consistent with PacifiCorp's system planning criteria. Thus the mandatory conditions would reduce total generation by only 4 percent of current, planned energy losses.

Since PacifiCorp is only one of a number of energy suppliers in the Northwest, the impact on total regional energy supply must be considered *de minimis*. Although PacifiCorp provided no information regarding the impact of its proposed alternative on energy supply, we note that Klamath generation, in total, represents less than 1 percent of total system generation, and a little over one-sixth of transformer and line losses. Accordingly, Klamath, itself, makes an insignificant contribution to PacifiCorp's energy supply, and makes a *de minimis* contribution to regional energy supply. Thus, neither the prescriptions nor the alternative regarding Klamath would have a significant impact on energy supply, either in the region or on the applicant's system.

Distribution: The BLM Condition does not address energy distribution facilities, and therefore does not have any direct impact on the distribution of energy. Moreover, as regional energy supply impacts are *de minimis*, there are no indirect impacts on energy distribution. PacifiCorp provided no information regarding the impact of its proposed alternative on the distribution of energy. The BLM has no other information indicating any impact of PacifiCorp's alternative on energy distribution.

Cost: The impact of the BLM Conditions on energy cost is judged not to be significant. PacifiCorp's filings in its recent rate case in California explains that Klamath is an unreliable source of power and that its energy, when available, is used to displace other, more expensive sources; accordingly, PacifiCorp views the replacement value of Klamath energy as PacifiCorp's decremental generation cost, which is unaffected by any changes in Klamath Project operations.[9]

In 2004, PacifiCorp purchased 15,594,000 MWh at a cost of $368 million dollars[10], or about $23.60 / mWh. The loss of the 165,000 MWh due to the BLM's conditions has a cost impact of $3.5 million annually. In 2004, PacifiCorp's total revenues from sales of electricity, (including unbilled revenues) were approximately $3 billion, including $328 million in sales for resale. Thus the potential impact on electric costs would be no more than. 0.12 percent; or no more than $0.00006 per kWh, based on a total of 62,693,000 MWh sold or used in 2004.

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[9] "Decremental Generation Cost" is a term used by PacifiCorp in its Opening Brief in U-901-E before the Public Utilities Commission of the State of California, filed August 28, 2006. It refers to the cost that would otherwise occurred but for the availability of the Klamath power. Since the most readily available alternative to Klamath would be for PacifiCorp to purchase additional power under its existing supply arrangements, the average cost of purchased power reflects this decremental generation cost. See especially pages 30 – 35.

[10] FERC Form 1 for 2004, page 401a, line 27 and quoted in "Klamath Annual Net Benefits 10(j) Presentation December 2006", Robert Berman, U.S. Department of the Interior, Office of Policy Analysis, slide 16.

Even this cost may be overestimated. Efficiency improvements to PacifiCorp's transmission and distribution systems, to reduce energy losses, may be available at a cost of only $1.20 / MWh. Specifically, transmission and distribution losses average 2-3 percent for line losses and 5-6 percent for transformer losses. Thus transformer losses account for two-thirds of total losses. These transformer losses are equally divided between no-load losses (which occur 24x7x365 hours per year) and load losses which occur only when supplying load. Thus the no-load losses are 2-3 percent of generation or one-third of total losses. No-load losses can be reduced by approximately 70 percent through the use of energy-efficient transformers such as those with amorphous metal cores. Accordingly, of the 3,741,000 MWh energy losses, 1,247 gWh were no-load losses, of which 873 gWh were avoidable through the use of modern, energy-efficient transformers. These transformers average about $1.20 MWh more than the less efficient, steel core transformers PacifiCorp uses. Since avoidable losses are significantly greater than the losses associated with the Modified Condition, the value of the lost power may be no more than $1.20 MWh.

Use: Neither the BLM Condition nor the proposed alternative conditions would have any impact on energy use.

2. Flood control

Because the Project's reservoirs are relatively small compared with the Klamath River's annual runoff (e.g., Iron Gate reservoir impounds only 4 percent of annual runoff, and Copco No. 1 reservoir only 5 percent), the Project reservoirs are generally *not* operated for flood control (Pacificorp 2004, Ex E, Page 3-181). While Project reservoirs are drawn down to some extent prior to spring runoff, this can provide only very limited flood control during high flow events. (PacifiCorp 2004, Ex B Page 2-7).

PacifiCorp identified that their proposed alternatives would not affect flood control (PacifiCorp 2006, Pages 58 and 83). Similarly, the ODFW and California Department of Fish and Game identified no impacts on flood control (ODFW 2006 at 30 and CDFG 2006 at 20). None of the conditions analyzed in this section would result in any change to the currently very limited flood control.

3. Navigation

There is no large-scale commercial navigation on the Klamath River, and the dams are not equipped with locks for barges.

There is downstream navigation by rafts and kayaks, these are considered recreational effects, and are analyzed in more detail above.

PacifiCorp stated that its alternatives would not negatively affect navigation (PacifiCorp 2006, Pages 58 and 83). Similarly, the ODFW and California Department of Fish and Game identified no impacts on navigation (ODFW 2006 at 30 and CDFG 2006 at 20). None of the conditions analyzed in this section would result in any change to navigation.

4. Water Supply

PacifiCorp's Final License Application did not identify any Project-induced effects on municipal or irrigation water supply (PacifiCorp 2004, Exhibit E, Page 9-54). PacifiCorp stated that its alternatives would not negatively affect water supply (PacifiCorp 2006, Pages 58 and 83). Similarly, ODFW and California Department of Fish and Game identified no impacts on water supply (ODFW 2006 at 30 and CDFG 2006 at 20). None of the conditions analyzed in this section would result in any change to the water supply.

5. Air Quality

PacifiCorp did not identify any effect of its proposed alternatives (PacifiCorp 2006, Pages 58 and 83) on air quality. ODFW and California Department of Fish and Game did not address air quality. None of the conditions analyzed in this section would result in any change to air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp stated that its alternatives will not affect other aspects of environmental quality (PacifiCorp 2006, Pages 58 and 83). The ODFW and California Department of Fish and Game indicated that their alternatives would be complimentary of prescriptions and recommendations submitted by other agencies and the implementation of water quality improvements on the Klamath River and tributaries, but identified no effects on other aspects of environmental quality (ODFW 2006 at 30 and CDFG 2006 at 20). Analysis of the environmental effects of altering flow, ramping rate requirements and sediment augmentation are analyzed in more detail above. None of the conditions analyzed in this section would result in any change to other aspects of environmental quality.

BLM Condition 5

One alternative condition was provided by PacifiCorp for BLM Preliminary Condition 5 (See PacifiCorp 2006, pages 84-86).

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production.

Answer – The alternative condition would likely cost less to implement, and may be significantly less. The alternative condition would not result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would likely cost less to implement since it limits the Licensee's responsibilities for cultural resources to those found within the Project boundary, and only those cultural resources found on what PacifiCorp considers to be BLM "reservations" within the Project boundary. PacifiCorp estimated that the additional surveys required by the BLM preliminary condition (excluded in the alternative condition) would cost

approximately $10,000 to $15,000 and amending the current Historic Properties Management Plan (HPMP) would cost approximately $45,000. In addition, PacifiCorp inappropriately uses a proportion of the costs for managing the 59 sites in the current HPMP to the 18 additional sites identified in the BLM preliminary condition, using an assumption that management of these sites would be of similar costs. The costs of managing the additional sites identified in the BLM preliminary condition are directly related to the Project-related effects on these sites. As such, it is inappropriate to extrapolate the expected costs for managing the sites until they are incorporated into the amended HPMP and appropriate measures are identified. The BLM preliminary condition does not establish any specific measures to be implemented by the Licensee, only that known damages will be addressed in terms of measures for the sites in the amended HPMP. PacifiCorp estimates the costs for their alternative condition to be $8 million (2004 dollars) in capital costs and $7.8 million in operations and maintenance (O&M) costs (2004 dollars) over a 30-year license term. A total estimated cost of surveying the remaining BLM-administered lands within the Area of Potential Effect and amending the HPMP of $60,000 is not significantly more than the total costs of implementing PacifiCorp's alternative condition. However, if, as PacifiCorp argues, the Project-related effects to the additional sites identified in the BLM preliminary condition and necessary measures are proportional to the sites already contained in the HPMP, then the overall cost of implementing the amended HPMP could approach their estimated $10.5 million for capitol costs and $7.8 million in O&M costs (both 2004 dollars), and therefore could be considered significantly more that PacifiCorp's alternative condition.

PacifiCorp's alternative condition would not result in improved operation of the project works for electricity production over BLM's preliminary condition. PacifiCorp's "diversion of resources" argument is not related to improving operation of the project works for electricity production, but is related to PacifiCorp's interpretation that the preliminary condition exceeds BLM's authority. The Licensee is responsible for protection of cultural resources that are affected by the Project, including by Project-related recreation. PacifiCorp's alternative condition, to the extent it would divert resources from meeting that responsibility, still would not likely improve the operation of the project works for electricity production.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – PacifiCorp bases the majority of its arguments on legal premises that either have no merit or are not relevant to protection and utilization of the BLM reservation. These legal arguments are addressed elsewhere in this analysis

or are addressed in the rationale for the BLM's Modified Condition. PacifiCorp's departure from the accepted process of analyzing cultural resources that may be affected by the Project through the identification and subsequent survey of an Area of Potential Effect (APE) has resulted in the inadequacy of the current HPMP, as the current HPMP does not include analysis and appropriate measures for all sites within the APE, including sites on BLM-administered lands. Therefore, PacifiCorp's alternative condition does not provide for adequate protection and utilization on the BLM reservation.

Conclusion

To satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. Although PacifiCorp's alternative may cost less to implement, it would not provide for the adequate protection and utilization of the BLM reservation

Equal Consideration of Effects Demonstration

The BLM has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for the BLM Modified Condition 5 and PacifiCorp's Alternative Condition 5:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp indicates that their alternative condition would not have a negative effect on energy supply, distribution, cost or use (PacifiCorp 2006, Page 89). PacifiCorp asserts that the BLM's condition will have "…a relatively greater impact…" on energy supply, distribution, cost or use due to the potential "…diversion of resources to activities and requirements…" required by the BLM condition. *Id.* The Department does not accept this notion, as any diversion of resources required by the BLM condition would not affect energy supply, distribution, cost or use, nor would it greatly affect the operation of the Project in general for electricity production. It is the Department's conclusion that neither PacifiCorp's alternative condition nor BLM's Modified Condition will have an effect on energy supply, distribution, cost or use.

2. **Flood control**

PacifiCorp identified that their proposed alternative would not affect flood control (PacifiCorp 2006, Page 89). The BLM's Modified Condition would not affect flood control.

3. **Navigation**

PacifiCorp identified that their alternative would have no affect on navigation (PacifiCorp 2006, Page 89). The BLM's Modified Condition would not affect navigation.

4. **Water Supply**

PacifiCorp identified that their alternative would have no affect on water supply (PacifiCorp 2006, Page 89). The BLM's Modified Condition would not affect water supply.

5. Air Quality

PacifiCorp identified that their proposed alternative would have no effect on air quality (PacifiCorp 2006, Page 89). The BLM's Modified Condition would not affect air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp identified that their alternative will have no effect on environmental quality (PacifiCorp 2006, Page 90). The BLM's Modified Condition would not change other aspects of environmental quality.

BLM Condition 6

One alternative condition was provided by PacifiCorp for BLM Preliminary Condition 6 (See PacifiCorp 2006a, pages 90-93).

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production.

Answer – The alternative condition would likely cost significantly less to implement. The alternative condition would not result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would cost less to implement since it limits the Licensee's responsibilities for Project-related recreation to those found within the Project boundary, and only those Project-related recreation resources found on what PacifiCorp considers to be BLM "reservations" within the Project boundary. Without arguing the veracity of PacifiCorp's cost estimates of the BLM's preliminary condition and PacifiCorp's alternative condition, it is reasonable that the BLM's preliminary condition will cost significantly more than PacifiCorp's alternative condition. The BLM's preliminary condition requires additional facilities on BLM-administered lands that receive Project-related recreation use to be included in the Recreation Resource Management Plan (RRMP) to identify additional Licensee responsibilities, while the PacifiCorp alternative excludes these facilities.

PacifiCorp's alternative condition would not result in improved operation of the project works for electricity production over BLM's preliminary condition. PacifiCorp's "diversion of resources" argument is not related to improving operation of the project works for electricity production, but is related to PacifiCorp's interpretation that the preliminary condition exceeds BLM's authority. The Licensee is responsible for Project-related recreation, including

that which occurs on BLM-administered lands. PacifiCorp's alternative condition, to the extent it would divert resources from meeting that responsibility, still would not likely improve the operation of the project works for electricity production.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – PacifiCorp bases the majority of its arguments on legal premises that either have no merit or are not relevant to protection and utilization of the BLM reservation. These legal arguments are addressed elsewhere in this analysis or are addressed in the rationale for the BLM's Modified Conditions.

PacifiCorp's argument regarding the Topsy Campground is nonsensical, as even though PacifiCorp proposes to exclude the site from the Project boundary, there is no dispute that the campground is 100% Project-related, and would logically be included in the new Project boundary (as it is in the existing Project boundary) since the site is needed for the Project purpose of recreation. PacifiCorp's uses background information purporting the argument that since PacifiCorp did not have any responsibility for several BLM recreation sites in the existing license, they shouldn't have any responsibility in a new license. They also use this argument to support the proposed exclusion of these sites from the Project boundary.

The BLM recognizes that the Commission has the sole jurisdiction to determine the Project boundary for the Project. The Project boundary will include lands and roads that are necessary for operation and maintenance of the Project and for other Project purposes, including Project-related recreation, shoreline control, or protection of environmental resources. As such, the BLM expects that the Project boundary for the new license, if one is issued, will include additional BLM-administered lands from those proposed by PacifiCorp in their license application. The BLM preliminary condition provides for the Licensee to take their share of the responsibility for Project-related recreation on BLM-administered lands and to ensure that those activities meet BLM land management direction. PacifiCorp's alternative condition would unnecessarily limit these requirements, and therefore would not provide for the adequate protection and utilization of the BLM reservation.

PacifiCorp provides another argument that the BLM lacks authority to require changes to Project operations through revision of 4(e) conditions. While in this instance PacifiCorp's assertions are related to BLM's reserving the right to

require changes to the RRMP, the overriding issue is addressed in the rationale for BLM Modified Condition No. 9 in this submission.

Conclusion

To satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. Although PacifiCorp's alternative may cost less to implement, it would not provide for the adequate protection and utilization of the BLM reservation

Equal Consideration of Effects Demonstration

The BLM has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for the BLM Modified Condition 6 and PacifiCorp's Alternative Condition 6:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp indicates that their alternative condition would not have a negative effect on energy supply, distribution, cost or use (PacifiCorp 2006, Page 97). PacifiCorp asserts that the BLM's condition will have "…a relatively greater impact…" on energy supply, distribution, cost or use due to the potential "…diversion of resources to activities and requirements…" required by the BLM condition. *Id.* The Department does not accept this conclusion, as any diversion of resources required by the BLM condition would have no effect on energy supply, distribution, cost or use, nor would it even greatly affect the operation of the Project in general for electricity production. It is the Department's conclusion that neither PacifiCorp's alternative condition nor BLM's Modified Condition will have an effect on energy supply, distribution, cost or use.

2. **Flood control**

PacifiCorp identified that their proposed alternative would not affect flood control (PacifiCorp 2006, Page 97). The BLM's Modified Condition would not affect flood control.

3. **Navigation**

PacifiCorp identified that their alternative would have no affect on navigation (PacifiCorp 2006, Page 98). The BLM's Modified Condition would not affect navigation.

4. **Water Supply**

PacifiCorp identified that their alternative would have no affect on water supply (PacifiCorp 2006, Page 98). The BLM's Modified Condition would not affect water supply.

5. **Air Quality**

PacifiCorp identified that their proposed alternative would have no effect on air quality (PacifiCorp 2006, Page 98). The BLM's Modified Condition would not affect air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp identified that their alternative will have no effect on environmental quality (PacifiCorp 2006, Page 98). The BLM's Modified Condition would not change other aspects of environmental quality.

BLM Condition 7

One alternative condition was provided by PacifiCorp for BLM Preliminary Condition 7 (See PacifiCorp 2006a, pages 99-100).

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production?

Answer – The alternative condition would likely cost less to implement, but not significantly less. The alternative condition would not result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would cost less to implement since it limits the Licensee's responsibilities for vegetation management activities to those that would occur within the Project boundary, and only those Project-related recreation resources found on what PacifiCorp considers to be BLM "reservations" within the Project boundary. PacifiCorp's "reservations" argument has no merit (see analyses for Condition No. 1); and the differences between "BLM-administered lands affected by the Project" in the BLM preliminary condition and "within the Project boundary" as proposed in the alternative condition are difficult to ascertain. While PacifiCorp insinuates that the BLM preliminary condition could be applied to "…7,599 acres of BLM-owned lands within the Klamath River canyon area between J.C. Boyle Dam and Copco Reservoir…," the condition is intended to be applicable, as stated, to BLM-administered lands affected by the Project. If the Licensee intends to conduct vegetation management activities on lands affected by the Project, activities both on and off BLM-administered lands should be addressed in the Vegetation Resources Management Plan (VRMP).

However, notwithstanding the legal arguments, the requirements of the BLM preliminary condition and PacifiCorp's alternative condition are substantially similar. The VRMP in both conditions is intended to guide the Licensee's vegetation management activities through a new license term. The BLM does not anticipate that the practices employed would differ to any great extent between the conditions, and therefore the costs would not be significantly different.

PacifiCorp's alternative condition would not result in improved operation of the project works for electricity production over BLM's preliminary condition. PacifiCorp's "diversion of resources" argument is not related to improving operation of the project works for electricity production, but is related to PacifiCorp's interpretation that the preliminary condition exceeds BLM's authority. The Licensee is responsible for and proposes to conduct vegetation management activities, including on BLM-administered lands. PacifiCorp's alternative condition, to the extent it would divert resources from meeting that responsibility, still would not likely improve the operation of the project works for electricity production.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – In general, the alternative condition unnecessarily limits the scope of the condition to BLM-administered lands in the Project area that meet PacifiCorp's interpretation of what constitutes a "reservation" under the Federal Power Act, and similarly limits BLM's authority to only some BLM-administered lands within the Project boundary for the Project. PacifiCorp bases the majority of its arguments on legal premises that either are without merit or are not relevant to protection and utilization of the BLM reservation. These legal arguments are addressed elsewhere in this analysis and/or are addressed in the rationale for the BLM's Modified Conditions. The limitations contained in the alternative condition would result in the BLM's inability to ensure the adequate protection and utilization of the BLM reservation.

The BLM recognizes that the Commission has the sole jurisdiction to determine the Project boundary for the Project. The Project boundary will include lands and roads that are necessary for operation and maintenance of the Project and for other Project purposes, including Project-related recreation, shoreline control, or protection of environmental resources. As such, the BLM expects that the Project boundary for the new license, if one is issued, will include additional BLM-administered lands from those proposed by PacifiCorp in their license application. The BLM preliminary condition provides for the Licensee to take their share of the responsibility for Project-related recreation on BLM-administered lands and to ensure that those activities meet BLM land management direction. PacifiCorp's alternative condition would unnecessarily limit these requirements, and therefore would not provide for the adequate protection and utilization of the BLM reservation.

PacifiCorp provides another argument that the BLM lacks authority to require changes to Project operations through revision of 4(e) conditions. While in this

instance PacifiCorp's assertions are related to BLM's reserving the right to require changes to the VRMP, the overriding issue is addressed in the rationale for BLM Modified Condition No. 9 in this submission.

Conclusion

To satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. Although PacifiCorp's alternative may cost less to implement, it would not provide for the adequate protection and utilization of the BLM reservation

Equal Consideration of Effects Demonstration

The BLM has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for the BLM Modified Condition 7 and PacifiCorp's alternative condition 7:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp concludes that their alternative condition would not have a negative effect on energy supply, distribution, cost or use (PacifiCorp 2006, Page 104). PacifiCorp asserts that the BLM's condition will have "…a relatively greater impact…" on energy supply, distribution, cost or use due to the potential "…diversion of resources to activities and requirements…" required by the BLM condition. *Id.* The Department does not accept this conclusion, as any diversion of resources required by the BLM condition would have no effect on energy supply, distribution, cost or use, nor would it even greatly affect the operation of the Project in general for electricity production. It is the Department's conclusion that neither PacifiCorp's alternative condition nor BLM's Modified Condition will have an effect on energy supply, distribution, cost or use.

2. **Flood control**

PacifiCorp identified that their proposed alternative would not affect flood control (PacifiCorp 2006, Page 104-105). The BLM's Modified Condition would not affect flood control.

3. **Navigation**

PacifiCorp identified that their alternative would have no affect on navigation (PacifiCorp 2006, Page 105). The BLM's Modified Condition would not affect navigation.

4. **Water Supply**

PacifiCorp identified that their alternative would have no affect on water supply (PacifiCorp 2006, Page 105). The BLM's Modified Condition would not affect water supply.

5. **Air Quality**

PacifiCorp identified that their proposed alternative would have no effect on air quality (PacifiCorp 2006, Page 105). The BLM's Modified Condition would not affect air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp identified that their alternative will have no effect on environmental quality (PacifiCorp 2006, Page 105). The BLM's Modified Condition would not change other aspects of environmental quality.

BLM Condition 8

One alternative condition was provided by PacifiCorp for BLM Preliminary Condition 8 (See PacifiCorp 2006a, pages 106-107).

Criteria 1 – Will the alternative condition, as compared to the BLM's preliminary condition, cost significantly less to implement, or result in improved operation of the project works for electricity production?

Answer – The alternative condition would likely cost less to implement, but not significantly less. The alternative condition would not result in improved operation of the project works for electricity production.

Justification – PacifiCorp's alternative condition would cost less to implement since it limits the Licensee's responsibilities for wildlife management activities to those that would occur within the Project boundary, and only those Project-related wildlife resources found on what PacifiCorp considers to be BLM "reservations" within the Project boundary. PacifiCorp's "reservations" argument has no merit (See analyses for Condition No. 1); and the differences between "BLM-administered lands affected by Project operations and maintenance" in the BLM preliminary condition and "within the Project boundary" as proposed in the alternative condition are difficult to ascertain. While PacifiCorp insinuates that the BLM preliminary condition could be applied to "…7,599 acres of BLM-owned lands within the Klamath River canyon area between J.C. Boyle Dam and Copco Reservoir…", the condition was intended to be applicable, as stated, to BLM-administered lands affected by Project operations and maintenance. If the Project affects wildlife species or habitat, including on BLM-administered lands, and if the Licensee proposes to implement related measures on those lands, both should be addressed in the Wildlife Habitat Management Plan (WHMP).

However, notwithstanding the legal arguments, the requirements of the BLM preliminary condition and PacifiCorp's alternative condition are substantially similar, with one exception. The WHMP in both conditions is intended to guide the Licensee's wildlife habitat management activities through a new license term. The BLM preliminary condition requires that measures include escape ramps on the J.C. Boyle Canal, whereas the alternative condition only requires use monitoring of the existing escape ramps. This results in the alternative condition

potentially costing somewhat less, but it is unclear as to the significance of this cost difference. PacifiCorp did not provide any cost information regarding these measures in their rationale for the alternative condition, so the BLM must assume that the cost difference is not significant. As the two conditions do not significantly differ in terms of elements of the WHMP, the BLM does not consider the costs to be significantly different.

PacifiCorp's alternative condition would not result in improved operation of the project works for electricity production over BLM's preliminary condition. PacifiCorp's "diversion of resources" argument is not related to improving operation of the project works for electricity production, but is related to PacifiCorp's interpretation that the preliminary condition exceeds BLM's authority. The Licensee is responsible for and proposes to develop and implement a WHMP, including BLM-administered lands. PacifiCorp's alternative condition, to the extent it would divert resources from meeting that responsibility, still would not likely improve the operation of the project works for electricity production.

Criteria 2 – Will the alternative condition, as compared to the BLM's preliminary condition, provide for the adequate protection and utilization of the reservation?

Answer – PacifiCorp's alternative condition will not provide for the adequate protection and utilization of the reservation.

Justification – In general, the alternative condition unnecessarily limits the scope of the condition to BLM-administered lands in the Project area that meet PacifiCorp's interpretation of what constitutes a "reservation" under the Federal Power Act, and similarly limits BLM's authority to only some BLM-administered lands within the Project boundary for the Project. PacifiCorp bases the majority of its arguments on legal premises that are without merit or are not relevant to protection and utilization of the BLM reservation. These legal arguments are addressed elsewhere in this analysis and/or are addressed in the rationale for the BLM's Modified Conditions. The limitations contained in the alternative condition would result in the BLM's inability to ensure the adequate protection and utilization of the BLM reservation.

The BLM recognizes that the Commission has the sole jurisdiction to determine the Project boundary for the Project. The Project boundary will include lands and roads that are necessary for operation and maintenance of the Project and for other Project purposes, including Project-related recreation, shoreline control, or protection of environmental resources. As such, the BLM expects that the Project boundary for the new license, if one is issued, will include additional BLM-administered lands from those proposed by PacifiCorp in their license application. The BLM preliminary condition provides for the Licensee to take their share of the responsibility for Project-related recreation on BLM-administered lands and to

ensure that those activities meet BLM land management direction. PacifiCorp's alternative condition would unnecessarily limit these requirements, and therefore would not provide for the adequate protection and utilization of the BLM reservation.

PacifiCorp provides another argument that the BLM lacks authority to require changes to Project operations through revision of 4(e) conditions. While in this instance PacifiCorp's assertions are related to BLM's reserving the right to require changes to the WHMP, the overriding issue is addressed in the rationale for BLM Modified Condition No. 9 in this submission.

Conclusion

To satisfy FPA Section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be adequately protective of the reservation *and* either significantly less costly to implement or resulting in improved operations for electricity production. Although PacifiCorp's alternative may cost less to implement, it would not provide for the adequate protection and utilization of the BLM reservation

Equal Consideration of Effects Demonstration

The BLM has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following for the BLM Modified Condition 8 and PacifiCorp's proposed alternative condition 8:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp indicated that their alternative condition would not have a negative effect on energy supply, distribution, cost and use (PacifiCorp 2006, Page 110), asserting that the BLM's condition will have "…a relatively greater impact…" on energy supply, distribution, cost or use due to the potential "…diversion of resources to activities and requirements…" required by the BLM condition. *Id.* The Department does not accept this conclusion, as any diversion of resources required by the BLM condition would have no effect on energy supply, distribution, cost or use, nor would it even greatly affect the operation of the Project in general for electricity production. It is the Department's conclusion that neither PacifiCorp's alternative condition nor BLM's Modified Condition will have an effect on energy supply, distribution, cost or use.

2. **Flood control**

PacifiCorp identified that their proposed alternative would not affect flood control (PacifiCorp 2006, Page 110). The BLM's Modified Condition would not affect flood control.

3. **Navigation**

PacifiCorp identified that their alternative would have no affect on navigation (PacifiCorp 2006, Page 110). The BLM's Modified Condition would not affect navigation.

4. Water Supply

PacifiCorp identified that their alternative would have no affect on water supply (PacifiCorp 2006, Page 110). The BLM's Modified Condition would not affect water supply.

5. Air Quality

PacifiCorp identified that their proposed alternative would have no effect on air quality (PacifiCorp 2006, Page 111). The BLM's Modified Condition would not affect air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp identified that their alternative will have no effect on environmental quality (PacifiCorp 2006, Page 111). The BLM's Modified Condition would not change other aspects of environmental quality.

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Attachment A1: U.S. Department of the Interior Modified 4(e) Conditions – BLM Reservation

BLM Modified Condition 1: Activities on or Affecting Bureau of Land Management-Administered Lands

(a) For any proposed activity to be implemented by the Licensee on or affecting BLM administered lands that are added to the Project boundary, the Licensee shall request and obtain a BLM use authorization prior to conducting the activity. The Licensee shall fund any required environmental analysis related to the issuance of the use authorization, as determined by the BLM. As part of the request for the use authorization, the Licensee may provide environmental analysis of the proposed action that meets BLM requirements for implementing the National Environmental Policy Act (NEPA) in existence at the time the request is made, including changes in statutes or regulations governing BLM NEPA procedures. The Licensee may also refer to or rely on any previous NEPA analysis for the proposed measure to the extent the analysis is currently applicable, as determined by BLM. The use authorization may contain stipulations for fire protection, spoils disposal, hazardous materials, safety or other standard use authorization measures consistent with the requirements in effect at the time for implementation of similar actions on BLM-administered land.

(b) The Licensee shall prepare site-specific plans for the approval of the BLM for activities required by the license that have the potential to impact BLM administered lands or resources. The site-specific plans shall include, at a minimum:

(i) a map depicting the location of the proposed activity;

(ii) the land use allocation and management designation including standards and guidelines for the area of the proposed activity;

(iii) site-specific designs for the proposed activity;

(iv) proposals for Project-specific mitigation measures, including, but not limited to, applicable measures addressing safety, inspections, spoils disposal, hazardous substances, and restoration needs;

(v) proposals for implementation and effectiveness monitoring necessary to meet standards and guidelines; and

(vi) data from surveys, biological evaluations, or consultation required by regulation and as applicable to activities on BLM-administered lands.

(c) Upon BLM approval of the site-specific plans, the Licensee shall conduct any additional environmental analysis deemed necessary by the BLM to ensure consistency with statutes, regulations and policies, including the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), the Native American Grave Protection Act (NAGPRA), the Clean

Air Act, the Clean Water Act, and the Endangered Species Act (ESA) and the BLM direction in the National Environmental Policy Act Handbook 1790-1 (USDI BLM 1988), or as amended. As part of the site-specific plan, the Licensee may provide environmental analysis of the proposed activity that meets BLM requirements for implementing the National Environmental Policy Act (NEPA) in existence at the time the request is made. The Licensee may also refer to or rely on any previous site-specific NEPA analysis for the proposed activity to the extent the analysis is currently applicable, as determined by BLM. The Licensee shall obtain written authorization of the BLM prior to the implementation of the activity.

(d) The Licensee shall avoid disturbance to all public land survey monuments, private property corners, and BLM boundary markers. In the event that any markers or monuments are destroyed by an act or omission of the Licensee, in connection with the use and/or occupancy authorized by the license or a BLM use authorization, depending on the type of monument destroyed, the Licensee shall reestablish or reference same in accordance with (1) the procedures outlined in the "Manual of Instructions for the Survey of the Public Land of the United States," (2) the specifications of the County Surveyor, or (3) the specifications of the BLM. The Licensee shall ensure that any such official survey records affected are amended as provided for by law.

(e) The Licensee shall maintain Project-related improvements and facilities located on BLM-administered lands to accepted standards of repair, orderliness, neatness, sanitation, and safety. The Licensee shall comply with all applicable Federal, State, and local laws, regulations, including but not limited to, the Federal Water Pollution Control Act, 33 U.S.C. § 1251 et seq., the Resources Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 et seq., the Comprehensive Environmental Response, Control, and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., and other relevant environmental laws, as well as public health and safety laws and other laws relating to the siting, construction, operation, and maintenance of any facility, improvement, or equipment.

(f) The Licensee shall restore BLM-administered lands affected by the Project to a condition satisfactory to BLM prior to any surrender of the Project license. At least one year in advance of license surrender, the Licensee shall file with the Commission a restoration plan approved by the BLM. The plan shall identify Project-related improvements to be removed, restoration measures, and time frames for implementation and estimated restoration costs.

(g) Prior to the abandonment of any Project-related facilities on or affecting BLM-administered lands, including impacts due to changes in the Project boundary from that in the original license, the Licensee shall restore such lands and improvements to a condition acceptable to BLM. At least one year in advance of the abandonment of these Project-related facilities, the Licensee shall file with the Commission a restoration and maintenance plan approved by the BLM. The plan shall identify, at a minimum, improvements that will be removed,

improvements abandoned but not removed, restoration and maintenance measures, time frames and costs.

(h) The Licensee shall, within one year of license issuance, develop a standard operating procedures plan that the Licensee shall implement in the event of Project-related emergencies. At a minimum, the plan shall address BLM-administered lands potentially affected by the Project, and address procedures, environmental permits, and subsequent mitigation measures for any Project-related impacts to BLM administered lands including, but not limited to, the J.C. Boyle emergency spillway and canal and slope failures. This plan shall be developed with consultation and approval by BLM. The plan shall include implementation strategies for agency coordination, restoration actions, monitoring and evaluation, and potential mitigation measures.

(i) The Licensee shall exercise diligence in protecting from damage the land and property of the BLM covered by and used in connection with this license, including any buildings, bridges, roads, trails, lands or other property of the BLM; and shall restore, reconstruct or compensate the BLM for any damage resulting from negligence and from the violation of the terms of this license or any law or regulation applicable to the BLM by the Licensee, or by any agents or employees of the Licensee acting within the scope of their agency or employment. Arrangements to restore, reconstruct, or compensate for damages shall be made with the BLM.

(j) The Licensee shall indemnify, defend, and hold the United States harmless for any costs, damages, claims, liabilities, and judgments arising from past, present, and future acts or omissions of the Licensee in connection with the use and/or occupancy of BLM-administered lands or resources authorized by the license. This indemnification and hold harmless provision applies to any acts and omissions of the Licensee or the Licensee's heirs, assigns, agents, employees, affiliates, subsidiaries, fiduciaries, contractors, or lessees in connection with the use and/or occupancy authorized by this license which result in: (1) violations of any laws and regulations which are now or which may in the future become applicable, and including but not limited to environmental laws such as the CERCLA, RCRA, Oil Pollution Act, Clean Water Act, Clean Air Act; (2) judgments, claims, demands, penalties, or fees assessed against the United States; (3) costs, expenses, and damages incurred by the United States; or (4) the release or threatened release of any solid waste, hazardous substances, pollutant, contaminant, or oil in any form in the environment.

BLM Modified Condition 2: Consultation with the Bureau of Land Management

A. The Licensee shall consult with the Bureau of Land Management (BLM) at least annually and prepare a report on the status of implementing conditions of the license, including, at a minimum, those that may affect BLM-administered lands and resources. The report shall include, but is not limited to, the:

1. Results of any monitoring preformed over the previous year for reporting effectiveness of license requirements;
2. Review of any non-routine maintenance;
3. Discussion of any foreseeable changes to Project facilities or operations;
4. Discussion of any necessary revisions or modification to plans approved as part of this license; and
5. Discussion of elements of current year maintenance plans, e.g. road maintenance.

B. A copy of the records, plan reports, monitoring reports, and other pertinent records shall be provided to the BLM at least 10 days prior to the annual meeting, unless otherwise agreed.

C. Within 60-days of issuance of the report to BLM, the Licensee shall file the record of consultation and any BLM comments and recommendations with the Commission.

D. The Licensee shall consult with the BLM on a as-needed basis to identify and resolve potential conflicts with BLM policy and direction prior to initiating activities on BLM-administered lands,

E. The Licensee shall consult with the BLM at least annually to determine if any Project-related activity may affect other authorized activities on BLM-administered lands in the Project area. If a Project-related activity may affect other authorized uses, then the Licensee shall resolve potential conflicts with representatives of those permitted uses.

The Licensee shall submit copies of other reports related to Project safety, including Spill Prevention Control and Countermeasure Plans and annual emergency and hazardous chemical inventories, and non-compliance to the BLM concurrently with submittal to the Commission. These include, but are not limited to, any non-compliance report filed by the Licensee for facilities or operations on or affecting BLM-administered lands.

BLM Modified Condition 3: Roads Inventory Analysis and Roads Management

A. Within six months of license issuance, the Licensee shall complete, in consultation with the Bureau of Land Management (BLM), a Project Roads Inventory Analysis (Analysis) and file the Analysis with the Commission for approval. The Licensee shall prepare a draft Analysis after consultation with the BLM. The Licensee shall allow a minimum of 60 days for the BLM to comment and make recommendations on the draft Analysis before finalizing the Analysis and filing it with the Commission. The Licensee shall include with the Analysis documentation of consultation, copies of comments and recommendations and a description of how the comments and recommendations are accommodated by the Analysis. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the Analysis with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM. At a minimum, the Analysis shall address all roads that cross BLM-administered lands included within

the geographical scope of the *Study Area Roadway Inventory Analysis and Project Roadway Management Plan – Klamath Hydroelectric Project (FERC Project No. 2082)* (PacifiCorp 2004m), including in the analysis the estimated percentage of use that is associated with Project operations and maintenance and other Project-related activities such as Project-related recreation. The Analysis, at a minimum, shall identify and map the roads, bridges, culverts and other transportation-related structures within the broader overall study area, as described above, as well as identifying the estimated percentage of Project-related use these transportation-related facilities sustain.

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B. Within one year of license issuance, the Licensee shall develop, in consultation with the BLM, a Road Management Plan (Plan) and file the Plan with the Commission for approval. The Licensee shall prepare a draft Plan after consultation with the BLM. The Licensee shall allow a minimum of 60 days for the BLM to comment and make recommendations on the draft Plan before finalizing the plan and filing it with the Commission. The Licensee shall include with the Plan documentation of consultation, copies of comments and recommendations and a description of how the comments and recommendations are accommodated by the Plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the Plan with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM. The Plan shall include all roads that cross BLM-administered lands (BLM Roads) that are identified in the Project Roads Inventory Analysis that sustain Project-related uses, including Project-related recreation.

1. At a minimum, the Plan shall include the items specified in the Final License Application (PacifiCorp 2004a, Executive Summary, page 8-5; Land Use, Visual, and Aesthetic Resources Final Technical Report, page 3-7; and Appendix 3C) and shall:
   (a) Identify roads, bridges, culverts and other transportation-related structures necessary for Project-related activities, including Project-related recreation;
   (b) Identify transportation-related operations and maintenance (O&M) activities required for the continued operation of the Project;
   (c) Identify transportation-related activities required to address Project-related recreation uses;
   (d) Include provisions for use and cost-sharing agreements for Project and Project-related transportation related structures;
   (e) Identify the Licensee share for management and maintenance of BLM Roads affected by the Project;
   (f) Identify BLM roads previously used but which are no longer necessary to operate and maintain the Project or used for Project-related recreation, and include plans for decommissioning these roads as appropriate;
   (g) Provide for continued protection of natural and cultural resources along Project-related roadway corridors;
   (h) Identify appropriate standards for the maintenance of Project-related roads and other transportation-related structures;

(i) Identify and implement Best Management Practices for maintaining and protecting cultural resources, vegetation resources (including management for noxious weeds), aquatic resources, and minimizing soil erosion; and
(j) Identify relevant BLM policies for transportation management of BLM Roads affected by Project-related activities.

2. The Roads Plan shall accommodate unrestricted access by the BLM necessary to manage and administer BLM lands and resources that are affected by Project operations. The plan shall include provisions for the maintenance of crossings and rights-of-way (ROW) required by and consistent with permit requirements for powerlines, penstocks, ditches, and pipelines.

C. The Licensee shall consult with the BLM prior to erecting any signs on BLM-administered lands that are necessary for operation or maintenance of Project operations or facilities. The Licensee must obtain approval from the BLM specific to the location, design, size, color, and content of signs. The Licensee shall be responsible for maintaining all Licensee-erected signs to neat and presentable standards.

BLM Modified Condition 4: River Corridor Management

A. J.C. Boyle Bypassed River Reach

1. Required Minimum Streamflows – The Licensee shall, within one year after license issuance, operate J.C. Boyle Development to accomplish the following:

(a) Proportional flow requirement: Provide no less than 40% of the inflow to J.C. Boyle Reservoir to the J.C. Boyle Bypassed River Reach, to be measured at a new gage below the J.C. Boyle Dam near RM 225. Inflow to J.C. Boyle Reservoir shall be calculated by averaging the previous three days of the combined daily flows as measured at the Keno gage #11509500 and Spencer Creek gage #11510000 (Calculated Inflow).
(b) Minimum base flow requirement: When Calculated Inflow is less than 1,175 cubic feet per second (cfs), no less than 470 cfs shall be provided to the J.C. Boyle Bypassed River Reach, except that when the Calculated Inflow is less than 470 cubic feet per second (cfs), then flow shall be provided to the J.C. Boyle Bypassed River Reach in an amount equal to the Calculated Inflow.
(c) Seasonal high flow requirement: When Calculated Inflow to J.C. Boyle Reservoir exceeds 3,300 cfs during the period between February 1st and April 15th, diversion to the J.C. Boyle Power Canal shall be suspended at least once and continued for a minimum of seven days.

2. Ramping During Controlled Events – The Licensee shall, within one year after license issuance, operate J.C. Boyle Development to not exceed an up-ramp rate or down-ramp rate of two inches per hour as measured at the new gage below J.C. Boyle Dam when conducting controlled flow events (e.g., scheduled maintenance and changes in minimum flow requirements), except when implementing the seasonal high flow or when turbine capacity is exceeded. The Licensee, in

consultation with the BLM, shall develop and implement an appropriate ramp rate to follow after the seasonal high flow to prevent stranding fish in the J.C. Boyle Bypassed Reach.

B. J.C. Boyle Peaking Reach

1. Streamflow Requirements – The Licensee shall, within one year after license issuance, operate the J.C. Boyle Development from May 1st to October 31st to provide a minimum streamflow of 1,500 cfs a maximum of once a week, such that these flows occur at the Spring Island Boat Launch between 0900 and 1400 hours from Friday through Sunday, in the priority of Saturday, Sunday, and then Friday.
2. Ramping During Controlled Events – The Licensee shall, within one year after license issuance, operate the J.C. Boyle development to not exceed an up-ramp rate or down-ramp rate of two inches per hour when conducting controlled flow events (e.g. scheduled maintenance, power generation, changes in streamflow requirements), except during implementation of the seasonal high flow, as measured at the J.C. Boyle Powerhouse gage USGS #11510700.
3. Flow Continuation Measure – The Licensee shall, within one year of license issuance, implement a flow continuation measure at the J.C. Boyle canal and powerhouse to provide a minimum of 48 hours of continuous flow under powerhouse shutdown conditions.

C. Streamflow Measurement and Reporting: J.C. Boyle Bypassed River and Peaking Reaches

1. Instream Flow Measurement – The Licensee shall, within one year after license issuance:

   (a) Continuously measure the stage of water at three existing gage sites. Existing gage stations shall include the Klamath River below Keno Dam (#11509500), Spencer Creek above the confluence with the J.C. Boyle Reservoir (#11510000), and Klamath River below the J.C. Boyle Powerhouse (#11510700). The Licensee shall operate and maintain the gages at these sites if the gages are no longer operated or maintained by the current operators.

   (b) The Licensee shall establish and operate one additional gage on the Klamath River J.C. Boyle Bypassed River Reach below all outlets from the J.C. Boyle Dam and above the springs near RM 225, using the most current USGS protocol for gage station installation, maintenance, and data collection.

2. Instream Flow Reporting - The Licensee shall, within one year after license issuance:

   (a) Provide instantaneous 30-minute real time streamflow data in cfs via remote access that is readily available and accessible to the public.

   (b) Design and maintain a database, similar to the most current version of the USGS National Water Information System (NWIS) for reporting on surface water. The database shall store gage network data and streamflow tracking procedures. BLM shall review and approve the database.

3. The Licensee shall, within two years after license issuance, submit a report for each water year (i.e. October 1st through September 30th) of streamflow data

reported in cfs to the BLM. The report shall be filed with the BLM within six months of the end of each water year.

D. Sediment Management Plan (SMP)

Within one year of license issuance, the Licensee shall develop, in consultation with and approval of the Bureau of Land Management (BLM), a Sediment Management Plan (SMP) and file the SMP with the Commission for approval. The Licensee shall prepare a draft SMP after consultation with the BLM and other stakeholders that are willing to participate, including, but not limited to USFWS, BOR, NOAA Fisheries, USGS, ODEQ/EPA, ODFW, CDFG, NCRWQCB, ODSL and affected Tribes. The Licensee shall allow a minimum of 60 days for the BLM and other stakeholders to comment and make recommendations on the draft SMP before finalizing the plan and filing it with the Commission. The Licensee shall include with the SMP documentation of consultation, copies of comments and recommendations, and a description of how the comments and recommendations are accommodated by the SMP. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the SMP with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM. The SMP shall be designed to meet the following objectives:

-increase channel complexity;
-increase spawning habitat for resident and anadromous fish; and

The SMP, at a minimum, shall adhere to the following 1) overall strategy; 2) goals; 3), elements, 4) performance measures, and 5) reporting requirements:

1) Overall Strategy - increase sediment storage in the J.C. Boyle Bypassed River reach (gravel/cobble sized material in boulder/bedrock pockets, gravel/cobble sized material on bars and in pools, and sand/gravel sized material on bar tops and along channel margins); improve coarse sediment transport (distribute introduced and existing accumulations downstream); and restore a balance between sediment supply and transport using high flows and sediment introduction.

2) Goals – improvement of physical habitat attributes corresponding to sediment storage in the reach. Broadly, the goals to be achieved include (a) increasing fish spawning habitat; (b) increasing stream channel complexity; and (c) improving riparian habitat quality.

3) Elements – The above goals may be achieved by meeting all of the following:

a. In one large introduction effort establish bed-stored sediment to its potential in the J.C. Boyle Bypassed River Reach. Determine capacity for gravel and cobble sediment to be trapped in boulder pockets and pools and capacity for sand and gravel trapped on bar surfaces and along the channel margins. An estimate of the large introduction quantity for gravel/cobble in spawning pockets and pools is 1 foot of gravel depth in pockets likely to trap coarse sediment, which cover approximately 1/3 of the low flow channel. Similar estimates for bar top and

channel margin trapping of sands and gravels to meet riparian goals need to be developed. If restoring seasonal high flows mobilizes and distributes the sediment accumulated at the J.C. Boyle emergency spillway deposit sufficiently to meet the capacity of the bypassed river reach downstream from that deposit, then the sediment introduction criteria can be reduced by a corresponding quantity to attain the potential for the bypassed river reach upstream from the emergency spillway.

b. Establish a sediment transport model to initially estimate sediment exports, per grain size, from the reach in order to estimate and plan for implementation of subsequent sediment infusion quantities and qualities. Annually refine the model with annual flood season bed material and suspended sediment transport measurements.

c. Establish a sediment monitoring program, using standardized techniques, that adaptively manages the program over time and evaluates whether the sediment augmentation program is effective. Effectiveness shall be determined based on the Performance Measures (See part 4 below). The monitoring results shall be reported to sufficiently inform annual adaptive management decisions for sediment infusion quantities and qualities after the initial large sediment input. Monitoring results may also be used to adapt additional aspects of the augmentation, including, but not limited to, timing, location, augmentation methods, and particle size composition.

d. Maintain sediment continuity per grain size in the J.C. Boyle bypassed river reach through adaptive infusions of sediment quantities sized to replace sediment exported from the reach.

e. Develop spawning habitat suitability criteria for the JC Boyle bypassed river reach for steelhead, coho, Chinook, and resident trout by modeling the quantity and quality of salmonid spawning habitat for a flow of 470 cfs plus accretion flows. Establish a periodic monitoring program to validate model estimates of spawning habitat quantity and quality.

f. Annually monitor and identify locations of salmonid spawning activity in the bypass reach for each salmonid species or stock.

4) Performance Measures – The following shall be considered for inclusion in the SMP:

a. Achieve the determined capacity for gravel and cobble sediment to be trapped in boulder pockets and pools within three years of SMP approval.

b. Achieve the determined capacity for sand and gravel trapped on bar surfaces and along the channel margins within three years of SMP approval.

c. Maintain sediment continuity and a balanced sediment budget, such that gravel/cobble spawning patches and sand/gravel riparian bar surfaces remain within an average of +/- 10% of the estimated sediment trap capacity.

5) Reporting -

a) The Licensee shall submit to the BLM and the Commission an annual report on the activities of the SMP implementation during the previous year. The report shall include a description of the quantities, sizes, composition, timing, method(s), and location of sediment added and any monitoring data. The report shall integrate data from year to year, such that an analysis of trends is included.
b) At least every five years, the Licensee shall consult with the BLM to review and update or revise the SMP as appropriate. Upon Commission approval, the Licensee shall implement the revised SMP.

E. Adaptive Management Plan (AMP)

Within one year of license issuance, the Licensee shall develop, in consultation with the Bureau of Land Management (BLM), an Adaptive Management Plan (Plan) and file the Plan with the Commission for approval. The Licensee shall prepare a draft Plan after consultation with the BLM. The Licensee shall allow a minimum of 60 days for the BLM to comment and make recommendations on the draft Plan before finalizing the plan and filing it with the Commission. The Licensee shall include with the Plan documentation of consultation, copies of comments and recommendations and a description of how the comments and recommendations are accommodated by the Plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the Plan with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM. At a minimum, the Plan shall address all BLM-administered lands that are affected by the Project in the J.C. Boyle Bypassed River and Peaking Reaches. After Commission approval, the Licensee shall implement the Plan.

The Plan, at a minimum, shall:

1. Be designed to monitor how implementation of the River Corridor Management Condition is effective in improving fish habitat quantity and quality for resident, migratory, and anadromous fish, with emphasis on spawning habitat.
2. Be designed to monitor how implementation of the River Corridor Management Condition is effective in increasing channel complexity and riparian habitat quality.
3. Be designed to monitor how implementation of the River Corridor Management Condition affects flows for recreational boating.
4. Be designed to monitor how implementation of the River Corridor Management Condition is affecting fish migration, spawning, and rearing conditions for salmonids.

5. Contain annual reporting requirements of the Licensee for monitoring results, data collection, and an evaluation of these results for all monitoring efforts in the river corridor.

BLM Modified Condition 5 – Cultural Resources Inventory and Management

1. Cultural Resources Inventory – Within one year of license issuance, if not previously completed, the Licensee shall complete cultural resources inventory of Bureau of Land Management (BLM)-administered lands within the Area of Potential Effect (APE) to the following specifications:

(A) In consultation with the BLM and affected tribes, the Licensee shall complete a cultural resources inventory of approximately 77.2 acres of BLM-administered land within the APE that were not inventoried in the Licensee's 2002-2003 inventory efforts.

(B) The Licensee shall employ survey standards consistent with BLM Class III survey protocols (BLM 1998).

(C) In consultation with the BLM, affected tribes, and State Historic Preservation Officer (SHPO), the Licensee shall document newly identified sites according to BLM and SHPO standards and assess the sites for eligibility on the National Register of Historic Places (NRHP). Newly discovered sites shall be incorporated in an amended HPMP (see below).

(D) The Licensee shall submit a draft report to the BLM documenting the results of the inventory within 60 days of completion. The report shall follow SHPO report guidelines. The Licensee shall allow a minimum of 60 days for the BLM to review and make recommendations on the draft before finalizing the report and filing it with the Commission. A copy of the final report shall be submitted to the BLM, affected tribes, and the SHPO.

2. Amend Historic Properties Management Plan

Within one year of license issuance, the Licensee shall amend, in consultation with the BLM, the Historic Properties Management Plan (HPMP) to address the management of all sites within the APE and file the HPMP with the Commission for approval. The Licensee shall prepare a draft amended HPMP after consultation with the BLM, affected tribes and SHPO. The Licensee shall allow a minimum of 60 days for the BLM to comment and make recommendations on the draft amended HPMP before finalizing the plan and filing it with the Commission. The Licensee shall include with the HPMP documentation of consultation, copies of comments and recommendations and a description of how the comments and recommendations are accommodated by the HPMP. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the HPMP with the Commission, the Licensee shall serve a copy of the filed documents upon the

BLM. At a minimum, the HPMP shall address all BLM-administered lands within the APE.

The HPMP, at a minimum, shall include:

(A) Measures to monitor, stabilize, protect, restore, and/or mitigate for Project-related effects to known sites within the APE on BLM-administered land. Sites discovered during the completion of surveys on BLM land within the APE shall also be included in the amended HPMP.
(B) Monitoring of BLM cultural sites within the APE that shall be completed by a qualified professional archaeologist, and shall involve, at a minimum, visiting 20% of the eligible sites each year to ascertain impacts, the effects of mitigations in preventing continued degradation of the resource, whether eligible properties are being affected by Project-related activities, and whether non-eligible historic properties should be re-evaluated for consideration of eligibility.
(C) Protocols for conducting cultural resources surveys on BLM-administered lands prior to future Project-related activities proposed within the APE. If a Project-related activity is proposed within an area where cultural resource surveys are older than 15 years, the Licensee shall conduct a new survey.
(D) Procedures for handling, cataloging, interring, or repatriating cultural resources on BLM land exposed by unanticipated Project related effects.
(E) Provisions for annual reports to be submitted to the Commission, the BLM, and affected tribes documenting mitigations, new findings and assessment of the effectiveness of mitigations in preventing degradation of cultural properties on BLM-administered lands.
(F) A schedule for implementing the amended HPMP, incorporating a priority for those sites which are at greatest risk of continued degradation from Project-related activities.
(G) Provisions for the review and periodic revision of the HPMP to incorporate new information regarding the condition or effects to historic properties on BLM-administered lands or changes in site eligibility as a function of policy, law, regulation, or advances in scientific technology.
(H) Implementation of the HPMP upon Commission approval.

3. Detailed Site Specific Studies – Within one year of the license issuance, the Licensee shall, in consultation with the BLM, conduct detailed, site specific studies to determine the erosion impacts, if any, from flows resulting from Project operations at five BLM sites (35KL21/786, 35KL22, 35KL24, 35KL558, and 35KL577) which are within, or partially within, the T1 terrace.

(A) The Licensee shall submit a draft report documenting the results of the detailed studies within 60 days of the completion of the fieldwork to the BLM for review. The Licensee shall allow a minimum of 60 days for the BLM to review and make recommendations on the draft before finalizing the report and filing it

with the Commission. A copy of the report shall be submitted to the BLM, affected tribes, and the SHPO.

(B) If the detailed studies show that Project related flows impact any of the five sites, mitigation measures developed in consultation with the BLM and affected tribes shall be incorporated within the amended HPMP.

BLM Modified Condition No. 6 – Recreation and Aesthetic Resources Management

Within one year of license issuance, the Licensee shall develop, in consultation with the Bureau of Land Management (BLM), a Recreation Resource Management Plan (RRMP) and file the RRMP with the Commission for approval. The Licensee shall prepare a draft RRMP after consultation with the BLM. The Licensee shall allow a minimum of 60 days for the BLM to comment and make recommendations on the draft RRMP before finalizing the plan and filing it with the Commission. The Licensee shall include with the RRMP documentation of consultation, copies of comments and recommendations and a description of how the comments and recommendations are accommodated by the RRMP. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the RRMP with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM. At a minimum, the RRMP shall address all BLM-administered lands that are affected by Project-related recreation. After Commission approval, the Licensee shall implement the Plan.

A. The RRMP, at a minimum, shall include:

1. Descriptions of Project related existing and potential recreation sites and trails and all those that are on or affecting Bureau of Land Management (BLM) administered lands. These include such sites as Topsy Campground, Spring Island Boaters Access, Klamath River Campground, dispersed day-use sites, Stateline Takeout and Bypass Reach fishing access and trails.
2. A schedule for implementation, maintenance, capital improvements, and monitoring for those BLM recreation facilities that are affected Project-related recreation.
3. Estimates of the costs to operate, maintain and monitor BLM facilities that receive Project-related recreation. The RRMP shall identify responsibility for the costs of operating, maintaining and monitoring, at a minimum, Topsy Campground, Spring Island Boaters access, the Stateline Takeout, the Klamath River Campground and dispersed day-use sites. The RRMP shall identify the appropriate instruments for shared administration of these sites.
4. Maintenance and needed development measures for recreation sites, day-use areas, and non-motorized and motorized trails located on BLM-administered lands affected by Project-related recreation. At a minimum, these sites will include: Topsy Campground; J.C. Boyle Bypass Reach boating and fishing access sites and associated access trails; Spring Island Boaters Access; Klamath River Campground; and

dispersed day-use sites used by whitewater boaters along the Klamath River; scouting trails at major rapids; and the Stateline Takeout.

5. Standards for facilities operation and maintenance; facility replacement, modification, or upgrade; and monitoring for those BLM recreation facilities affected by Project-related recreation.

6. Provisions to bring facilities up to accepted standards for handicap accessibility, public health and cleanliness, safety, and security.

7. Provisions for monitoring and assessment of visitor use on BLM-administered lands that are affected by Project-related recreation at an interval no greater than six years. The assessment shall identify when new facilities or management are needed and shall incorporate a feedback loop and necessary trigger points for action for adaptive management.

8. Provisions for an annual visitor-use report that will be provided to the BLM.

9. Provision for annual review and periodic modifications or revisions of the RRMP.

B. The Licensee shall include a Visual Resource Management (VRM) Plan in the RRMP that includes provisions and guidelines for managing visual (e.g., aesthetic) resources on BLM-administered lands that contain Project facilities from the headwaters of J.C. Boyle Reservoir to Iron Gate Reservoir. The VRM Plan should describe how the design, maintenance, and construction of Project facilities will maintain or preserve visual resource values. The VRM plan shall be consistent with BLM VRM objectives and guidelines (USDI BLM 1995a, pages 43-44 and Map 2-5; USDI BLM 1993, page 33). The VRM Plan shall include provisions for aesthetics at the bypass canal and other concrete structures, switch yards, power houses, buildings, penstocks, metal powerline structures; and Project recreation facilities including campgrounds and day-use sites. The following are examples of the types of mitigation measures that may be used to meet VRM objectives for the Project:

(a) For bypass canal and other concrete structures: mitigate color and form contrasts by application of acid/stain agent (e.g., Permeon) to reduce contrasts in existing structures; by addition of earthtone coloring agents in concrete mix for new structures; and in concert with vegetative screening or landscaping. Vegetative screening or landscaping may require systematic watering, fertilizing or other measures to ensure its survivability and effectiveness over the term of the license.

(b) For switch yards, power houses, buildings, penstocks, metal powerline structures: mitigate color and form contrasts by application of paint/stain earthtone colors selected from the surrounding natural appearing landscape colors to reduce contrasts; and in concert with vegetative screening or landscaping. Replace conductors with non-reflective materials at such time as reflectors would otherwise be replaced.

(c) For Project recreation facilities including campgrounds and day-use sites: mitigate color and form contrasts by vegetative or structural screening for all existing and newly constructed recreation facilities. Mitigate impacted areas with vegetation plantings to reduce erosion, improve aesthetics and screening.

(d) For J.C. Boyle Powerhouse and Canal access roads, Project roads, and other landform alterations: mitigate color and form contrasts by establishing

vegetation. Application of soil tackifiers and bio-stimulants may be necessary to facilitate revegetation. Talus slopes and cutbanks; mitigate color and form contrasts by establishing vegetation. Application of soil tackifiers and bio-stimulants may be necessary to facilitate revegetation.

BLM Modified Condition 7 - Vegetation Resources Management Plan

Within one years of license issuance, the Licensee shall develop, in consultation with the Bureau of Land Management (BLM), a Vegetation Resources Management Plan (Plan) and file the Plan with the Commission for approval. The Licensee shall prepare a draft Plan after consultation with the BLM. The Licensee shall allow a minimum of 60 days for the BLM to comment and make recommendations on the draft Plan before finalizing the plan and filing it with the Commission. The Licensee shall include with the Plan documentation of consultation, copies of comments and recommendations and a description of how the comments and recommendations are accommodated by the Plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the Plan with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM. At a minimum, the Plan shall address all BLM-administered lands that are affected by the Project, including those affected by Project-related recreation. After Commission approval, the Licensee shall implement the Plan.

The Plan, at a minimum, shall include:

1. Provisions to re-survey lands affected by the Project, including, at a minimum, BLM-administered lands affected by Project-related activities, according to accepted protocols to determine or verify the distribution of TES species.
2. Provisions for establishing a weed management area (WMA) that includes the Project area and interested stakeholders.
3. Provisions for surveying, documenting, managing and monitoring noxious weed and invasive plant species, including periodic review of federal, state and local noxious weed lists in the Project area.
4. Provisions for surveying, documenting, monitoring and protecting threatened, endangered, and sensitive (TES) plants, including periodic review of BLM sensitive species, Oregon Natural Heritage Information Center (ORNHIC), California Natural Diversity Database, and California Native Plant Society records.
5. Proposed vegetation management activities for, at a minimum, the J.C. Boyle Powerhouse and canal, maintenance of transmission line and road rights-of-way (ROW), and use of Project-related roads on or affecting BLM-administered lands.
6. Proposed remediation measures and subsequent monitoring program for the eroded area below the J.C. Boyle emergency spillway.
7. A geospatial map (e.g., GIS map) and digital database to store information on species occurrence; distribution; status according to the ODA system of ranking species for control; and timing of last survey.
8. Proposed treatments, mitigations, and best management practices for managing weeds on BLM-administered lands that are impacted by Project-related activities.

9. Descriptions as to how the Plan is consistent with BLM guidance for integrated pest management.
10. Principles of integrated pest management that include prevention and detection, application of integrated control methods, education, coordination, native plant community restoration, monitoring, and evaluation. Integrated control methods may include cultural, physical, biological, and chemical control techniques.
11. Provisions for annual review and periodic modifications or revisions of the Plan.

BLM Modified Condition 8: Wildlife Habitat Management Plan

Within two years of license issuance, the Licensee shall develop, in consultation with the Bureau of Land Management (BLM), a Wildlife Habitat Management Plan (Plan) and file the Plan with the Commission for approval. The Licensee shall prepare a draft Plan after consultation with the BLM. The Licensee shall allow a minimum of 60 days for the BLM to comment and make recommendations on the draft Plan before finalizing the plan and filing it with the Commission. The Licensee shall include with the Plan documentation of consultation, copies of comments and recommendations and a description of how the comments and recommendations are accommodated by the Plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the Plan with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM. At a minimum, the Plan shall address all BLM-administered lands that are affected by the Project, including those affected by Project-related recreation. After Commission approval, the Licensee shall implement the Plan.

The Plan, at a minimum, shall include:

1. Measures with use monitoring for wildlife crossings and escape ramps for the J.C. Boyle Canal.
2. Measures with use monitoring for western pond turtle habitat improvement.
3. Threatened, endangered, sensitive (TES) species and Special Status (SS) species survey and monitoring including survey protocols for long-term survey and monitoring of TES and SS species and their habitat for BLM-administered lands affected by Project-related activities to assess impacts and develop necessary mitigations. This information shall supplement the previous study completed by PacifiCorp (PacifiCorp 2004c - Threatened, Endangered, Sensitive and Special Status Species Assessment).
4. Restoration, protection, and/or enhancement measures for wildlife and/or wildlife habitat affected by Project-related activities.
5. Seasonal restrictions for active nest sites on BLM-administered lands for bald eagles, golden eagles, ospreys, peregrine falcons and other raptors affected by Project-related activities.
6. An Avian Protection Plan (APP) for the Upper Klamath River. This plan shall address avian interaction (electrocution, collision, nesting, perching) with all transmission facilities and follow guidelines in the Avian

Protection Plan Guidelines (APLIC and USFWS, 2005), "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996" (APLIC 1996) and/or the most current publication for avian protection at the time.

7. Provisions for annual review and periodic modifications or revisions of the Plan.

BLM Modified Condition 9: BLM Reservation of Authority

Authority is reserved to require the Licensee to implement such conditions for the protection and utilization of Department of Interior reservations as may be provided by the Secretary of the Interior, pursuant to Section 4(e) of the Federal Power Act, 16 U.S.C. § 797(e).

Section B: U.S. Department of Interior Preliminary 4(e) Conditions – Reclamation Reservation

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Section B: U.S. Department of Interior Preliminary 4(e) Conditions – Reclamation Reservation

Introduction

The Energy Policy Act of 2005, section 241 (c), amending section 33 of the Federal Power Act (16 U.S.C. § 823d) (Act) allows any party in a licensing proceeding to propose an alternative Federal Power Act (FPA) Section 4(e) condition. As such, in the Federal Energy Regulatory Commission relicensing proceeding for P-2082, PacifiCorp filed a proposed alternative to the Section 4(e) conditions proposed by the Bureau of Reclamation (Reclamation). Based on requirements of the Act, and the regulations at 43 CFR § 45.70-.73, Reclamation is required to provide modified Section 4(e) conditions to FERC based on the alternative provided, the results of the Administrative Law Judge preliminary hearings, comments received on FERC's draft environmental impact statement (DEIS) and other evidence available to the Secretary.

The ALJ ultimately dismissed all Reclamation issues raised by the licensee or interveners as outside the purview of the ALJ because they did not raise any disputed issues of material fact regarding Reclamation's conditions.

As provided in previous Reclamation and Interior filings (REA filing of March 2006 and DEIS Comments of November 2006), Reclamation does not agree with the licensee's determination, or FERC's preliminary determination for that matter, that Keno Dam is not used and useful for hydropower generation. Because FERC determined that Keno Dam operations data is of a proprietary nature and cannot be released to the public, Reclamation is unable to prove the value of Keno Dam to the licensee. Personal communication over the years with licensee staff regarding operational changes at Keno Dam during the winter months; that is, during periods of high power use for heating residential buildings, proves that the licensee does indeed gain value from Keno Dam.

Additionally, Keno Dam should remain a part of the license because of additional project purposes including recreation and flood control. It is FERC's responsibility to determine project boundaries based on **all project purposes**.

Section 1: Resource Goals

Reclamation's goal is to protect the efficient, reliable, and cost effective supply of water for Klamath Irrigation Project purposes.

Section 2: Description and Rationale for Modified Condition

Reclamation is not modifying originally submitted conditions. No evidence was developed during the ALJ process, from DEIS comments, or provided in the licensee's alternative that warranted modification. The rationale and supporting evidence for the conditions are stated in

the Department's March 27, 2006 preliminary conditions filing which is hereby incorporated by reference.

Section 3: Alternatives Analysis

This section presents analysis of PacifiCorp's proposed alternative condition for adequacy and implementation costs or operational impacts to electricity production as compared to Reclamation's proposed condition, in accordance with Section 33 of the FPA. Reclamation's preliminary conditions were included in DOI 2006, and as modified are included as Attachment 1. Reclamation's condition is compared to PacifiCorp's April 25, 2006, alternative.

A. Description of Alternative Conditions

Description of Reclamation's Conditions:

Following is a summary of Reclamation's seven 4(e) conditions. Please see previous filing by the Department of the Interior on March 27, 2006 for specific details associated with each condition.

Condition 1: The Licensee shall enter into new or amended contract with Reclamation for the operation and maintenance of Link River and Keno Dams under terms and conditions satisfactory to the Secretary of the Interior as follows: (1) ensure continued operation and maintenance consistent with annual operating plans, (2) ensure cost of service power rates for agricultural users, (3) maintain the "A" Canal approach channel, (4) assume liability for damages due to Link River operations, (5) not limit the rights of the United States to Klamath Water or lands surrounding Upper Klamath Lake, and (6) operate Keno Dam ensuring continued operations consistent with irrigation and endangered species requirements.

Condition 2: Develop operating criteria, in consultation with Reclamation, to allow Reclamation to meet its responsibilities.

Condition 3: Develop operating criteria that provides for coordination with the operations of Keno Dam and Iron Gate Dam, or the most downstream dam within Project No. 2082.

Condition 4: Provide Reclamation with area capacity curves and real-time access to reservoir elevations and releases for facilities within Project No. 2082.

Condition 5: Cause no affect the Federal Klamath Reclamation Project unless approved by Reclamation.

Condition 6: Make no claim against the United States arising from the effect of any changes in releases from, operations of, or elevation changes in and facility above Keno Dam or use of water for the Upper Klamath, Lower Klamath or Tule Lake National Wildlife Refuges.

Condition 7: Reserves the Commission authority to require the Licensee to implement such conditions for the protection and utilization of Reclamation reservations. This general reservation of authority allows the Secretary to consider additional data as it becomes available; to respond to changed circumstances, and modify the existing section 4(e) conditions as may be necessary. The Secretary's reservation of mandatory authorities under the FPA has been accepted by the Commission and judicially affirmed. *Wisconsin Public Services Corp.*, 62 FERC ¶ 61,905 (1993), *aff'd*, *Wisconsin Public Serv. Corp. v. FERC*, 32 F.3d 1165 (7th Cir. 1994).

The Klamath Tribes of Oregon hold treaty-protected property rights, including fishing and water rights, in the upper Klamath Basin. The United States and the Klamath Tribes have jointly filed claims in the State of Oregon's water rights adjudication for the surface waters of the Klamath Basin in Oregon, including instream flow claims within the Project area (from Link River Dam to the Oregon-California border), to protect the Tribes' fishing and water rights reserved to them pursuant to their 1864 Treaty with the United States. In addition, the Hoopa Valley and Yurok Tribes have confirmed reserved fishing rights in the lower Klamath Basin, and the water necessary to protect those rights may likewise be determined in a subsequent proceeding.

Any condition or prescription required for this Project's license, including those to protect federal interests, must be consistent with these reserved rights. Additional data or other information, including a binding decree resulting from the State of Oregon's water rights adjudication, may require modification to the license conditions. Thus, the Department is submitting these reservations of authority. The Department's other recommendations do not ask FERC to take any action or otherwise engage in the issues being addressed in the water rights adjudication.

Description of PacifiCorp Alternative

The licensee proposes to delete these conditions in their entirety, arguing that because East and Westside power houses will be taken off-line and because Keno Dam and Reservoir operations do not add to power generation capability that Reclamation has no legal authority to prescribe 4(e) conditions. Reclamation does not agree with PacifiCorp's proposal or rationale.

With respect to Condition 7, the reservation of authority, the preamble to the Joint Regulations implementing the EP Act states that license parties cannot request a hearing regarding the reservation of authority itself, or submit alternative to such reservation." 70 Fed. Reg. 69804, 69808 (November 17, 2005). Moreover, the effects of a reservation of authority, by its nature, are indeterminate. Reclamation has not considered PacifiCorp's proposed alternative to Condition 7 as a formal alternative.

B. Comparison of PacifiCorp's Alternative to Reclamation's Conditions Under Statutory Criteria

Condition 1a – Link River Dam O&M:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

The licensee's alternative eliminates any requirement to operate and maintain Link River Dam. This alternative does not adequately protect the reservation. Storage in Upper Klamath Lake is vital to the continued operation of the Klamath Irrigation Project. Additionally, PacifiCorp must operate Link River Dam consistent with the Klamath Irrigation Project Annual Operations Plans because Reclamation is mandated to meet obligations under the Endangered Species Act and Tribal Trust, in addition to delivering water to project irrigators. Continued operations and maintenance of Link River Dam in coordination with the operations plans is vital to fully protect Reclamation's reservation. Operating within the operating plan guidelines is necessary to provide an appropriate water level in Upper Klamath Lake to protect the endangered suckers, and allow for full water deliveries at A Canal; control necessary to maintain Lake Ewauna at an elevation appropriate to provide the necessary head to make deliveries in the Lost River Diversion Channel and North and Ady Canals; and to provide the required flows at Iron Gate Dam to meet Reclamation's responsibilities under its biological opinion from NOAA Fisheries. Additionally, in April 2006 PacifiCorp voluntarily entered into an annual contract with Reclamation to continue operation and maintenance of Link River Dam. PacifiCorp's willingness to enter voluntarily into this contract exhibits their interest in and desire to operate Link River Dam to benefit hydropower generation.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

PacifiCorp has in the past conducted Operations and Maintenance (O&M) at Link River Dam, under the previous contract between PacifiCorp and Reclamation. They are currently conducting O&M under a year-to-year contract. This O&M is being undertaken at PacifiCorp's cost and for their benefit as well as Reclamations'. PacifiCorp's predecessor, Copco, constructed Link River Dam to provide more flexibility in power production and transferred the dam to Reclamation upon completion of construction. Reclamation's condition is not more costly than current operations because it is anticipated that PacifiCorp will continue to operate and maintain Link River Dam to the benefit of its power production facilities downstream. PacifiCorp failed to provide a viable alternative to this Reclamation condition that addresses its operation of Link River Dam. PacifiCorp should be expected to incur costs for its continued operation and associated maintenance of Link River Dam in support of its downstream power production. Reclamation's proposed condition addresses this ongoing obligation of PacifiCorp's and is reasonable and cost effective alternative.

Condition 1b – Power Rates:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

It is necessary for the adequate protection and utilization of the Klamath Reclamation Project to maintain Klamath Project cost-based rates in the basin to provide pumping of return water from the irrigation project to the Klamath River for downstream uses and power generation by PacifiCorp.

These cost-based rates allow Reclamation to return a substantial quantity of water to the Klamath River via the Lost River Diversion Channel, D Plant, and Pumping Plants F and FF. These return flows are important to the annual operations of the Klamath Project for several reasons including flood control and continued reclamation of project lands. Unlike most Reclamation Projects, the Klamath Project is essentially a drainage project, not a large water storage project. Lands were developed for irrigation by draining Lower Klamath Lake and Tulelake.[1] To accommodate this, Reclamation developed Clearlake and the Lost River Diversion Channel to reduce flows to Tulelake to allow evaporation of the lake and development of the lakebed as irrigated agricultural lands.

The Klamath Reclamation Project depends on pumping of Klamath River water for use on and for drainage of Project lands. Without such pumping, which depends on electrical power, the purposes of the Project would be significantly impacted. Thus, a condition to require electrical power rates no higher that the cost of service from Project 2082 is necessary for the protection and utilization of the Klamath Reclamation Project.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

PacifiCorp only provided a summary statement to support its proposed alternative condition to Reclamation's condition 1(b) regarding furnishing electric power at rates no higher than the cost of service. PacifiCorp's proposed alternative eliminated Reclamation's condition and did not offer a substitute. PacifiCorp supported its conclusion that eliminating the Reclamation condition would cost significantly less to implement than Reclamation's condition because the proposed rates in the Reclamation condition would generate revenues that are less than those provided for in PacifiCorp's approved tariff (that is, the rates set by the California and Oregon public utilities commissions), seemingly ignoring the likelihood that any changes in rates would be reflected in future revenue requirements and therefore be revenue neutral.

PacifiCorp also did not address whether its proposed alternative condition would result in improved operation of the project works for electricity production as compared to Reclamation's condition and whether its proposed alternative condition provides for the adequate protection and utilization of the reservation as compared to Reclamation's condition. 43 CFR § 45.73 (b). Since PacifiCorp did not provide any evidence to support its proposed alternative, Interior has

[1] Cessions Act, 33 Stat. 174, Dated February 9, 1905

reviewed other evidence available to it and comments received on its preliminary conditions from other parties in deciding whether to adopt PacifiCorp's proposal. Interior has determined that it will not adopt PacifiCorp's proposed alternative condition and adopts Reclamation's preliminary condition as its modified condition in accordance with section 33 of the Federal Power Act.

The Klamath Project (the reservation at issue) provides significant benefits that are critical to PacifiCorp's power production on the Klamath River. Without these benefits PacifiCorp's costs to generate power from Project 2082 would significantly increase. Additionally, without Reclamation's condition, the costs to operate Klamath Project facilities and to provide a water supply for irrigation and refuges and to properly provide drainage of irrigated lands, including the refuge lands (the specific utilization of the reservation) will significantly increase. This significant increase in Project costs also does not provide adequate protection for the Klamath Project, the reservation at issue. PacifiCorp has recently been granted approval to increase power rates for Project power users that are approximately 13 to 17 times greater than the rates in place prior to 2006.[2] See Decision by the California Public Utilities Commission regarding PacifiCorp's Application no. 05-11-022, dated December 11, 2006 and Oregon Public Utility Commission Order in UE-170, dated April 12, 2006. Thus, PacifiCorp's proposed alternative condition will cost significantly more to implement than Reclamation's condition.

Interior provided support for its conditions in its March 27, 2006 Filing of Comments, Preliminary Terms, Conditions, Prescriptions and Recommendations which is incorporated here by reference. That information showed the significant benefits to PacifiCorp's power production from the operation of the Klamath Project, benefits that will not be available with PacifiCorp's proposed alternative condition. Without these benefits, PacifiCorp will not be able to generate power at the same level as it currently does which will adversely affect the operation of its project works for electricity production as compared to Reclamation's condition.

Independent of any benefits that PacifiCorp derives from the operation of the Klamath Project which was fostered by the pre-2006 power rates, PacifiCorp's proposed alternative condition would cost significantly more to implement than Reclamation's condition because the power costs are significantly higher under PacifiCorp's proposed condition. This significantly increased cost also adversely impacts the utility of the reservation by affecting the use and efficiency of irrigation water and refuge water supplies of the Klamath Project.

To use 2003 as an example, the total power consumption on the Klamath Project for irrigation related uses for calendar year 2003 was approximately 88,200,000 kWh. This includes uses in both California and Oregon and uses directly by Reclamation and the individual Project water users. At pre-2006 rates, the total cost paid by the Project was approximately $500,000.00. At current tariff rates (after the phase in periods end), the total cost would be approximately $8,170,000.00. If the comparison is to the projected cost of service at a rate of approximately

[2] The rates in place prior to 2006 were generally .6 cents per kWh. The new rates, that will be in effect after a phase in period (Oregon and California each have separate and different phase in rates and periods), are on the order of 7.928 cents per kWh, or approximately 13 times the pre-2006 rates in California and 10.25 cents per kWh or approximately 17 times the pre-2006 rates in Oregon. This represents a significant cost to the Klamath Project water users in carrying out the purposes of the reservation.

4.25 cents per kWh in Oregon and 1.9 cents per kWh in California the increased cost of implementing PacifiCorp's proposed alternative condition is approximately $2,900,000.00 or a difference of $5,270,000.00 annually in additional power costs for Klamath Project purposes. Thus, PacifiCorp's proposed alternative condition is significantly more costly than Reclamation's condition.

Condition 1c – "A" Canal approach O&M:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

The intake for the 'A" Canal is just upstream from Link River Dam and the operations of Link River Dam can affect diversions to the "A" Canal if not properly monitored and maintained. Any adverse affect to the "A" Canal approach channel will likewise adversely affect the ability of Reclamation to deliver water to the lands within the Reclamation Project. Therefore, the licensee's alternative condition to discontinue maintenance of the "A" Canal approach does not protect Reclamation's reservation.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

PacifiCorp has in the past conducted Operations and Maintenance (O&M) of the "A" Canal approach, under the previous contract between PacifiCorp and Reclamation. They are currently conducting O&M under a year-to-year contract. This O&M is being undertaken at PacifiCorp's cost to mitigate any possible impacts to irrigation operations due to operations of Link River Dam. PacifiCorp's predecessor, Copco, constructed Link River Dam to provide more flexibility in power production and transferred the dam to Reclamation upon completion. For the reasons stated above for condition 1a, Reclamation's condition is not more costly than current operations, and is expected to be the status quo in the future. PacifiCorp's alternative would not result in improved operation for electrical power production.

Condition 1d – Link River Dam O&M Liability:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

In 1917, Copco (now PacifiCorp) proposed development of Link River Dam as a feature of the Klamath Reclamation Project. Reclamation agreed to the project, and in 1917 the parties entered into a contract for Copco to build the dam and transfer it to Reclamation. The construction of Link River Dam was originally initiated by the licensee to take full advantage of power generation opportunities. As a result of the power generation benefit, the licensee agreed to fully fund O&M requirements. It should be noted that incidental Klamath Project benefits were realized by Reclamation. In order to protect the Reclamation reservation; that is, to ensure proper elevations and diversions, the licensee should be required to continue operation and maintenance of the facility as has been required, under contract, since 1917.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

PacifiCorp has in the past assumed Operations and Maintenance (O&M) for Link River Dam, under the previous contract between PacifiCorp and Reclamation. They currently assume O&M liability under a year-to-year contract. This O&M liability is being undertaken at PacifiCorp's cost to mitigate any possible impacts to lands adjacent to Upper Klamath Lake and Link River due to operations of Link River Dam. PacifiCorp's predecessor, Copco, constructed Link River Dam to provide more flexibility in power production and transferred the dam to Reclamation upon completion of construction. Copco also constructed or improved many of the dikes protecting agricultural lands adjacent to Upper Klamath Lake, and has a responsibility to continue to protect and indemnify those lands. Reclamation's condition is not more costly than current operations, and is expected to be the status quo in the future. The alternative would not result in improved operation for electrical power production. Reclamation's condition is reasonable as long as PacifiCorp operates and maintains Link River Dam, which it is anticipated to do for the term of any new license for Project No. 2082. PacifiCorp offered no alternative condition that addresses the potential for damages in the future to Reclamation's resources due to its operation and associated maintenance of Link River Dam. PacifiCorp's failure to provide any commitment for any adverse effects of its operation is contrary to normal business practice and would not provide adequate protection to the Klamath Project.

Condition 1e – Federal Klamath water rights maintained:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

Reclamation holds water rights for the Klamath Reclamation Project that are senior to the water rights for Project No. 2082 except for a 250 cfs water right of PacifiCorp's for power generation from Link River. Reclamation's reservation; that is, to deliver water to the Klamath Project, must be protected by ensuring consistency with existing statute and water rights declarations. Any operations inconsistent with the annual operating plan, existing statute, or water rights requirements could jeopardize the reservation.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

With the exception of approximately 250 cfs acquired by Copco from Moore Brothers, all of Reclamation's water rights are senior and higher in priority to any rights held by PacifiCorp. It is anticipated that this senior priority will become part of the final determination by the state of Oregon in the pending Klamath Basin Adjudication, and thus, PacifiCorp will be required by Oregon State Law to recognize Reclamation's priority and seniority of water rights. Reclamation's condition will not be more costly to implement than the existing conditions which are equivalent to PacifiCorp's proposed alternative condition. PacifiCorp has not

demonstrated how Reclamation's condition would be more costly to implement than either Reclamation's preliminary condition or PacifiCorp's proposed alternative condition which is merely to delete Reclamation's preliminary condition. Reclamation's condition is consistent with project operations for the past 100 years and Reclamation is not aware of any circumstances that would result in more cost to PacifiCorp to implement the Reclamation condition or that the PacifiCorp's proposed alternative condition would result in improved operation for electrical power production as compared to Reclamation's condition.

Condition 1f – Keno Dam O&M:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

This specific control is necessary to maintain Lake Ewauna at an elevation appropriate to provide the necessary head to make deliveries in the Lost River Diversion Channel and North and Ady Canals which are essential to the proper operation of the Klamath Project for both agricultural lands and lands within the National Wildlife Refuges.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

PacifiCorp is the owner of, and is currently operating and maintaining Keno Dam, under a contract between PacifiCorp and Reclamation. This operation requires that the water level upstream of Keno Dam shall be as specified in the contract, which level is designed to protect Klamath Project operations. PacifiCorp has not provided any information that would demonstrate that the cost to implement this condition is more costly than PacifiCorp's proposed alternative condition (which is to have no such operational level) or any other possible alternative condition. Based on the contract and expected future operations, the requirements of this condition are anticipated to carry forward in any new license issued to PacifiCorp. Not providing for this requirement would significantly increase the cost to operate the Klamath Project for irrigation and other purposes while not affecting the costs to PacifiCorp.

Condition 1g – Keno Dam discharge rate:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

Reclamation's reservation includes maintaining a discharge rate at Keno Dam to control flooding of the Project and surrounding lands. Any changes to operational activities; that is, the discharge rate at Keno Dam could jeopardize flood control capability causing adverse affect to the Klamath Project and surrounding lands. Removing Keno Dam from the license and leaving its future uncertain would jeopardize Reclamation's reservation.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

As discussed above for condition 1f, PacifiCorp is the owner of, and is managing the discharges at Keno Dam, under a contract between PacifiCorp and Reclamation. This discharge management is being undertaken at PacifiCorp's cost and for their benefit as well as Reclamation's. PacifiCorp's predecessor, Copco, constructed Keno Dam to provide more flexibility in power production, and to aide in flood control for the Klamath Basin. Reclamation's condition is not more costly than current operations, and is expected to be the status quo in the future because PacifiCorp is contractually required to operate Keno Dam to meet these discharge requirements. Reclamation's condition is consistent with current and anticipated future requirements for Keno Dam and is thus, not more costly to implement than PacifiCorp's proposed alternative condition. PacifiCorp did not provide a viable alternative to this condition that addresses the necessary operational requirements of Keno Dam.

Condition 2 – Develop operating criteria for Link River Dam and Project No. 2082:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

Reclamation's responsibilities under the ESA as well as its responsibilities for Tribal Trust require that measured flows be provided into the Lower Klamath River (currently below Iron Gate), while specific water levels are maintained in Upper Klamath Lake. To adequately protect its resources, coordinated operations are imperative. Without coordinated operations, flow variations could have a deleterious effect on threatened species, or other resources valuable to downstream and upstream tribes. Ramping rates and flow variations that are currently under the control of PacifiCorp could cause stranding, or crowding of fish that could lead to disease, or death if these facilities are not operated in a coordinated manner to fulfill the responsibilities and needs of all parties. Further, if these operations are not coordinated for the purposes stated above, the operations of the Klamath Reclamation Project would be adversely affected. This could result in curtailment of irrigation deliveries or deliveries of water to the National Wildlife Refuges. Removing Keno Dam from the license and leaving its future uncertain would jeopardize Reclamation's reservation.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

It is important to both Reclamation and PacifiCorp that the water resources of the Klamath Basin are managed in a coordinated manner. Both have responsibilities for endangered species in the area and both need the cooperation of the other to meet those responsibilities in the most expeditious manner. This requirement will not increase costs over that of the existing conditions. PacifiCorp's proposed alternative would not result in improved operation for electrical power production. Reclamation's proposed condition for coordination in operations between PacifiCorp's project and Reclamation's Klamath Project would be less costly than PacifiCorp's

proposed alternative condition of no coordination because such coordination will make operation of the two projects more efficient, thus, saving cost by eliminating unnecessary overlap in operations and making more efficient use of the available water resources.

Condition 3 – Develop operating criteria for Keno and Iron Gate Dams:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

In addition to the justification in 2 above, management of operations at Keno is critical to delivery of water to Project lands along Link River to Keno reach, in the Lower Klamath Lake area and to the Lower Klamath Lake Wildlife Refuge. Approximately 41 percent of the lands irrigated by the Klamath Irrigation Project and the Lower Klamath Lake National Wildlife Refuge receive their water directly or indirectly by gravity flow from the Link River to Keno reach. Coordination of these operations to meet the criteria listed in the attachment are necessary to meet minimum elevations for charging North and Ady Canals to meet demands throughout the year, as these facilities are operated year round. In addition, coordinated operations should minimize impacts to salmonids and suckers from low flows and fluctuations by Project operations at Keno Dam. Removing Keno Dam from the license and leaving its future uncertain would jeopardize Reclamation's reservation.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

As with Reclamation's condition 2 above, this condition is also important to both Reclamation and PacifiCorp and furthers the management of water resources of the Klamath Basin in a coordinated manner. Both have responsibilities for endangered species in the area and both need the cooperation of the other to meet those responsibilities in the most expeditious manner. For the same reasons stated for Reclamation's condition 2, this condition will not result in increased costs of implementation over that of the existing conditions, nor will PacifiCorp's proposed alternative result in improved operation for electrical power production.

Condition 4 – Provide area capacity curves for all P-2082 facilities:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

Area capacity curves and real time operational data are necessary for Reclamation to plan for releases from the Lost River Diversion Channel and the Straits Drain. This coordination would allow Reclamation to protect its reservation and encourage the best use of a limited resource, water. Reclamation is bound by project contractual, ESA, and Tribal Trust responsibilities to deliver water for competing needs. The availability of area capacity curves will assist Reclamation in ensuring all requirements are met.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

Without the information required by this condition, Reclamation's operation of the Klamath Project, such as releases from the Lost River Diversion Channel or the Klamath Straits Drain, would be severely impacted. This would result in increased costs to Reclamation over the proposed alternative of PacifiCorp's which is to not provide this necessary operational data. PacifiCorp has not provided a viable alternative that makes this essential operational data available. There is no indication that by not providing this information that PacifiCorp's operation for electric power production will be improved.

Condition 5 – Prohibits changes that affect the Klamath Reclamation Project:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

Changes in operations or modifications to Project No. 2082 could impact Reclamations ability to meet its contractual responsibilities within the Reclamation Project, as well as its ESA and Tribal Trust responsibilities downstream. To protect the reservation, operations and maintenance must be in line with the annual operating plans.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

PacifiCorp has not provided any information that Reclamation's condition would be more costly to implement or that PacifiCorp's proposed alternative will result in improved operation for electrical power production. This condition merely requires PacifiCorp to ensure that its operations do not affect Reclamation's Klamath Project operations unless such operation by PacifiCorp is approved by Reclamation. Because PacifiCorp's water rights are junior to Reclamation's water rights for the Klamath Project, except for a 250 cfs right, and Reclamation has, by statute, been authorized to store water in Upper Klamath Lake and adjust the levels of that lake for irrigation deliveries, PacifiCorp cannot reasonably assert that Reclamation's proposed condition is more costly to implement than without the condition in place. This condition ensures that the relative priority of Reclamation's operations is properly considered by PacifiCorp in its operation under any new license.

Condition 6 – No claim against the U.S.:

***Criteria 1* – Would the Alternative, as compared to the Reclamation Condition adequately protect the reservation?**

PacifiCorp's Project No. 2082 has limited water rights, and is a subsequent user of surplus water from the Klamath Reclamation Project. Reclamation has no responsibility for delivery of water to Project No. 2082 beyond those limited water rights that are senior to Reclamation's water

rights. Any operation of the Klamath Project is senior to operations of Project No. 2082, and has precedence over its operations.

***Criteria 2* – Would the Alternative, as compared to the Reclamation Condition, be significantly less costly to implement or result in improved operation for electricity production?**

The reasons for this condition are the same as for condition no. 5 recognizing that Reclamation's operation has priority over PacifiCorp's operation. Thus, this recognition of existing priorities will not increase the cost to implement the condition over that proposed by PacifiCorp which is not to recognize these existing priorities. Also, merely by stating that it does not recognize these existing priorities will not result in improved operation for electrical power production.

C. Equal Consideration of Effects

The Department has conducted the appropriate analysis in accordance with 43 C.F.R §45.73 and has determined the following:

1. **Energy supply, distribution, cost, and us**e

PacifiCorp asserts that Keno Dam and Reservoir results in an overall loss of downstream generation potential. The opposite is the case, as Reclamation has explained elsewhere. Nevertheless, there is no difference between keeping the 4(e) conditions, or excluding them, with respect to overall energy supply, distribution, cost, and use, as explained below.

Supply: Any energy impact of the conditions is insignificant when compared to the total customer requirements, and *de minimis* in the context of regional energy supply. The project is a system resource, and has no function other than the provision of electric energy to the applicant's system as a whole. Since PacifiCorp is only one of a number of energy suppliers in the Northwest, the impact on total regional energy supply must be considered *de minimis*. Although PacifiCorp provided no information regarding the impact of its proposed alternative on energy supply, we note that Klamath generation, in total, represents less than 1 percent of total system generation. Accordingly, Klamath, itself, makes a insignificant contribution to PacifiCorp's energy supply, and makes a *de minimis* contribution to regional energy supply. Thus, no alternative regarding Klamath would have a significant impact on energy supply, either in the region or on the applicant's system.

Distribution: The Department's mandatory condition does not address energy distribution facilities, and therefore does not have any direct impact on the distribution of energy. Moreover, as regional energy supply impacts are *de minimis*, there are no indirect impacts on energy distribution. PacifiCorp provided no information regarding the impact of its proposed alternative on the distribution of energy and the Department had no information indicating any impact of PacifiCorp's alternative on energy distribution.

Cost: The impact of the Department's mandatory condition on energy cost is judged not to be significant. PacifiCorp presented information in its recent rate-setting case before the California

Public Utilities Commission explaining that Klamath is an unreliable source of power and that its energy, when available, is used to displace other, more expensive sources; accordingly, PacifiCorp views the replacement value of Klamath energy as PacifiCorp's decremental generation cost, which is unaffected by any changes in Klamath Project operations.

As to costs associated with Reclamation condition 1(b), see the above discussion.

Use: Neither the Department's mandatory condition nor PacifiCorp's proposed alternative are expected to have any impact on energy use.

2. Flood control

Because the Project's reservoirs are relatively small compared with the Klamath River's annual runoff (e.g., Iron Gate reservoir impounds only 4 percent of annual runoff, and Copco No. 1 reservoir only 5 percent), the Project reservoirs are generally *not* operated for flood control (PacifiCorp 2004, Ex E, Page 3-181). While Project reservoirs are drawn down to some extent prior to spring runoff, this can provide only very limited flood control during high flow events. (PacifiCorp 2004, Ex B Page 2-7).

PacifiCorp did not identify any effect of their proposed alternative (PacifiCorp 2006, Page 121]). None of the alternatives analyzed in this section would result in any change to the currently very limited flood control.

3. Navigation

There is no large-scale commercial navigation on the Klamath river, Keno Dam is not equipped with locks for barges. PacifiCorp did not identify any effect of their proposed alternative (PacifiCorp 2006, Page 121).

4. Water Supply

PacifiCorp's Final License Application did not identify any Project-induced effects on municipal or irrigation water supply (PacifiCorp 2004, Exhibit E, Page 9-54). PacifiCorp did not identify any effect of their proposed alternative (PacifiCorp 2006, Page 121]). Nevertheless, it is clear that Reclamation's condition protects the water supply for the federal irrigation project and refuges, while the PacifiCorp alternative provides no protection. Reclamation must ensure that Keno Reservoir elevations remain at levels to accommodate agricultural deliveries. Any modification to the operations criteria, the structure itself, or the diversion points as a result of this FERC process would be detrimental to Reclamation's responsibility to deliver water to Federal water contractors and the wildlife refuges.

5. Air Quality

PacifiCorp did not identify any effect of their proposed alternative (PacifiCorp 2006, Page 121). None of the alternatives analyzed in this section would result in any change to air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp did not identify any other anticipated effects of their proposed alternative (on environmental quality (PacifiCorp 2006, Page 122). None of the alternatives analyzed in this section would result in any change to other aspects of environmental quality.

Section 4: Response to Comments

No comments were received on the DEIS that warranted modification to Reclamation's 4(e) conditions.

Some comments were received that focused on items beyond Reclamation's requested 4(e) conditions. An example is the identification of water quality issues within the Keno impoundment. Water quality issues in this reach of the river are the responsibility of the licensee as the Keno Dam and the resulting impoundment area were initially constructed and created to benefit hydropower generation by the licensee. As such, any water quality remediation is the responsibility of the licensee. A second example is fish passage at Keno Dam. Again, because the dam was constructed by and is owned by the licensee, the licensee carries the burden of constructing fish passage facilities for salmonids and resident fish species.

PCFFA comments state that it is outside of FERC's authority to address power rates. Reclamation is not asking FERC to set retail power rates. Reclamation is asking FERC to condition any license, in order to protect its reservation; that is, to provide power to irrigators to continue current operations of the project. That is, Reclamation is proposing a section 4(e) preliminary condition that is necessary for the adequate protection and utilization of the relevant federal reservation as set forth in its section 4(e) conditions filed with FERC.

Attachment B1: U.S. Department of Interior Modified 4(e) Conditions – Reclamation Reservation

1) The Licensee shall enter into new or amended contract with Reclamation for the operation and maintenance of Link River and Keno Dams under terms and conditions satisfactory to the Secretary of the Interior. Such terms shall be substantially similar to the terms of the current contract and shall specifically include the following terms necessary for the protection of Klamath Reclamation Project operations:

    a. The Licensee shall continue to operate and maintain Link River Dam. Such operation shall be consistent with the Klamath Reclamation Project Annual Project Operations Plans.

    b. For the period of the contract the Licensee would agree to furnish electric power for the purposes of pumping Klamath Water for use on Project Land and for drainage of Project Land at rates no higher than the cost of service from Project 2082.

    c. The Licensee shall, at its own expense, maintain the approach channel to the "A" Canal of the Klamath Reclamation Project to the satisfaction of Reclamation so far an may be necessary to carry a flow of not less than 1200 cfs into the "A" Canal with the water of Upper Klamath Lake at an elevation of 4137 (USBR datum).

    d. The Licensee shall assume any and all liability for damages resulting from operation of the Link River Dam by the Licensee or resulting from its regulation and control of the water levels of Upper Klamath Lake. The Licensee would undertake to hold the United States harmless from any and all liability for damage arising out of the operation by the Licensee of Link River Dam and the regulation and control by the Licensee of Upper Klamath Lake provided for in the contract.

    e. Nothing in the contract shall curtail or in anywise be construed as curtailing the rights of the United States to Klamath Water or to the lands along or under the margin of Upper Klamath Lake. No Klamath water shall be used by PacifiCorp when it may be needed or required by the United States or any irrigation or drainage district, person, or association obtaining water from the United States for use for domestic, municipal, and irrigation purposes on Project Land.

    f. PacifiCorp shall operate Keno Dam so that the upstream water level will not be below the minimum normal objective operating height of elevation 4085.0 (USBR Datum), at or near the location of the present Highway No. 66 bridge at Keno, Oregon.

g. PacifiCorp shall operate Keno Dam to accommodate the discharge of three thousand (3,000) cubic feet per second from the Lost River Diversion Channel, and six hundred (600) cubic feet per second from the Klamath Straits Drain.

2) The Licensee, in consultation with Reclamation, shall develop operating criteria that provides for coordination with the operations of Link River Dam and Iron Gate Dam, or the most downstream dam within Project No. 2082 to allow Reclamation to meet its responsibilities.

3) The Licensee, in consultation with Reclamation, shall develop operating criteria that provides for coordination with the operations of Keno Dam and Iron Gate Dam, or the most downstream dam within Project No. 2082, as in Attachment 2.

4) The Licensee shall provide Reclamation with area capacity curves for all facilities within Project No. 2082, and will provide Reclamation with real time access to reservoir elevations and releases for facilities within Project No. 2082.

5) Any operations or modifications to Project No. 2082 that could affect the federal Klamath Reclamation Project are prohibited unless approved by Reclamation.

6) The licensee shall have no claim against the United States arising from the effect of any changes in releases from, operations of, or elevation changes in Upper Klamath Lake or Lake Ewauna related to the federal Klamath Project operations or use of water for the Upper Klamath, Lower Klamath or Tule Lake National Wildlife Refuges.

7) Authority is reserved to the Commission to require the Licensee to implement such conditions for the protection and utilization of Reclamation reservations as may be provided by the Secretary of the Interior, pursuant to Section 4(e) of the Federal Power Act, 16 U.S.C. § 797(e).

SECTION C: UNITED STATES DEPARTMENT OF THE INTERIOR AND NATIONAL MARINE FISHERIES SERVICE MODIFIED PRESCRIPTIONS FOR FISHWAYS AND ALTERNATIVES ANALYSIS PURSUANT TO SECTION 18 AND SECTION 33 OF THE FEDERAL POWER ACT FOR THE KLAMATH HYDROELECTRIC PROJECT (FERC Project No. 2082)

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Introduction

The U.S. Fish and Wildlife Service and National Marine Fisheries Service hereby submit joint Modified Prescriptions for the construction, operation, and maintenance of upstream and downstream fishways for the Klamath Hydroelectric Project (FERC Project No. 2082; hereafter Project) pursuant to section 18 of the Federal Power Act (FPA). For the sake of simplicity, a naming convention is adopted in this document. Where language pertains independently to the U.S. Fish and Wildlife Service, the word "Service" (singular) is used. Where language pertains independently to the National Marine Fisheries Service, the acronym "NMFS" is used. Where language reflects the joint position of the Service and NMFS, the term "Services" (plural) is used. The Services are submitting this document, along with the Supplemental Administrative Record,[1] to the Federal Energy Regulatory Commission (Commission).

The Services' Modified Prescriptions for Fishways are based on the best biological and engineering information available, as described more fully in the rationale that accompanies each prescription. Although the maximum benefits to the fisheries are accrued with the combination of all the prescription elements, each prescription also stands on its own, and provides its own benefits. These prescriptions have been developed over a period of several years by the biological and engineering staff of the Services, in consultation with the Applicant, the U.S. Bureau of Land Management (BLM), the California Department of Fish and Game (CDFG), Oregon Department of Fish and Wildlife (ODFW), affected Tribes (Klamath, Karuk, Hoopa Valley, and Yurok Tribes), the Klamath Intertribal Fish and Water Commission, and other entities that are participating in this relicensing proceeding. Each Modified Prescription is based on substantial evidence contained in the record of this licensing proceeding before the Commission, and filed herein with the Commission. The rationale for each Modified Prescription is intended only to summarize the supporting information and analysis upon which these prescriptions are based. Several documents previously submitted to the record in this proceeding contain detailed and specific information describing the Project's impacts on fish and wildlife (National Marine Fisheries Service 2003 DLA; National Marine Fisheries Service 2004 FLA; U. S. Department of the Interior 2004). These documents, including the relevant descriptions of baseline reference conditions and ongoing Project effects relative to applicable resource planning goals, provide relevant supporting information pertaining to Project impacts on anadromous and resident fish and their habitat. All documents previously filed with the Commission by the Services are hereby incorporated by reference.

The Services' Modified Prescriptions for Fishways provided in Attachment 1 herein are issued under the authority of the Secretary of the Interior pursuant to section 18 of the FPA, delegated by the Secretary of the Interior to the California/Nevada Operations

[1] The Services filed an original Administrative Record with their filing of the Preliminary Prescriptions on March 27, 2006. The original Administrative Record is incorporated by reference, and is supplemented by the materials included herein in the Supplemental Administrative Record.

Office Manager, U.S. Fish and Wildlife Service; the Director, U.S. Fish and Wildlife Service; and the Assistant Secretary for Fish, Wildlife and Parks. See 64 Stat. 1262; 209 Departmental Manual 6.1; and 242 Departmental Manual 1.1A. The NMFS hereby prescribes the license conditions as provided in Attachment 1 for the construction, operation and maintenance of upstream and downstream fishways for the Klamath Hydroelectric Project pursuant to its authority under section 18 of the FPA, as delegated to NMFS by the Secretary of Commerce.

FERC Relicensing Proceeding

PacifiCorp (Applicant) is seeking a new license for the continued operation of the 169 megawatt (MW) Project. The existing license expired on March 1, 2006, and the Commission issued an annual license on March 9, 2006. The Department and its bureaus (the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Bureau of Reclamation (Reclamation), National Park Service (NPS), and Fish and Wildlife Service (Service)) have provided technical assistance and participated on technical subgroups with the Applicant since 2001. The Department also provided the Applicant with comments and recommendations on its Draft License Application (DLA) on September 24, 2003, the Final License Application (FLA) on April 26, 2004, and in many other letters filed with the Commission and hereby incorporated by reference. The Department formally intervened in the proceeding on September 29, 2004. On December 28, 2005, the Commission issued its "Notice Soliciting Comments and Final Recommendations, Terms and Conditions, and Prescriptions" (REA Notice) for the Klamath Project. The Department filed comments, recommendations, and preliminary prescriptions on March 27, 2006, that included preliminary fishway prescriptions to accommodate upstream and downstream passage, and between dam connectivity for resident trout, anadromous salmon, steelhead, and Pacific lamprey (USDI 2006). The Commission issued a draft environmental impact statement (DEIS) on September 25, 2006, and the Department filed comments in response to that document on December 1, 2006.

In a similar manner, NMFS has participated in the re-licensing process for this Project. NMFS provided comments on the Applicant's DLA and FLA, which are hereby incorporated by reference. NMFS formally intervened in the proceeding on October 5, 2004. NMFS filed comments, recommendations, and preliminary prescriptions dated March 24, 2006, that included preliminary fishway prescriptions to accommodate upstream and downstream passage, and between dam connectivity for resident trout, anadromous salmon, steelhead, and Pacific lamprey (NMFS 2006). NMFS filed comments in response to the Commission's DEIS on November 29, 2006.

Energy Policy Act Procedures

On April 25, 2006, PacifiCorp and the Hoopa Valley Tribe submitted requests for a hearing on disputed issues of material fact related to the Preliminary Prescriptions pursuant to the FPA, as amended by the Energy Policy Act of 2005 (EPAct), and pursuant to the Services' joint implementing regulations. (See 43 C.F.R. § 45.21; 50

C.F.R. § 221.21). The CDFG, ODFW, the Hoopa Valley Tribe, the Klamath Tribes, the Yurok Tribe, the Karuk Tribe, and a consortium of Conservation and Fisheries Groups timely intervened in response to the hearing request. The hearing requests were referred to the Department of Commerce's designated Administrative Law Judge (ALJ) office, and Coast Guard ALJ Parlen L. McKenna was appointed to preside over the case in accordance with implementing regulations at 50 C.F.R. Part 221. On July 6, 2007, the ALJ issued an order withdrawing the Hoopa Valley Tribe's disputed issue based on the Hoopa Valley Tribe's notice of withdrawal filed on July 5, 2006.

After an evidentiary hearing that included direct written testimony, live cross-examination, some re-direct examination, and submission of thousands of pages of scientific studies and other evidence, before ALJ McKenna on August 21–25, 2006 and briefing by the parties, the ALJ issued a decision on September 27, 2006, containing Preliminary and Ultimate Findings of Fact and Discussion. The ALJ found that, as to the eight issues of material fact that went to trial, PacifiCorp "partially proved its version of the facts" as to one issue[2] but "failed to prove its version of the facts with respect to the remaining disputed issues of material fact." ALJ Decision at 2.

In the Preliminary Prescriptions, the Services provided the rationale and scientific evidence providing the basis for the prescriptions. The Modified Prescriptions incorporate by reference the scientific evidence cited by the Services in their Preliminary Prescriptions; in addition, the Services provide additional or revised discussions that are based on relevant ALJ Findings of Fact,[3] including short form citation to the relevant Findings. Where the Modified Prescriptions reference the ALJ's Findings, the underlying citations to those Findings incorporate by reference supporting evidence developed in the hearing process. These citations offer further scientific support to the Services' prescriptions. The ALJ's Findings of Fact and the scientific information upon which they were based are included in the ALJ's decision (Administrative Law Judge 2006) and the record for that decision. The full record has been forwarded to the Commission for inclusion in the licensing record. (See 50 C.F.R. § 221.60(c)(2)). The Services' filing herein refers extensively to these Findings of Fact and supporting evidence. The ALJ's decision is referenced as follows: ALJ Decision at [page number][Finding of Fact (FOF) number]; ALJ Decision at [page number][Ultimate Findings of Fact and Conclusions of Law (UFOF)]. Testimony and exhibits submitted in the hearing are cited [Issue] [Agency] [Witness Name], [Exhibit Number], and [page number], where applicable.

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[2] As to USFWS/NMFS Issue 8, the ALJ qualified his findings as is discussed more fully below, in Section 3.B.8.

[3] The purpose of the trial-type hearing is to provide a "determination on the record. . . of any disputed issues of material fact." 70 Fed. Reg. 69,804 (Nov. 17, 2005). The ALJ's findings are "final, with respect to the disputed issues of material fact" for the Departments. 43 C.F.R. § 45.60(d); 50 C.F.R. § 221.60(d). The ALJ's decision was made "following a two-day prehearing conference; the submission of thousands of pages of written direct and rebuttal testimony, exhibits, and transcripts; the filing of and ruling on numerous pretrial motions; and over forty-five hours of hearing over a five day period." ALJ Decision at 2. The ALJ made preliminary findings of fact "based upon a complete review of all evidence of record." ALJ Decision at 10.

In addition to the hearing requests, on April 25, 2006, PacifiCorp timely submitted an alternative fishway prescription, pursuant to the section 33 of the FPA (16 U.S.C. § 823d as added by the EPAct; see 43 C.F.R. § 45.71, and 50 C.F.R. § 221.71).[4] PacifiCorp's April 25, 2006, alternative is analyzed in detail in Section 3, below.

Section 33 of the FPA and the Services' joint implementing regulations require that, along with the Modified Prescriptions, the Secretaries submit into the public record of the Commission a written statement explaining the basis for the Modified Prescriptions and the reason for not accepting any Alternative Prescription submitted under this section, and a demonstration that the Secretaries gave equal consideration to the effects of the prescriptions and of the alternative on energy supply, distribution, cost, and use; flood control; navigation; water supply; air quality; and the preservation of other aspects of environmental quality based on such information as may be available to the Secretaries. 43 C.F.R. § 45.73; 50 C.F.R. § 221.73. The entirety of this document constitutes the Secretaries' written statement.

The Modified Prescriptions are provided in Attachment 1; a full analysis of PacifiCorp's Alternative, and the reasons for not accepting and prescribing it are specifically set forth in Section 3; and the basis for the Modified Prescriptions is provided throughout this document and Attachment 1.

Overview

This document builds upon the Preliminary Fishway Prescriptions filed by the Services in March 2006. The document is structured as follows:

- Section 1 provides resource goals and objectives and statutory authorities.
- Section 2 describes the changes from the preliminary to the Modified Prescriptions, and rationale and basis for the Modified Prescriptions.
- Section 3 provides the detailed analyses of fishway alternatives required by the FPA section 33 (and pursuant to 43 C.F.R. § 45.73(b), 50 C.F.R. § 221.73(b)), and the effects consideration required by the FPA section 33 (and pursuant to 43 C.F.R. § 45.73(d), 50 C.F.R. § 221.73(d)).
- Section 4 discusses other material considered, including comments filed directly with the Services and material filed with FERC that relates to the preliminary prescriptions.
- Section 5 constitutes the Services' reservation of authority.
- Section 6 provides references to literature cited.

The Modified Fishway Prescriptions for the Klamath Project are provided as Attachment 1. When the Services filed the Preliminary Prescriptions with the Commission, the

[4] The Hoopa Valley Tribe submitted to NMFS an alternative fishway prescription dated April 27, 2006. However, the Hoopa Valley Tribe withdrew that alternative by a letter dated January 8, 2007.

Services also filed the Administrative Record relied upon to support the Preliminary Prescriptions as provided in the Services' joint regulations (43 C.F.R. § 45.20 and 50 C.F.R. § 221.20). Citations to the extant record are provided herein. Additional information that has been considered and used in developing the Services' Modified Prescriptions is listed on the attached Index to the Supplemental Administrative Record, which contains the studies, data, and other factual information relied on that are not already part of the licensing proceeding record, pursuant to 43 C.F.R. § 45.73(c)(2), 50 C.F.R. § 221.73(c)(2)). The Supplemental Administrative Record is filed concurrently with this submission of the Modified Prescriptions.

Section 1. Resource Management Goals and Statutory Authority

Section 18 of the FPA (16 U.S.C. § 811) states in part that: "the Commission shall require the construction, maintenance, and operation by a Licensee of... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior." Section 1701(b) of the Energy Policy Act of 1992, P.L. 102-486, provides guidance as to what constitutes a fishway. Section 1701(b) states: "The items which may constitute a 'fishway' under section 18 for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish; and Project operations and measures related to such structures, facilities, or devices which are necessary to ensure the effectiveness of such structures, facilities, or devices, for such fish."

The Services incorporate by reference the goals and objectives stated in the Preliminary Prescriptions, with the clarification that the goal to establish and maintain self-sustaining anadromous fish runs in the Upper Klamath River Basin, while a key part of the region's overall, long-term management objectives, is not the immediate objective of these Prescriptions. Consistent with the focus of Section 18 of the Federal Power Act, the Services' emphasis in this proceeding is to address the impacts of the Project and expand access to historical and currently suitable habitat above Iron Gate Dam.

In this relicensing, the Services' focus is on mitigating the Project's impacts to the passage of fish through the Klamath River. Mitigating Project impacts is separate and apart from larger fish reintroduction efforts. Fish passage at PacifiCorp facilities would provide access to habitat for resident fish and for anadromous fish already in the river below Iron Gate Dam, including the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of coho salmon which is listed as threatened under the Endangered Species Act. Reintroduction of anadromous fish to historic and suitable habitat above Upper Klamath Lake is a much broader enterprise, for which fish passage is but one necessary precursor. Reintroduction planning will require participation of Federal, State, Tribal, and local governments, as well as land owners and others, and is beyond the scope of the Commission's jurisdiction. While fish passage measures address a specific project impact, and are appropriately considered in the context of FERC relicensing, any adaptive management strategy to actively reintroduce fish in the upper Klamath basin is beyond the scope of the FERC relicensing.

Section 2. Description For Modified Fishway Prescriptions

General

The Modified Fishway Prescriptions have been revised from the Services' Preliminary Prescriptions dated March 27, 2006, as generally described below, to include revisions to the downstream fishway prescription at Copco 1, tailraces and spillways prescriptions, and bypass/attraction flow changes. The modification to the downstream fishway at Copco 1 was necessary to establish a single downstream, fishway for Copco 1 Dam that would provide the same level of guidance for downstream migrating fish. The tailraces and spillways prescriptions were modified based on an agreement with the Services during the Trial Type Hearing process to consider the results of studies in determining the need for and design of tailrace barriers and spillway modifications for anadromous and native resident fish (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). The bypass flow modifications were necessary to clarify flows for attraction for upstream fishways and the immediately downstream in bypass reaches as necessary to ensure the effectiveness of structures, facilities, or devices that constitute fishways.

Iron Gate

Iron Gate Dam Upstream Fishway Prescription: The Modified Fishway Prescription for Iron Gate Dam has been revised from the Services' Preliminary Prescription dated March 27, 2006, to include modifications for lamprey and resident trout passage to the existing ladder below the CDFG trap and holding tanks. These changes are necessary because the current approach to the CDFG trap is not designed to criteria for resident trout or lamprey.

Iron Gate Dam Downstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Iron Gate Dam Spillway: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for spillway modifications in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

Fall Creek

Fall Creek Upstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Fall Creek Downstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Fall Creek Tailrace Barrier: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for tailrace barriers in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

Spring Creek

Spring Creek Upstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Spring Creek Downstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Copco 2

Copco 2 Dam Upstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Copco 2 Dam Downstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Copco 2 Dam Spillway: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for spillway modifications in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

Copco 2 Tailrace Barrier: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for tailrace barriers in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

Copco 2 Bypass Channel Barrier/Impediment Elimination: The Modified Fishway Prescription has been revised from the Services' Preliminary Prescription dated March 27, 2006, to clarify that PacifiCorp shall construct physical structures, facilities, devices or a barrier modification to eliminate the impediment, unless PacifiCorp demonstrates through an approved evaluation that there is not a barrier to fish passage

under normal operating flows specified for the Copco 2 bypassed reach in the new license.

Copco 1

Copco 1 Upstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Copco 1 Downstream Fishway Prescription: The Modified Fishway Prescription has been revised from the Services' Preliminary Prescription dated March 27, 2006, to include one downstream bypass system from the Copco 1 forebay into the Copco 2 reservoir (immediately below the Copco 1 Dam). This revision will benefit fish and be less costly.

Copco 1 Spillway: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for spillway modifications in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

Copco 1 Tailrace Barrier: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for tailrace barriers in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

J.C. Boyle

J.C. Boyle Bypass Channel: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

J.C. Boyle Upstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

J.C. Boyle Downstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

J.C. Boyle Spillway: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for spillway modifications in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

J.C. Boyle Tailrace Barrier: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for tailrace barriers in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

Keno

Keno Upstream Fishway Prescription: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

Keno Spillway: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for spillway modifications in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

East Side and West Side Developments

East Side and West Side Downstream Fishway Prescriptions: The Modified Fishway Prescription and rationale have not changed substantively from the Services' Preliminary Prescription dated March 27, 2006.

East Side and West Side Tailrace Barriers: In accordance with a stipulation with PacifiCorp, the Services have revised the prescriptions for tailrace barriers in the Modified Prescriptions to allow PacifiCorp to conduct site-specific studies on the need for and design of spillway modifications (Administrative Law Judge 2006b).

Section 3. Alternative Condition Analyses

In accordance with the Interim Final Rule "Resource Agency Procedures for Conditions and Prescriptions in Hydropower Licenses," which the Departments of Agriculture, Commerce, and Interior jointly promulgated (70 Fed. Reg. 69804, (November 17, 2005)), any party to a license proceeding may propose an alternative to a Federal Power Act (FPA) section 4(e) condition or section 18 fishway prescription within 30 days after the deadline for the agency's preliminary condition or prescription (43 C.F.R. § 45.71; 50 C.F.R. § 221.71). The Department of the Interior and the Department of Commerce must adopt the proposed alternative prescription if the Department determines, based on substantial evidence provided by any party to the license proceeding or otherwise available to the agency, that the Alternative Prescription, as compared to the preliminary prescription:

1. Will be no less protective than the Services' Preliminary Prescription; and
2. Costs significantly less to implement or results in improved operation of the project works for electricity production.

[*see* Pub. L. No. 109-58, Title II, §241(c), 119 Stat. 674, 675-76 (2005) (adding new FPA Section 33(a) and (b)) (codified at 16 U.S.C § 823d(a) and (b)).]

In deciding whether to adopt a proposed alternative, the statute and implementing regulations (43 C.F.R. § 45.73 (Interior); 50 C.F.R. §221.73 (Commerce)) require that agencies must consider the evidence/supporting material provided by any party to the license proceeding or otherwise available to the agency, including evidence on the implementation costs or operational impacts for electricity production of the proposed alternative, comments received to the Preliminary Prescription, any comments received on the draft or final National Environmental Policy Act documents, the Proposed Alternative, and any Administrative Law Judge (ALJ) decision on disputed issues of material fact issued under 43 C.F.R. § 45.60 (Interior), and/or 50 C.F.R. §221.60 (Commerce) with respect to the preliminary prescription. In this case, this includes the ALJ decision issued by the Hon. Parlen L. McKenna, dated September 27, 2006.

When the agency files its Modified Prescriptions, it must also file with FERC:

1. Any study, data, or other factual information relied on that is not already part of the licensing proceeding record.

2. A written statement explaining:
    a. The basis for the Modified Prescription (justification); and
    b. If the agency is not adopting any alternative, its reasons for not doing so.

This written statement must also demonstrate that the agency gave equal consideration to the effects of the prescription adopted and any alternative not adopted on:

1. Energy supply, distribution, cost, and use;
2. Flood control;
3. Navigation;
4. Water supply;
5. Air quality; and
6. Preservation of other aspects of environmental quality.

In Section 3, below, the Services analyze the alternative prescriptions for protectiveness and cost, in accordance with the statutory standards set forth in Section 33 of the FPA (16 U.S.C. § 823d(b)(2)); and include the Services' consideration of effects in accordance with the factors set forth in Section 33 of the FPA (16 U.S.C. § 823d(b)(4)). The Services' Preliminary Prescriptions were included in U.S. Department of the Interior 2006 and NMFS 2006 (National Marine Fisheries Service 2006), and as modified are

included as Attachment 1. The Services' Prescriptions are compared to PacifiCorp's April 25, 2006, Alternative.[5]

In addition to the April 25, 2006, Proposed Alternative Fishway, PacifiCorp on December 1, 2006, sent to the Services an "Addendum" to the earlier filing. PacifiCorp requested that the proposal be considered under FPA Section 33 as an additional proposed alternative, or "modified prescription," to be considered "in the event that the Services prioritize anadromous fish access to habitat within the Project area" (a qualification not fully explained in the filing). *See* Addendum at 1. PacifiCorp also requested that, even if the Services did not consider the filing as setting out an alternative under Section 33, the Services nevertheless consider the Addendum as information relevant to development of the Services' modified Prescriptions. *See, e.g., id.* at 1 n.2; *id.* at 7 n.5; *id.* at 10. PacifiCorp expressly declined to withdraw the distinct April Alternative.

The joint regulations implementing the EPAct amendments to the FPA provide the definitive set of procedures to be followed by parties wishing to place a proposal before the Services for full consideration as an "alternative" under Section 33. The regulations were recently upheld as validly promulgated procedural and interpretive rules.[6] The regulations expressly require that any such alternative must be filed within 30 days after the deadline for the Services to file preliminary Prescriptions with FERC. See 50 C.F.R. § 221.71(a)(2) (DOC regulations); 43 C.F.R. § 45.21(a)(2) (DOI regulations). The deadline for filing proposed alternatives for the Services' March 2006 preliminary prescription was no later than April 28, 2006. The December 1 "Addendum" filed by PacifiCorp was thus filed more than seven months past the binding regulatory deadline.

Adherence to the regulatory deadline for submitting new proposals for full Section 33 analysis is essential to facilitate timely and thorough consideration of alternatives and the concomitant preparation of Modified Prescriptions. Consistency with the deadlines is particularly important for projects of the level of complexity of the Klamath Project, to allow full development of a record within the time available in the FERC licensing process. Thus, it would have been both inconsistent with the regulations and infeasible for the Services to accord full section 33 analysis to an alternative proposal filed so late in the process.

However, consistent with their statutory and regulatory obligations to consider relevant evidence and supporting material that is reasonably available to the Services, the Services reviewed the Addendum to determine whether it set forth "evidence and supporting material" that was relevant to consideration of the timely filed April Alternative and the development of Modified Prescriptions. See 50 C.F.R. § 221.73(a); 43 C.F.R. § 45.73(a).

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[5] The Hoopa Valley Tribe submitted to NMFS an Alternative Fishway Prescription dated April 27, 2006. However, the Hoopa Valley Tribe withdrew that Alternative by a letter dated January 8, 2007.

[6] *See* American Rivers v. United States Department of Interior, *et al.*, 2006 WL 2841929 (W.D. Wa. Oct. 3, 2006) (holding, *inter alia*, that the interim final regulations were valid procedural and interpretive regulations and, as such, were not required to be issued with prior notice and comment).

To the extent relevant and feasible in the time available, such evidence and supporting material was considered by the Services in evaluating the April alternative and developing the modified prescriptions. *See also* 16 U.S.C. §823d(b)(4) (information "provided in a timely manner" must be taken into account in preparation of the written statement explaining basis for ultimate decision to accept or reject an alternative).

The FPA provides that, where the relevant Secretary finds on the basis of substantial evidence that the statutory criteria are met, then he or she "shall accept and prescribe" the proposed alternative. FPA § 33(b)(2), 16 U.S.C. § 823d(b)(2). Thus, like the Services' Preliminary Prescriptions, each element of the Modified Prescriptions must fall within the Secretaries' authority under FPA Section 18 to prescribe "fishways."[7]

Though there is no current regulation defining "fishway," Congress has provided guidance that a "fishway for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish; and project operations and measures related to such structures, facilities, or devices which are necessary to ensure the effectiveness of such structures, facilities, or devices for such fish." Energy Policy Act of 1992, Public Law 102-486, Title XVII, Section 1701(b), 106 Stat. 3008 (Oct. 24, 1992) (vacating definition at 18 C.F.R. Section 4.30(b)(9)(iii) (1992)). The Services must be guided by these parameters in developing their modified fishway prescriptions, including consideration of alternatives.[8]

In its Alternative, PacifiCorp suggests that several items (specifically, those elements requiring planning, record-keeping, and monitoring activities, the tailrace barriers, seasonal trap and haul around reservoirs, and removal of barriers in Copco and J.C. Boyle bypass channels, and prescriptions for resident fish passage) in the Services' Preliminary Prescriptions do not constitute a 'fishway." The Services disagree with this assessment, concluding that the listed elements do meet the parameters as set out in the Congressional guidance discussed above. Planning, record-keeping and monitoring activities are

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[7] PacifiCorp suggested in its Alternative that the Services could accept a measure or measures set forth as part of a party's proposed alternative that do not themselves constitute a "fishway" consistent with the Congressional guidance. Alternative at 18. However, because any alternative must be ultimately "prescribe[d]" by the Secretary, language which invokes the scope of authority available to the Secretary under Section 18 (16 U.S.C. § 811), it would be unreasonable to read the statute to permit the Secretary to adopt, by way of a proposed alternative, measures that the Secretary would not otherwise have authority to prescribe. Thus, the Agencies believe the legislative guidance of the 1992 Energy Policy Act setting out the basic parameters for what constitutes a fishway that may be prescribed is equally applicable to all elements of the modified prescription, whether initially set forth by the Services or taken from a party's proposed alternative. Accordingly, the elements of PacifiCorp's Alternative that do not meet the fishway parameters are not included in the following alternatives analysis. The non-fishway elements of PacifiCorp's filing include hatchery operations and other elements not consistent with the Secretaries authority under Section 18.

[8] This guidance language is not codified in the United States Code, but rather was set out in the context of repealing the then-current FERC regulatory definition of "fishway" and directing that any future definition must be concurred in by the Secretaries of the Interior and Commerce and limited to the parameters identified above.

"measures" related to the structures, facilities, or devices necessary to maintain all life stages of such fish and which are necessary to ensure the effectiveness of the structures, facilities, or devices. As fish move upstream, tailrace barriers guide their migration so that they can successfully navigate upstream passage facilities, thus constituting structures, facilities, or devices necessary to maintain all life stages of such fish. The seasonal trap and haul prescribed at Keno Dam (upstream) and at the East- and West-Side diversions (downstream) provide safe, timely, and effective passage of fish around the dams in the context of the particular applicable conditions. Removal of barriers constitute "devices," consistent with the ordinary meaning of that term (which includes a "contrivance or an invention serving a particular purpose" as well as a "technique or means"),[9] necessary to endure that fish can pass through these bypass channels and thus achieve safe, timely, and effective passage. Finally, with respect to resident fish, based on the scientific evidence before him, the ALJ found that "migration is one of several defining life history characteristic[s] of trout. ... (citations omitted). Their ability to migrate is one of several evolutionary advantages contributing to survival of trout in the Klamath River for millions of years through dramatic environmental changes." ALJ Decision at 27; FOF 3-7. The ALJ's Ultimate Finding on this issue found that "Project operations have and continue to adversely affect the resident trout fishery by, among other things: a) confining the resident trout between the Project dams and associated reservoirs thereby impairing their utilization of the full range of life history strategies and spawning productivity; (b) unscreened flow through Project turbines result in mortality of juvenile and adult trout migrating down stream; and the inability to effectively migrate adversely affects the genetic health and long term survival of the resident species." ALJ Decision at 87, UFOF 6. Accordingly, as migration represents a life history characteristic of resident trout that is necessary to their overall health, reproduction, and survival, the prescription of passage allowing resident fish to meet these life history requirements is permissible under the fishway definition.

A. Description of Alternative Fishway Prescriptions

Description of the Services' Preliminary Prescriptions

The NMFS and FWS issued general and specific Preliminary Section 18 Prescriptions for the Klamath Hydroelectric Project on March 27, 2006. The Prescriptions address design standards, consultation, construction, monitoring, evaluation, and adaptive management requirements that would apply to all developments within the Klamath Project. The NMFS and FWS prescribe volitional passage facilities at all project dams. However, due to the prevalence of water quality problems (primarily excessive water temperatures) in the Keno reach during late spring, summer and early autumn, the agencies include an interim trap-and-haul measure to transport juvenile and adult fish past Keno Reservoir. Trap-and-haul operations would cease once conditions improved to the point that fish could survive transit through the reservoir. Specific fish passage

[9] The American Heritage College Dictionary (4th ed. 2004).

measures prescribed by the Services for upstream and downstream passage of anadromous and resident fish at each project are listed in Table 4 of the Services' Preliminary Prescriptions. These measures would be constructed over a period ranging from 3 to 8 years from license issuance.

Description of PacifiCorp's April 25, 2006 Alternative

The Pacificorp Alternative includes no passage at Keno dam and Link River Dam Eastside/Westside powerhouses. For resident fish within the Project area the PacifiCorp Alternative includes upstream and downstram passage at Fall and Spring Creek diversion dams and modifications to the existing J.C. Boyle fish ladder. PacifiCorp's Fishway Alternative for anadromous fish at Iron Gate, Fall Creek, Copco 1, Copco 2, and J. C. Boyle Dams are described in PacifiCorp (2006), and consist of minor modifications to the existing Iron Gate Dam hatchery ladder to accommodate an adult collection and transport facility, creation of adult fish release access sites above J.C. Boyle Dam, modifications to the existing J.C. Boyle fish ladder, and studies for 5 to 10 (or more) years to determine what, if any, juvenile collection and release efforts should be implemented. At some point within the study period, PacifiCorp would either construct a collection facility at J.C. Boyle Dam and commence a juvenile collection and transport program, or end fish passage activities upon completion of a "limiting factors analysis." Details regarding the final design and implementation of fish passage are not fully described in the alternative.

Upstream Passage of Adult Fish

The PacifiCorp Alternative for upstream passage anticipates modification to the existing J.C. Boyle ladder, and modifications to the existing Iron Gate Hatchery fish collection, sorting, and holding facilities as necessary to facilitate upstream collection and transport (trap and haul) of Chinook, coho, steelhead, and Pacific lamprey. The details of the construction requirements would be based on the results of 5 to 10 year Phase I studies. PacifiCorp's Alternative includes an additional lift/hopper system per NMFS criteria and would augment the existing sorting facility to enable detection and recording of PIT-tag data and other identifiers at Iron Gate Dam. The existing auxiliary water system would probably continue to be used to augment ladder flow from the forebay. Neither the existing ladder nor the spillway would be modified. PacifiCorp would develop a design and construction plan for modifications to the existing hatchery facilities for the Services' review and approval, and would complete construction and begin operating within two years of license issuance. However, the actual time frame for construction and/or implementation is unclear as up to 5 to 10 years of Phase 1 studies on juvenile survival and behavior through lakes and reservoirs; juvenile transport survival; early life-stage survival and juvenile production from important tributaries; disease effects to both juveniles and adults; adult transport and migration survival and behavior; and smolt-to-adult survival rates are proposed ((PacifiCorp 2006), Attachment A, page A-6 and A-10, Table 2). Decisions regarding full implementation of adult and juvenile transport facilities will be based on the results of these 5 to 10 year Phase I studies.

PacifiCorp proposes that some or all of the adult fish trapped at Iron Gate Dam would be transported and released at or above J.C. Boyle Reservoir. However, the proposed alternative focuses on Chinook and does not specify how other species would be accommodated. Final decisions on how each species would be handled, potential release locations, and final design criteria would be deferred until the results of the Phase 1 monitoring studies outlined in Attachment A of the PacifiCorp Alternative have been completed. Phase 1 studies are scheduled to take between 5 and 10 years to complete. PacifiCorp indicates that their program would likely not include collection and transport of steelhead trout.

At J.C. Boyle Dam, PacifiCorp proposes to modify the existing ladder. The existing bar spacing on the fishway exit pool trashrack will be increased and an additional weir will be added to the fishway entrance pool to decrease the height of the existing step.

PacifiCorp proposed no new upstream fish passage facilities for Copco 1, Copco 2, and Keno.

PacifiCorp's Alternative does not include fishways at Iron Gate Dam (other than the upstream passage proposed as part of the anadromous fish collection and transport program) or at the Copco 1 and 2 dams for resident fish. PacifiCorp's position is that all trout now arriving at the Iron Gate ladder are considered to be of a coastal-lineage stock (steelhead). However, PacifiCorp would transport any resident fish that do arrive in the Iron Gate Dam collection facility to above or below the Dam at the request of fish managers.

PacifiCorp proposes no downstream fishway at Iron Gate Dam, and no upstream or downstream fishways or spillway modifications at Copco 1 or Copco 2 Dams. PacifiCorp does not believe that resident fish require passage at J.C. Boyle Dam (Section V.B.3.a.). However, because there is an existing ladder at J.C. Boyle Dam, PacifiCorp proposes to modify the ladder, increase the existing bar spacing on the fishway exit pool trashrack, and add an additional weir to the fishway entrance pool. PacifiCorp is proposing to implement minor fixes to fill gaps among boulders and bedrock in the J.C. Boyle spillway within four years of license issuance; however, PacifiCorp is not proposing to implement hydraulically-engineered spillway modifications of the type described in the Services' Prescription because, they suggest, there is no evidence that significant modifications are necessary to protect redband trout.

PacifiCorp proposed in its license application to decommission the East Side and West Side powerhouses at Link Dam, and PacifiCorp is also prepared to apply to FERC to decommission Keno Dam. PacifiCorp's position is that there is no evidence to suggest that passing resident fish—and in the future, anadromous fish—requires any additional protections at the Keno Dam. PacifiCorp does not propose to subsample fish on a daily basis for size, species identification, age determination, and condition, as described in the

Services' Prescription. PacifiCorp's collection and transport program for anadromous fish would be used to provide fish access to habitat above Keno Reservoir.

Downstream Passage of Juvenile Fish

Under PacifiCorp's Alternative (pages 57-61, 90-91 in Attachment A), PacifiCorp proposes no downstream fish passage facilities for Iron Gate, Copco 1, Copco 2, or Fall Creek Dams.

At J.C. Boyle, PacifiCorp will continue to use existing downstream screening facilities to bypass resident fish. These facilities consist of traveling screens that cover the entire flow to the power canal. The system also includes a fish bypass system that discharges to a pool just downstream of the spillway. The screen approach velocities under maximum flows do not meet current criteria for fry; however, if a juvenile anadromous collection and transport facility is ultimately constructed at J.C. Boyle Dam, it will be constructed to meet criteria for juvenile salmon and trout.

In addition, PacifiCorp states that it *might* construct a juvenile collection and transport facility at or above J.C. Boyle Dam. PacifiCorp proposes to conduct a number of studies (up to 5 years in duration) on juvenile fish survival in transport, survival in the upper basin, and survival after downstream release. The decision to build a collection facility would be based on the results of the studies, but neither the evaluation criteria nor the decision-making process have been described in detail. As a result, the precise timing, location and type of juvenile collection facilities is not known at this time, although PacifiCorp has included an example of the type of facility that may be considered in Attachment D of their Alternative. Under PacifiCorp's proposal, these details would be based on a phased analysis of downstream migrating juvenile behavior.

PacifiCorp does not specify release facilities, but provides that juvenile migrants could be released directly into the Klamath River below Iron Gate Dam at one or more unspecified locations. PacifiCorp's Alternative does not include stress relief ponds at this time. However, presumably using available raceway space at the Iron Gate Hatchery, stress relief ponds "easily could be added if determined to be worthwhile." (PacifiCorp 2006, page 60).

Limiting Factors Analysis

The PacifiCorp Alternative for complete fish passage (upstream and downstream for both adults and juveniles of all species) will only be fully implemented if PacifiCorp and fisheries managers decide that self-sustaining runs of reintroduced anadromous fish can be established. The criteria for establishing successful establishment of self-sustaining runs were not articulated in the PacifiCorp Alternative. If, based on the results of the proposed studies, PacifiCorp and Fisheries Managers decide that sustained runs cannot be established, PacifiCorp will develop and implement a limiting factors analysis to identify obstacles to establishing such runs. PacifiCorp specifies that it would not, solely by

virtue of implementing this Adaptive Reintroduction Plan (ARP), assume any responsibility for addressing or removing an identified limiting factor. However, should Fisheries Managers or other stakeholders succeed in removing or minimizing limiting factors in a manner that is anticipated to allow the establishment of self-sustaining fish runs in the upper Klamath basin, PacifiCorp will implement necessary studies to confirm that the relevant factor is no longer limiting. If, based on such additional studies, the Fisheries Managers determine that a previously-limiting factor is no longer an obstacle to establishing self-sustaining anadromous fish runs, only then will PacifiCorp commence reintroduction efforts as directed by Fisheries Managers. Under the PacifiCorp Alternative, it is possible that complete fish passage may never be established.

B. Comparison of PacifiCorp's Alternative to the Services' Prescriptions Under Statutory Criteria

Criteria 1 – Would the Alternative, as compared to the Services' Prescriptions, be no less protective?

As described more fully below, the Services' Prescriptions are more protective than PacifiCorp's Alternative. In short, the Project's dams create barriers to migration of resident trout among reaches within the Project area, and to migration of anadromous fish into and above the Project area. The Services' Prescriptions are intended to restore migration through the Project and provide migrating fish a means through the barriers posed by project facilities. The level of protection provided by the Services' Prescriptions is much greater than the level of protection provided by PacifiCorp's Alternative for the following reasons:

1. PacifiCorp's Alternative Provides Less Access to Habitat in the Project Reach
2. PacifiCorp's Alternative Provides Less Habitat Connectivity
3. Evidence Indicates that for the Site-specific Conditions of the Project, Volitional Passage Would Be More Effective than Trap and Haul Methods at Passing Anadromous and Resident Fish Across Dams
4. Upstream Migration
    - 4a. PacifiCorp's Alternative Provides Less Effective Passage at J.C. Boyle Dam and Keno Dam
    - 4b. PacifiCorp's Alternative Would Delay Upstream Migration
    - 4c. PacifiCorp's Alternative Would Cause Greater Stress and Prespawn Mortality to Adult Fish
    - 4d. Services' Prescribed Upstream Fishways at Iron Gate and Copco 1 Dams Would Allow Fish to Express a Full Range of Migratory Behavior
    - 4e. PacifiCorp's Alternative Would Be No Less Likely to Cause Fish Losses in the Hatchery and Ladder
    - 4f. PacifiCorp's Alternative Would Increase Straying of Returning Adults
    - 4g. The Services' Prescriptions are Based on Well Documented Adult Cumulative Survival in Established and Accepted Fishways
5. Downstream Migration

5a. PacifiCorp's Alternative Would Cause Greater Stress to Juvenile Fish than the Service's Prescription

5b. PacifiCorp's Alternative Provides No Measures for Downstream Migration or Protection from Entrainment at Copco 1, Copco 2, and Iron Gate Facilities

5c. PacifiCorp's Alternative Provides Less Protection from Entrainment at J.C. Boyle Dam

5d. PacifiCorp's Alternative Would Cause Increased Mortality of Outmigrating Fish Associated with Premature Downstream Migration

5e. PacifiCorp's Alternative Does Not Minimize Spillway Mortality

5f. The Services' Prescriptions Provide for the Migratory Needs of Fish Based on Valid Modeling Comparisons of Passage Alternatives.

6. PacifiCorp's Alternative is More Likely to Exacerbate Pathogen and Fish Disease Risks to Anadromous Fish
7. PacifiCorp's Alternative Provides No Protective Measures for Fish at Keno Dam and Link River East Side/West Side Powerhouses
8. PacifiCorp's Alternative Would Bypass Habitat for Pacific Lamprey in the Project Reach
9. PacifiCorp's Alternative Would Rely on Passage Methods for Pacific Lamprey That Have Not Been Established
10. It Is Unlikely that PacifiCorp's Alternative Would Provide Migratory Cues Necessary for the Attraction of Adult Pacific Lamprey
11. PacifiCorp's Alternative Provides Lesser Population-level Benefits for the Upper Klamath Coho Population and for the Federally Listed SONCC Coho ESU
12. PacifiCorp's Alternative Does Not Protect Federally Listed Coho Salmon From Entrainment at the Copco 1, Copco 2, and Iron Gate Turbine Intakes
13. PacifiCorp's Alternative Risks Inadvertent Transport of Resident Trout and Lamprey
14. PacifiCorp's Alternative Provides Little Protection from Entrainment for Resident Trout
15. Unlike the Services' Prescriptions, PacifiCorp's Alternative Would Not Reduce the Project's Impacts on the Resident Trout Fishery
16. PacifiCorp's Alternative Does Not Protect or Bypass Federally Listed Suckers

The Services' Prescriptions provide certainty and an appropriate time frame (2-8 years) for the construction of fishways that will provide safe, timely, and effective passage for resident and anadromous fish at Project facilities. PacifiCorp's Alternative is less protective because it delays the certainty of fish passage in favor of studies that would not be completed for up to 10 years (PacifiCorp 2006, Attachment A, page A-12) and with no certainty that the eventual outcome will mitigate project effects.

The Services analyzed the Alternative in accordance with the regulations. As explained further below, the Services determined that, while likely less costly, the Alternative is less protective of the resource. Therefore, the Service are not adopting the Alternative. Below are discussions of the reasons that PacifiCorp's Alternative is less protective of fishery resources of the Klamath River than are the Services' Prescriptions. The first set

of reasons apply generally to the resident redband/rainbow trout currently inhabiting the Project reach and all of the anadromous fishes that could be reintroduced to the Project reach (i.e., fall Chinook salmon, spring Chinook salmon, coho salmon, steelhead, and Pacific lamprey). Secondly, we discuss specific reasons that apply to each of these species independently. All of the reasons, below, explain why the provision of safe, timely, and effective passage, as described in the Services Prescriptions, would be more protective than PacifiCorp's Alternative.

General

1. PacifiCorp's Alternative Provides Less Access to Habitat in the Project Reach

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions provide access to habitat suitable for anadromous fish in the Project Reach, including perennial tributaries, intermittent tributaries, mainstem habitat, and natal streams.
- PacifiCorp's Alternative is less protective because, if any fish passage is provided at all, anadromous fish would be transported around suitable habitat in the Project reach, including thermal refugia, perennial tributaries, intermittent tributaries, mainstem habitat, and natal streams.

The Service's Prescriptions provide volitional fish passage at each Project dam to allow both resident and anadromous fish to migrate freely among the habitats between the dams and in the tributaries of the mainstem between the dams and reservoirs. Resident fish need to migrate among these areas to improve their ability to meet their life history requirements over current conditions with volitional passage. Anadromous fish will be provided access to these habitats for the first time since the Project was constructed.

Significant habitat for anadromous fish currently exists in the Project Reach ((U.S. Department of the Interior 2006b; USDI Fish and Wildlife Service 2006)Tech memo). The ALJ agreed with the Services' technical finding that 58 miles is a reasonable estimate of the amount of useable habitat currently in the Project reach (ALJ Decision at 86, UFOF 8). Based on the scientific evidence presented, the ALJ found habitat in the Project reach to include: 1) the main stem (containing approximately 28 miles of suitable habit), which PacifiCorp admits is suitable for anadromous fish; 2) perennial tributaries (containing approximately 12 miles of suitable habitat) and intermittent streams (containing approximately 18 miles of suitable habitat) (ALJ Decision at 66, citing Findings of Fact 6-9 through 6-14). Of this habitat, PacifiCorp's Alternative would transport anadromous fish around the reach between Iron Gate Dam and J.C. Boyle Reservoir (pages 57-59 and page 62), bypassing approximately 40 miles of suitable anadromous fish habitat (Table 3, Agencies' Preliminary Prescription; see ALJ Decision citations above). Portions of this habitat contain spring influenced areas that would accommodate anadromous fish through periods when water quality might be unsuitable ((USDI Fish and Wildlife Service 2006) Tech memo). Such habitat includes areas cooled by springs (thermal refugia) in the J.C. Boyle bypass (ALJ Decision at 33, FOF 6-10). In

the lower river, refugial areas have been shown to accommodate over-summering anadromous fish (Benson and Holt 2006; Sutton et al. 2002; Sutton et al. 2004).

The Services' Prescriptions would provide access to the suitable anadromous fish habitat, including thermal refugia, between Iron Gate Dam and J.C. Boyle Reservoir.

2. PacifiCorp's Alternative Provides Less Habitat Connectivity

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because volitional fishways provide continuous habitat connectivity for fish so they can utilize the full range of different habitat types, such as perennial or intermittent streams or thermal refugia, at different points in their life history and fully express all life history strategies. The diversity of habitats available and the genetic intermixing of sub-populations provided with the Services' Prescriptions allow for the healthy maintenance of genetic diversity of the fish populations.
- PacifiCorp's Alternative is less protective because fish would not continually have access to the full range of different habitat types in the Project reach because anadromous fish would be trucked around the Project reach and resident fish would not be able to freely move past each of the dams. The diversity of life history strategies would not be fully expressed and the genetic diversity benefits would not be realized under PacifiCorp's Alternative.

Volitional passage, as the Services prescribed, allows fish to use ladders to move past dams in their migrations or other movements up and down rivers. As provided in PacifiCorp's Alternative, trap and haul would involve trapping and collecting fish downstream of Iron Gate Dam, and loading them in trucks to transport to the upstream side of J.C. Boyle Dam for release. This method would deprive the transported fish of access to the diversity of habitats available within the project reach. If instead, fish were trapped and hauled around each of Iron Gate and the Copco Dams in order to provide access to most of the 58 miles of habitat, the adverse effects due to stress of collecting and handling, described below (in Subsections 4c and 5a above), would be significantly increased. If it was decided to trap and haul at each dam and release at the upstream end of the reservoirs in order to avoid reservoir mortality, then the habitats in the tributaries that flow into the reservoirs, such as Spencer Creek and Jenny Creek, would not be accessible to migrating fish. Ladders, as prescribed by the Services, would operate continually, while trucks would only be available at specific times.

Connectivity is critical in the Klamath watershed to allow resident and anadromous fish to migrate seasonally to take advantage of different habitat types and thermal refugia as environmental conditions and life history needs change. Tributaries and thermal refugial areas are critically important in the Klamath watershed for juvenile (Belchik 1997; National Research Council et al. 2002; Sutton et al. 2004) and adult Chinook salmon (Hillemeier 1999; Strange 2005) and may not be adjacent or coincide with road access points for hauling trucks. Even if PacifiCorp contemplated release within the Project area, trap and haul operations would likely bypass many areas of good habitat because their

suitability is unknown or it is inconvenient to release fish in those areas. Therefore, at this particular site, and in context of this Project, it would be infeasible to devise a comprehensive Trap and Haul method as a primary approach that would be equally protective to the Services prescriptions because of site-specific conditions at this Project.

PacifiCorp (2006, pages 64-65) states that one of the clear benefits of a trap and haul operation over volitional passage for anadromous fish is the ability to bypass less viable areas in favor of higher-quality upstream habitat. In this way, PacifiCorp says, large reservoirs, unscreened diversions, and marginal water quality can be avoided. However, as discussed below, we find that fish can migrate through reservoirs and unscreened diversions, and marginal water quality could be addressed while using volitional passage. Unscreened diversions would still have to be screened (see Subsections 5b and 5c, below) and the marginal water quality in Lake Ewauna would need to be bypassed using trap and haul methods until water quality concerns are remediated (see Subsection 6, below). Many more problems exist with PacifiCorp's trap and haul Alternative, as discussed below. Attempts to sort upstream migrating fish to desired locations such as Fall Creek, Spencer Creek, or habitat below Iron Gate Dam would be difficult because identification of which natal stream the fish are from would not be possible. It would be most effective if the fish themselves were allowed to choose their natal streams through the use of fish ladders.

Migration Through Reservoirs – PacifiCorp (2006, page 49) states that the Services' Prescriptions would subject anadromous fish to stress and delay due to water temperature differences. Based on the record evidence, the ALJ found that adult coho salmon enter the river to spawn in late September and reach peak migration strength between late October and mid-November (ALJ Decision at 35, FOF 7-10) when the water temperatures above Iron Gate Dam are low. Further, juvenile coho salmon begin outmigrating to the ocean in late February and continue migration through early July (ALJ Decision at 36, FOF 7-11). For a significant amount of the outmigration period, water temperatures are low. While juvenile coho salmon rear in streams for one year and have a preference for cold water (ranging between 12 and 14° C), they can tolerate higher water temperatures (exceeding 20° C) where food is abundant, there are areas of thermal refugia, and other conditions are not stressful (ALJ Decision at 36, FOF 7-11). Therefore, water temperature will not preclude coho salmon from utilizing the habitat within the Project area (ALJ Decision at 36, FOF 7-12). The ALJ made similar findings for other species of anadromous fish (ALJ Decision at 17, FOF 2A-27 through FOF 2A-29 (fall-run Chinook); ALJ Decision at 18, FOF 2A-35 and FOF 2A-36 (spring-run Chinook); and ALJ Decision at 19, FOF 2A-43 and FOF 2A-44 (steelhead). With respect to anadromous species and habitat in the Project reach, the ALJ found that warm water temperatures in the summer and cold water temperatures in the winter will not preclude anadromous fish from successfully utilizing habitat above Iron Gate Dam (ALJ Decision at 14, FOF 2A-14). The ALJ found strong evidence that anadromous salmonids could migrate through Project reservoirs and facilities in the fact that anadromous fish currently complete life cycles through eight dams and reservoirs on the Columbia and Snake

Rivers, and historically completed life cycles through Upper Klamath Lake (ALJ Decision at 15, FOF 2A-20).

PacifiCorp (2006, page 92) states that "neither the resident trout populations in and above Copco 1 Dam nor the populations below Copco 1 Dam require passage in order to maintain all life stages." However, for resident trout, barriers such as dams may cause the extinction of mobile life history forms of resident trout, and if these life history forms are genetically distinct, their genetic contribution to the population will be lost (Young 1995). In addition, implementing fish passage would help improve connectivity among populations in the Project area to the extent that all life stages would be better maintained. The ALJ found that the Project contains habitat for resident trout (ALJ Decision at 26, FOF 3-1); that prior to the construction of dams, redband trout within the Project area belonged to a single, large intermixing population throughout the Klamath River Basin (ALJ Decision at 26, FOF 3-4); and that migration is one of several defining life history characteristics of trout (ALJ Decision at 27, FOF 3-7). The ALJ also found that life history strategies (such as spawning above the J.C. Boyle Dam) are denied to the resident trout population below the dam (ALJ Decision at 26, FOF 3-6); the Project restricts migration of resident fish within the mainstem and into and out of the tributaries (ALJ Decision at 27, FOF 3-8), including highly productive spawning and rearing habitat in Spencer Creek (ALJ Decision at 27, FOF 3-13); that the lack of fishways at Iron Gate, Copco I, and Copco II Dams block all upstream passage, isolating resident fish from counterparts below the dams (ALJ Decision at 27, FOF 3-8); and the Project's limitation on riverine migration may have reduced the genetic diversity of the remaining stocks within the Project reaches (ALJ Decision at 28, FOF 3-16). Improvements in the efficiency of the fishway at J.C. Boyle Dam would result in significant trout population migration above the dam over time (ALJ Decision at 27, FOF 3-12).

3. Evidence Indicates that for the Site-specific Conditions of the Project, Volitional Passage Would Be More Effective than Trap and Haul Methods at Passing Anadromous and Resident Fish Across Dams

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because volitional passage is the most effective method for re-establishing fish passage. Migrating salmonids, in particular, are capable of entering and ascending properly designed fishways, traversing reservoirs, and locating their streams of origin with little or no delay or wasted energy, thus minimizing the stress associated with migration.

- PacifiCorp's Alternative is less protective because of increased fish stress, injury, and mortality due to handling and transport, in combination with uncertainties of long term funding, maintenance, and operation.

The Services prescribe volitional passage as the most effective method for re-establishing fish passage across dams in the Project. This is primarily due to the successes achieved with volitional passage in similar river systems in comparison to the risks associated with

trap and haul, including the handling and transport of adult upstream migrants, in combination with the long term uncertainty of funding, maintenance, and operation of trap and haul programs. Volitional ladders have been accepted as effective and appropriate fishways, whereas trap and haul methods are generally considered when ladders are not technically feasible, desirable, or management goals include trapping anyway (National Marine Fisheries Service 2004b).

Volitional ladders are well understood (Steward and Associates 2007). The bioengineering principles of upstream passage systems are well established and the results, expressed as the proportion of fish arriving at the dam that are passed within an acceptable period of time, have generally been good (Steward and Associates 2007). Upstream migrating salmonids, in particular, are capable of entering and ascending properly designed fishways, traversing reservoirs, and locating their streams of origin with little or no delay or wasted energy. Importantly, energy expenditures and levels of stress associated with migration through fishways and reservoirs are comparable to those experienced in undammed systems, leaving ample reserves for sexual maturation and successful reproduction (Steward and Associates 2007).

When considering fish passage on other rivers, the river most comparable to the Klamath is the Columbia River. These are the only two west coast rivers with headwaters east of the Cascade Range. The rivers are comparable in size and both had large runs of anadromous fish historically.

Adult salmonids generally enjoy very high survival and passage success through ladders and through reservoirs on the Columbia. In a reach of the river with much larger reservoirs than the Klamath River, passage success rates of 86 to 98 percent have been estimated from tailrace to tailrace from Ice Harbor to Lower Granite Dam (3 dams and reservoirs). These survival rates include ladder entry, passage and reservoir survival (National Marine Fisheries Service 2000b) NMFS concluded that minimum per project passage rates for Columbia River facilities were 96 to 98 percent for Chinook and 97 percent for steelhead (National Marine Fisheries Service 2000a).

On the lower Columbia River, there are currently nine dams with ladders for upstream passage (Gary Fredricks, NMFS, pers. comm.). Originally, both ladders and locks (the concept is similar to trap and haul) were installed as fishways for the Columbia River at Bonneville Dam (Time Magazine 1938; U. S. Army Corps of Engineers 1958). When the first salmon to use the ladders at Bonneville returned, an average of 1,600 salmon per day used the ladders and there was no indication that fish had difficulty finding their way (Time Magazine 1938). Fish in general preferred to enter the ladders when available rather than the locks (U.S. Corps of Engineers 1958). The conventional pool-type fish ladders have been the primary means of passing fish over Bonneville Dam since they were placed in operation in 1938 (U.S. Corps of Engineers 1958).

The fish locks were later discontinued (U.S. Corps of Engineers 1958). They were not considered suitable for salmon and steelhead passage, were very time

consuming, and were labor intensive (Beamesderfer and Nigro 1992). It was difficult to attract and keep fish in a lock. Fish could be attracted to the lock chamber, but lack of directional flow within the chamber and other factors permitted fish to leave. Various types of trapping devices were tried but with only fair results. The longest period in which locks were continually used was during 1941 and 1942. (U.S. Corps of Engineers 1958).

On the Klamath River, the channel and reservoirs of the Project reach are relatively confined and narrow, making it easier for adults to find ladder entrances and navigate reservoirs. It is reasonable to expect that ladder efficiencies on the Klamath would be comparable to the facilities on the Columbia River.

Given this, even if the 95 percent adult upstream passage rate using trap and haul could be achieved as the Applicant has suggested, it be less than the best observed passage rates on the Columbia River. Further, the Alternative would be less protective of naturally spawned fish and less effective at restoration of native fish to historically occupied habitats and thus is inconsistent with the Department of the Interior and Klamath River Basin Fisheries Task Force's Long Range Plan (USDI Klamath River Basin Fisheries Task Force 1991). This alternative would also be inconsistent with Agency goals (U.S. Department of the Interior 2006b).

Trap and haul associated fish stress, injury, and/or mortality have been documented. Trap and haul relies on extensive handling and sorting of fish, as well as crowding fish in holding ponds and transport trucks, all of which cause stress to fish (Oregon Department of Fish and Wildlife 2006). For example, carbon dioxide use may contribute to physical injuries in adult salmon as they thrash in the anesthetic bath during handling. This stressful behavior can cause injuries that are not readily apparent when fish are released, but may show up as fungal infections in the following weeks (Beidler and Knapp 2005). Trap and haul operations delay fish passage by either closing off the entrance to the trap or by holding fish in entrance pools or holding ponds until a truck and driver are available for transport and release (Oregon Department of Fish and Wildlife 2006, Beidler and Knapp 2005). Fish delayed in the river below a dam often jump at the face of the dam or ladder and venture into draft tubes, all sources of potential mortality or injury. Fish that are held in pools are often over-crowded, increasing stress, risk of disease transfer, and the potential for injury or mortality (Oregon Department of Fish and Wildlife 2006). Captive fish can also become susceptible to poaching and pollution events.

System disruption during peak migration periods, due to either natural or logistical events, can result in catastrophic loss of significant segments of a fish run (Oregon Department of Fish and Wildlife 2006). For example, the traps at the Bennett Dams on the North Santiam River in Oregon cannot be operated during high flows (Firman et al. 2005; Firman et al. 2002), therefore, trapping was not possible the entirety of the winter steelhead run in 2004 (Firman et al. 2005). With a trap and haul alternative, a single malfunction of equipment or other such incident could harm a migrating portion of a

population of one of the ESA-listed species (Oregon Department of Fish and Wildlife 2006).

Further problems with the use of trap and haul for the Klamath Project is that there are species and life history issues that complicate the collection system. For example, steelhead juveniles can outmigrate after having spent one to three years in freshwater, and adults can return after one or two years in the ocean. The weir at the collection facility would need to be specially designed to prevent smaller fish such as trout, juveniles, and lamprey from exiting if these fish are designated for trap and transport. The smaller open area of the weir may be more prone to plugging by debris resulting in overflows and allowing all fish to escape ((Oregon Department of Fish and Wildlife 2006) Dec 1 comment letter).

4. Upstream Migration

4a. PacifiCorp's Alternative Provides Less Effective Passage at J.C. Boyle Dam and Keno Dam

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions would upgrade existing upstream fishways at J.C. Boyle Dam and Keno Dam.
- PacifiCorp's Alternative would be less protective because it relies on existing ladders at these facilities that fail to meet current criteria.

The Service has concluded that a new ladder constructed to current criteria is required to provide adequate passage for resident trout at J.C. Boyle Dam (USDI Fish and Wildlife Service 2005b). The existing ladder at J.C. Boyle Dam has approximately 1 foot drops across each weir (PacifiCorp 2004c). Current ODFW design criteria include a 6 inch maximum jump height between pools (Oregon Department of Fish and Wildlife 2004). In addition, the modern recommended turbulence factor for fish ladder pools for anadromous fish is less than 4.0 ft-lbs/s/ft^3 (National Marine Fisheries Service 2004a). The current turbulence factor in the J.C. Boyle fish ladder pools is approximately 6.8 ft-lbs/s/ft^3 or 1.7 times the recommended value. Improvements in the efficiency of the fishway at J.C. Boyle Dam would result in significant trout population migration above the dam over time (ALJ Decision at 27, FOF 3-12), and improved passage of anadromous fish.

At Keno Dam the existing fishway does not meet current criteria to accomplish lamprey passage because corners and ladder steps are not rounded (USDI Fish and Wildlife Service 2005b). Resident lamprey ammocoetes (juveniles) already rear within tributaries within the Project (ALJ Decision at 37, FOF 8-4). Although the historical upstream distribution of Pacific lamprey is unknown, suitable habitat for spawning and juvenile rearing is available within tributaries and stream reaches in the Project area (ALJ Decision at 37, FOF 8-3). Pacific lamprey below Iron Gate Dam would migrate above the dam if access was provided through fishways (ALJ Decision at 37, FOF 8-7).

Volitional passage for lampreys has been designed and is in place in other river systems (ALJ Decision at 37, FOF 8-8). Resident and Pacific lamprey would benefit from a fishway that meets current criteria to accomplish lamprey passage.

PacifiCorp (2006, pages 93-94) describes how a fish ladder primarily for resident trout was built at J.C. Boyle Dam in 1958, and trout use of the ladder was monitored. Trout use of the ladder in the first year was quite high, but it declined quite rapidly to almost no use today. PacifiCorp (2006, pages 94-95) states that the design of the existing ladder does not explain the decline in its use over the years because use became progressively worse through the years, yet the ladder remained unchanged. PacifiCorp believes their proposed ladder modifications will benefit fish that may use the ladder, but that resident fish do not need passage at this site (PacifiCorp 2006, page 95). The Services have addressed in detail problems with the J.C. Boyle ladder that have contributed to reduced resident fish passage in recent years (USDI Fish and Wildlife Service 2004). In addition, PacifiCorp has agreed to improve the channel configuration below the fishway so that upstream migration of trout will no longer be impeded (ALJ Decision at 27, FOF 3-11). This improvement is necessary in order to be compliant with the current license. The Services disagree that resident fish do not need passage at this site. Improvements in efficiency to the fishway at J.C. Boyle Dam would result in significant trout population migration above the dam over time (ALJ Decision at 27, FOF 3-12). Migration will benefit resident trout as migration is one of several defining life history characteristic of trout (ALJ Decision at 27, FOF 3-7).

4b. PacifiCorp's Alternative Would Delay Upstream Migration

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions provide volitional, timely migration of adult fish.
- PacifiCorp's Alternative would be less protective because adult migrating fish would be delayed.

PacifiCorp (2006, page 51-52) states that requiring migration through all project reservoirs would delay arrival of fall Chinook salmon at spawning grounds. PacifiCorp (2006, page 71) also states that upstream migration timing for fall Chinook is better served with their trap and haul Alternative. PacifiCorp states that because Chinook currently arrive at Iron Gate Dam at approximately October 1 and peak spawning occurs about two weeks later, and that pre-Project peak fall Chinook arrival to the upper basin probably occurred in September (Fortune et al. 1966), that it would take too long for Chinook to make it through the Project area to reach their spawning destinations above Upper Klamath Lake.

While delay may be a factor in reestablishing runs to the upper reaches of the Sprague River (Huntington et al. 2006) , delay would be of minimal concern for fish returning to Spencer Creek and Upper Klamath Lake. The fact that anadromous fish currently complete life cycles through eight dams and reservoirs on the Columbia and Snake

Rivers, and historically completed life cycles through Upper Klamath Lake, provides strong evidence that anadromous salmonids could also migrate through the reservoirs created by Project facilities (ALJ Decision at 15, FOF 2A-20).

For adult salmonids, migration speeds through reservoirs are generally high. Bjornn and Perry (1992) (in Steward and Associates 2007) estimated reservoir passage rates as ranging from 16 km/day to 56 km/day. Similarly, Bjornn et al. (1991) (in Steward and Associates 2007) measured reservoir migration rates of 55 km/day, while the rate in free-flowing rivers was estimated as 15-31 km/day. Historically, now extirpated runs of Chinook and steelhead were clearly able to use and migrate through Upper Klamath Lake and Spencer Creek.

Under PacifiCorp's Alternative, returning adults would be delayed up to 2 days in trapping facilities (PacifiCorp 2006, page 73). Delay can result in the depletion of energy reserves critical to successful spawning.

4c. PacifiCorp's Alternative Would Cause Greater Stress and Prespawn Mortality to Adult Fish

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' volitional fish passage Prescriptions result in less stress on fish, as opposed to PacifiCorp's trap and haul alternative, which involves intensive trapping, handling, crowding, transport, and acclimation.
- PacifiCorp's trap and haul Alternative is less protective because fish would be subject to the stress of trapping, handling, crowding, transport, and acclimation. Moreover, PacifiCorp's Alternative fails to specify details of transport.

Transportation is very stressful to fish of many, if not all, species. Decreased disease resistance generally follows stress in fishes and the delayed effects of stress may include the activation of latent disease organisms (Wedemeyer 1970). Most of the transportation stress-related work on salmonids has examined juvenile fish, since these are transported by barge and truck in large numbers on the Columbia River (see subsection 5a, below). However, a substantial amount of information is available regarding the stress of transport to adult salmonids and other fish species.

Transportation stress has been evaluated for many species. While some of these studies did not include wild fish, it should be noted that in studies of juvenile salmonids, wild Chinook show a greater stress response than did hatchery Chinook (Congleton et al. 2000). The primary response to stressors in fish is the release of corticosteroid hormones from renal tissues. Secondary effects include elevated plasma glucose concentrations and plasma electrolyte dysfunction (Mazeaud et al. 1977).

In a study of largemouth bass, Carmichael et al.(Carmichael et al. 1984) (cited in Steward and Associates 2007) documented significantly elevated plasma glucose and corticosteroid levels, coupled with reduced plasma chloride and osmolality. On long

hauls (24-30 hrs), 38-92 percent of fish perished when transported in untreated water. Plasma characteristics returned to normal in 3-28 days following transport, depending on the length of the haul.

Shrimpton et al. (Shrimpton et al. 2001) (cited in Steward and Associates 2007) studied transportation stress on shad subjected to 3 hrs of acute handling and confinement. They measured levels of plasma cortisol during recovery under two different treatments: recovery in freshwater and recovery in brackish water. In the freshwater group, plasma cortisol increased nearly 13-fold within 0.5 hrs of transport, then peaked at 40-fold after 3 hrs. Twelve percent of these fish died within 8 hrs, and 14 percent within 24 hrs.

Clements et al. (Clements et al. 2002) investigated the effect of a trapping procedure on the stress response of wild, sexually mature rainbow trout, an example that is particularly relevant to both resident and anadromous salmonids in the Klamath River. Both the basal plasma cortisol concentrations and subsequent stress responses to trap confinement were much higher in females than in males. Female cortisol concentrations rose from 21.4 ng/mL to 549.1 ng/mL in females after just one hour of confinement, and resting cortisol and glucose levels were not reached even after 40 hrs of recovery. Clements et al. (2002) concluded that the trapping procedure induces a severe and prolonged stress response in wild rainbow trout.

Hauling of fish would add stress in addition to trapping. In a study of domesticated rainbow trout, Chandroo et al. (Chandroo et al. 2005) found that vigorous swimming occurred in fish during a 50 minute transport by truck, but that the fish's swimming activity returned to baseline levels within 48 hrs. However, even after a 48 hr resting period in a stationary tank, swimming was still impaired relative to non-transported fish. Moreover, oxygen consumption was also substantially elevated following transport.

In the Biological Opinion for the Elk Creek Dam Interim Trap and Haul Project on the Rogue River, NMFS found that even with proposed upgrades to the trap-and-haul facility, significant risks to adult coho salmon remain associated with this trap and haul facility including fallback injury, trap rejection, migration delay, and injury during trapping, handling and hauling, as well as spawning disruption (National Marine Fisheries Service 2004b). In the Biological Opinion, NMFS cited documentation of direct mortalities associated with the trap-and-haul program by ODFW, and documentation of delayed mortalities by the U.S. Army Corps of Engineers.

Prespawn loss from transport activities can be high. Average prespawn loss for four species that were transported from the collection facility at Three Mile Diversion Dam on the Umatilla River to off-site brood holding facilities ranged from 8.7 percent to 17.1 percent (Zimmerman 2005). Delayed adult mortality due to transportation varies substantially and is affected by water temperature. Where water is relatively warmer (as can be the case in the Klamath River), trucking adult fish around dams can be problematic both because of the stress of the warm water on them and the shock of refrigerated trucks, followed by release into warmer water (Oregon Department of Fish

and Wildlife 2006). Disease problems can be more of a problem with trucking because of crowding. The extensive handling of fish when stream temperatures are high will exacerbate the effects of stress and disease, resulting in higher pre-spawning mortality (Oregon Department of Fish and Wildlife 2006). The ODFW is evaluating the success of adult releases in the Little North Fork as part of a larger study relating to compliance with the Biological Opinion of hatchery programs in the Willamette Basin (Beilder and Knapp, 2005,Table 7; Firman et al., 2002, 2004). Researchers suspect that most spring Chinook died before spawning as few adults were recovered in spawning surveys. All tagged carcasses were generally very decomposed and found within a few miles of the release site. Based on recovery of tagged carcasses, an estimated 93 percent of the females died prior to spawning. Similarly, Beidler and Knapp (2005) found overall production from fish outplanted above Foster Reservoir was relatively low, compared with the North Santiam above Detroit Reservoir. Pathology results indicated poor condition and disease manifestations for adult Chinook, potentially leading to pre-spawning mortality (Beidler and Knapp 2005). Their data indicated poor survival to spawning of transplanted adult Chinook and that most transplants produced few offspring in most years.

In contrast, volitional ladders easily pass large numbers of fish and avoid the risks of handling, stress, and delay (see Subsection 3, above). These are the primary reasons ladders are used for upstream passage on the Columbia River instead of other options, including trapping and hauling (Gary Fredricks, NMFS, pers. comm.).

4d. Services' Prescribed Upstream Fishways at Iron Gate and Copco 1 Dams Would Allow Fish to Express a Full Range of Migratory Behavior

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because volitional passage allows more species of fish to migrate at the appropriate times and to the appropriate locations.
- PacifiCorp's trap and haul Alternative is less protective because delays occur at the trap, followed by the stress of handling and transport.

PacifiCorp (2006, pages 52-53) states that the Services' prescribed volitional upstream fishways at Iron Gate and Copco 1 Dams would be biologically ineffective because they would be long, "result in long transit times for fish, and in come cases, fish may become discouraged and stop ascending the fishway."

However, the Services' Prescriptions are consistent with ladders for upstream migration that have been successful at other dams. For example, the North Fork Dam (upstream of River Mill Dam) on the Clackamas River has a 2 mile long ladder that rises 196 feet. This fishway has been in operation since 1958 and has generally had good passage success. Virtually all anadromous salmonids that enter the ladder also exit (Doug Cramer, Portland General Electric, pers. comm.). Pacific lamprey also ascend the ladder in its entirety, but trapping limitations preclude evaluation (Doug Cramer, Portland General Electric, pers. comm.). Median travel times from entrance to exit were 22 hours (year

2001) to 1.3 days (2003) for winter steelhead; 22 hours (2000) to 1 (2003) day for coho salmon; and 1.1 day (2004) for spring Chinook (Portland General Electric 2004a) (steelhead), (Portland General Electric 2004b)(coho), and (Portland General Electric 2005) (Chinook). The ladder has a trap near its base that is used for evaluation, monitoring, and other fish management purposes. Originally, the trap introduced some problems with Chinook delay, caused by a cooler water supply (causing hold up at the trap). This problem was subsequently corrected with modifications to the trap. Some of the delay at the trap is also related to the fact that fish move in and out. If they have to wait long to be moved they tend to move out. The introduction of human scent during fish sorting may slow them down as well (Doug Cramer, Portland General Electric, pers. comm.). The Services' trapping facilities would be used for monitoring limited to certain periods of the year (i.e., peak migration) and would not be used continually. This use would not necessarily involve the same level of evaluation and, thus, delays fish experience on the Clackamas River.

The ladder transport flow at North Fork Dam is provided by reservoir surface water, the temperature of which can become elevated during the summer. This warm water causes some problems with attraction during July and August and may have caused some minor rejection, but these problems will be addressed with design modifications (Doug Cramer, Portland General Electric, pers. comm.).

4e. PacifiCorp's Alternative Would be No Less Likely to Cause Fish Losses in the Hatchery and Ladder

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because they allow for the option of using water from the -17 ft and -35 ft depths for the Iron Gate ladder, which would provide water temperatures conducive to fish migration and maintain water for the hatchery.
- PacifiCorp's trap and haul Alternative is less protective because fish would not be able to volitionally migrate when conditions are appropriate.

PacifiCorp (2006, pages 50-51) states that summer operation of a fish ladder at Iron Gate Dam would deplete cool water and cause catastrophic fish losses in the hatchery and ladder. PacifiCorp (2006, page 88) reiterates this point and adds that PacifiCorp's Alternative, in contrast, would be compatible with operation of Iron Gate Hatchery. In addition, PacifiCorp (2006, pages 49-50) states that the volitional passage system in the Services' Prescription would cause temperature shock to adult fall Chinook migrating upstream that would likely result in significant stress and migration delays.

The CDFG currently uses cold water from Iron Gate Reservoir for the partial ladder to maximize holding survival of returning adult Chinook salmon for the hatchery, not for migration. The cold water is from -70 ft depth of Iron Gate Reservoir. It would be advantageous to have the option to use this water for the fishways, but for most of the year surface water would be appropriate. However, even if water from the -70 ft depth was used in the Iron Gate ladder, it would not cause thermal shock. In September of an

average water year (1997), the difference between the temperature of surface water and -70 ft water is predicted to range from -7.5°C on September 1 to -3.6°C on September 30 (U.S. Geological Survey 2006). Thus, if -70 ft depth water were used in the ladder during the period that adult fall-run Chinook salmon now migrate, the maximum temperature difference would be less than the 10°C difference that PacifiCorp considers would cause thermal shock (PacifiCorp 2006, April Alternative).

However, the Services' Prescription would not require use of cool water from Iron Gate Reservoir because surface water would generally be appropriate for ladders for anadromous fish. Migration to Iron Gate hatchery begins the second to third week of September with peak counts in mid October (Fishpro 2000). At this time, surface water temperatures at Iron Gate Reservoir on average do not exceed 20°C after mid September (for 1997, an average water year, surface temperature at Iron Gate Reservoir on September 12 was 19.9°C and temperatures stayed at or below 20°C until July 4 (U.S. Geological Survey 2006). For Chinook salmon, adults migrate up to 20°C and migration blockage and delay do not occur until 21-22°C (U. S. Environmental Protection Agency 2003).

There is evidence that Klamath River Chinook migrate at temperature greater than 20°C (Strange 2005). In the Snake River (Columbia River tributary), Caudill et al. (Caudill et al. 2006) observed Chinook to exit ladders into reservoirs with surface water temperatures close to 26ºC. At Iron Gate and Copco Reservoirs, SIAM simulations showed that surface temperatures did not exceed 22.4°C and 22.7°C in July, the hottest time of the year (U.S. Geological Survey 2006).

Water temperatures in ladders would be minimally increased by ambient conditions. For fishways at Ice Harbor and Lower Granite Dams on the Snake River, there was little evidence that water warmed in summer (Peery and Bjornn 2002). Any temperature changes along the length of the fish ladder were found to be slight: less than 0.5°C with differential increases to 2°C only found on a few occasions (Keniry and Bjornn 1998 in National Marine Fisheries Service 2000).

Under a worst case scenario, water from either the -17 ft or -35 ft depths at Iron Gate are options that would keep temperature in ladders to within thermal limits and not jeopardize hatchery supply of cool water. The CDFG currently has the capability to take water from the -17 ft depth (slightly cooler than the surface water) for the partial ladder and hatchery. Temperatures from the -35 ft depth are generally from 1 to 3°C cooler than the surface water at Iron Gate after July 4, and were 0.5 °C to 3°C cooler than the surface water for Copco Reservoir (U.S. Geological Survey 2006). In both reservoirs, the temperature at -35 ft is not predicted to exceed 20°C during the period from September to the end of July in an average year based on a 1997 SIAM simulation (U.S. Geological Survey 2006).

If necessary, these layers of cool water could be used to maintain appropriate water temperatures. While the partial ladder below Iron Gate Dam to the CDFG fish trap also uses water at 9–12°C from the -70 ft depth of Iron Gate reservoir (the same depth as water used for the hatchery), the use of water of this temperature to the CDFG trap is intended to maximize holding survival of returning adults Chinook, not for migration. Thus, the option of using water from the -17 ft and -35 ft depths for the ladders for the Iron Gate ladder would ensure that cool water necessary for the hatchery would be maintained with the Services' Prescriptions, thus avoiding any fish losses in the hatchery.

4f. PacifiCorp's Alternative Would Increase Straying of Returning Adults

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because volitional passage allows more species of fish to migrate at the appropriate times and to the appropriate locations, minimizing straying and other potentially detrimental behaviors.
- PacifiCorp's trap and haul Alternative is less protective because data on the Columbia River suggest that juvenile transport (similar to trap and haul proposed by PacifiCorp) impaired adult orientation of both hatchery and wild fish during return migration.

Recent data on adult returns to the Columbia River show increased survival for wild fish that migrated in-river, compared to those that were transported in the barge transport system. Keefer et al. (Keefer et al. 2006) examined the effects of juvenile transportation on adult fate and migration behaviors. Approximately 60 percent of the adults radio-tagged in this study were transported in barges as juveniles from Snake River dams to release sites downstream from Bonneville Dam on the Columbia River. Juveniles that were not transported migrated downstream in-river.

Adult homing was significantly lower and unaccounted loss and permanent straying into non-natal basins were higher for both spring–summer Chinook salmon and steelhead that were barged as juveniles. On average, adult fish barged as juveniles homed to Lower Granite Dam at rates about 10 percent lower than fish that had migrated in-river. Straying rates in both species were higher among groups barged as juveniles. When compared to in-river migrants, barged Chinook salmon were 1.9 times more likely and barged steelhead were 1.3 times more likely to fall back at dams as adults. Among fish that fell back, a significantly greater proportion of barged fish also experienced multiple fallback events than in-river migrants.

Decreased homing, increased fallback, and increased straying rates by transported fish were inter-related. The results were consistent between species and years, strongly suggesting that juvenile transport impaired adult orientation of both hatchery and wild fish during return migration. There were clear associations between adult behavior and transport history. Overall, the results suggest that the trap and haul methods proposed by PacifiCorp for the Klamath, which are similar to barging juvenile salmon and steelhead through the Columbia and Snake River hydrosystems, would cause negative effects on

returning adults. These effects may include a reduction in adult return rates and could foster significant changes to population genetic structure caused by increased straying and interbreeding of transported fish with natal fish. Accordingly, PacifiCorp's Alternative would be less protective than the Services' Prescriptions.

4g. The Services' Prescriptions are Based on Well Documented Adult Cumulative Survival in Established and Accepted Fishways

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because upstream survival with ladders is well documented and survival is high.
- PacifiCorp's trap and haul Alternative is less protective because adult trap and haul survival has not been well documented, and the one estimate provided by PacifiCorp is based on a significantly different project, with shorter transport distances, and does not account for key uncertainties including delayed mortality.

Adult salmonids generally demonstrate very high survival and passage success through ladders and through reservoirs. On facilities with much larger reservoirs on the Columbia River, passage success rates of 86 to 98 percent have been estimated from tailrace to tailrace from Ice Harbor to Lower Granite Dam (3 dams and reservoirs), including ladder entry, passage and reservoir survival (National Marine Fisheries Service 2000b). NMFS concluded that minimum per project passage rates for Columbia River facilities were 96 to 98 percent for Chinook and 97 percent for steelhead (National Marine Fisheries Service 2000a). Volitional passage rates of 95 percent were expected at one dam (Ferguson et al. 2002). The river channel and reservoirs of the Project are relatively confined and narrow, making it easier for adults to find ladder entrances and navigate reservoirs. It is reasonable to expect that ladder efficiencies on the Klamath would be comparable to the examples listed above.

PacifiCorp (2006, page 60 and 61) states that, based on experience elsewhere, they expect "(juvenile and) adult trucking survival rate(s) of 98 percent (State of California 2004)".

The adult trucking survival rates of 98 percent (State of California 2004) were achieved in conditions significantly different from the Klamath River. These estimates do not include delayed mortality and are based upon a short hauling duration, not the longer time fish would have to be hauled on the Klamath. This report (State of California 2004) qualifies its estimate as "assumed to be applicable for a transport period of less than one hour." Travel time was for time-in-truck alone which was just 45 minutes.

PacifiCorp's Alternative does not provide a justification for the substantial difference between the travel time referenced in the report (State of California 2004) and that associated with the Alternative. The Services estimate the transport distance in PacifiCorp's Alternative in excess of 100 miles and requiring at least 2 hours under favorable conditions. This does not include time for loading, unloading, acclimation, or delays (which could frequently occur on these rural and sometimes snowy roads). It is

reasonable to assume that survival would be lower than that referenced by the report (State of California 2004), especially when delayed mortality is taken into account.

PacifiCorp (PacifiCorp 2006, page 62) states that estimates used in KlamRAS modeling assumed an adult cumulative survival rate of 68 percent for fish volitionally traveling from J.C. Boyle Dam to tributaries to Upper Klamath Lake, and a survival rate of 79 percent for adult fish transported directly by trap and haul to the Williamson River, above Upper Klamath Lake.

Estimated adult survival is only one factor of many important to overall fish passage survival and returns. Considering in-river adult survival alone ignores gains in production that could be achieved in other habitats or during other life history phases. When the Services Prescriptions were compared to PacifiCorp's Alternative in terms of overall returns, the Services' Alternative (1A-volitional) provided greater returns of spawners on average, over years 11-50 of 50 year simulations, than PacifiCorp's Alternative of trap and haul of downstream migrants from J.C. Boyle (1C – screens-T&H JCB-below IGD) (Oosterhout 2005b).

In addition to adult returns other factors need to be considered. Bypassing historic habitat in a collection and transport scenario may decrease other measures of population viability (i.e., abundance, productivity, diversity, and spatial structure). PacifiCorp's collection and transport Alternative bypasses nearly all historical habitat for coho salmon, a federally listed species. PacifiCorp's Alternative is not feasible for lamprey and steelhead. Collection and transport may negatively impact behavioral traits of fish, such as when and where to migrate, whereas volitional passage provides fish the opportunity to move when they are ready. Finally, PacifiCorp's assessment does not take into account the uncertainties of trap and haul, such as human error, uncertainties in funding, or mechanical failure.

5. Downstream Migration

5a. PacifiCorp's Alternative Would Cause Greater Stress to Juvenile Fish than the Services' Prescription

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the stress, injury, and mortality associated with trap and haul would be minimized.
- PacifiCorp's trap and haul Alternative is less protective because increased stress to fish during transport and release makes them more vulnerable to predation or increased mortality due to injury or disease.

PacifiCorp's Alternative would transport juvenile outmigrants downstream via truck from above J.C. Boyle Dam to a release site below Iron Gate Dam on the Klamath River. Under similar circumstances on the Columbia River, transportation of juvenile Chinook and steelhead around multiple dams and the associated stress effects have been evaluated

in a number of studies. During barge transport indices of stress in wild and hatchery-origin juvenile Chinook and steelhead were higher in wild fish than in hatchery fish. Stress also increased with the density of fish in transport containers (Steward and Associates 2007).

Congleton et al. (Congleton et al. 1984) focused on the stress effects of different stages of the trap-and-haul process. Transport stress led to significant increases in plasma stress indicators. The authors found that the initial collection and routing of fish into gatewells was somewhat stressful. However, the transfer into raceways elicited an even stronger stress response, as did loading onto trucks and barges (overall mean plasma cortisol concentration after loading was 175 ng/ml). Cortisol concentrations were observed to decline during barge transport, but did not decline when the fish were transported in trucks, suggesting that truck transport is more stressful and for a more sustained period than barge transport. This study demonstrated a significant positive correlation between impaired predator avoidance and elevated stress indicators. Chinook salmon with plasma cortisol concentrations of 75-150 ng/ml or higher were captured by predators at a higher rate than control fish. This study concluded that physiological response to stressors associated with transportation probably would impair the ability of transported fish to escape predators immediately after release, but losses would depend on the numbers of predators near release sites. Exposure to acute handling stress resulted in increased avoidance response time for juvenile Chinook salmon (Sigismondi and Weber 1988) and presumably greater vulnerability to predators.

Congleton et al. (1984) found that plasma stress indicators remained elevated for 24-48 hours following truck transport. While blood plasma stress indicators can rise dramatically during or after passage through bypass systems, they generally return to pre-exposure levels within several hours (National Marine Fisheries Service 2000, page 101).

Evidence for transport-related juvenile stress extends to non-salmonids. In a study of red drum fingerlings, Tomasso and Carmichael (1988) (in Steward and Associates 2007) subjected fish to a five-hour haul by truck and documented only 1 percent mortality during transport. However, cumulative mortality over the following ten days reached 12-51 percent. They also subjected groups of transported fish to a secondary stressor of crowding, some with a recovery period following transport and others without. Those without the chance to recover had a mean mortality rate of 57 percent, whereas the groups that had recovered from transport for 2-5 days had much lower mortalities of 2-6 percent (Steward and Associates 2007).

Recent studies have found that transporting juvenile steelhead with outmigrating Chinook salmon significantly increased cortisol concentrations (stress indices) in the smaller Chinook (Congleton et al. 2000). Kelsey et al. (Kelsey et al. 2002) also found that confining steelhead and Chinook salmon together in tanks (similar to haul trucks) is stressful to Chinook salmon. When held with juvenile steelhead, Chinook were attacked up to 16 times more often and had higher cortisol concentrations. Steelhead established territories and aggressively defended them; Chinook showed little aggression toward the

steelhead. Under PacifiCorp's alternative, juvenile Chinook and steelhead would be confined together during downstream transport and juvenile Chinook would be subject to this aggression related stress in each transport downstream. Under the Services' Prescriptions, juvenile Chinook would not be subject to this stress (except during interim, seasonal trap and haul around Keno Reservoir when trap and haul is necessary to avoid water quality conditions that may be potentially fatal to fish).

There is evidence that the stress associated with trapping and hauling juvenile fish contributes to lower survival and reduced harvest. Yearling hatchery coho salmon transported prior to release had lower survival and reduced returns to the commercial fishery relative to untrucked fish (Johnson et al. 1990) and transportation of yearling hatchery coho salmon had a marked physiological stress response (Schreck et al. 1989). Budy et al. 2002 (Budy et al. 2002) found evidence linking delayed mortality of Snake River salmon to their earlier hydropower experience, including trap and barge. Capture, crowding, marking or tagging, loading, transport, and release of juvenile fish as the Applicant has proposed would result in similar exposure to handling stress and, thus, increase the risk of predation or mortality due to illness. Decreased disease resistance generally follows stress in fishes and the delayed effects of stress may include the activation of latent disease organisms (Wedemeyer 1970).

Some of the negative effects of transporting can be eliminated if the fish are allowed to acclimate for 6 weeks before release (Johnson et al. 1990). However, this would mean acclimation ponds need to be constructed and maintained and would need to be considered in an evaluation of the long term operation and maintenance costs of trap and haul operations. PacifiCorp's Alternative does not include acclimation ponds.

5b. PacifiCorp's Alternative Provides No Measures for Downstream Migration or Protection from Entrainment at Copco 1, Copco 2, and Iron Gate Facilities

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions protect downstream migrating fish from entrainment and mortality at Copco 1, Copco 2, and Iron Gate facilities.
- PacifiCorp's Alternative is less protective because no screens or bypass facilities would be provided at Copco 1, Copco 2, and Iron Gate facilities, which would likely result in entrainment, causing injury and mortality to downstream migrating fish.

Under PacifiCorp's alternative, juvenile anadromous fish will pass downstream into the Project reach below J.C. Boyle Dam where no screen and bypass system would guide migration away from entrainment and turbines.

With the construction of functional adult fish ladders at Iron Gate Dam and other Project facilities, salmon and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005; ALJ Decision at 12, FOF 2A-3 through FOF 2A-6; ALJ Decision at 14, FOF 2A-12; ALJ Decision at 33, FOF 6-4 and FOF 6-10; ALJ Decision at 34, FOF 6-11 and FOF 6-14; ALJ Decision at 35, FOF 7-9; ALJ Decision at 36, FOF 7-15). Pacific Lamprey would migrate past Iron Gate Dam and gain access to habitat that would provide benefits to that species (ALJ Decision at 37-38, FOF 8-7 and FOF 8-9). However, the progeny of these fish must negotiate not only the reservoir but the dam, powerhouse, and spillway during their outmigration. Migration is one of several defining life history characteristics of anadromous fish, especially salmonids (ALJ Decision at 13, FOF 2A-10). To ensure that the fish can outmigrate, downstream passage through the dam, powerhouse and spillway is necessary.

Unless protected by fish screening and bypass systems, fish migrating downstream can suffer injury or death by passing through turbines at hydroelectric plants (Electric Power Research Institute 1987). Turbine caused mortality can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001). Turbine mortality is caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (Electric Power Research Institute 1987) reported that Francis turbines, which are used at Iron Gate Dam, had average mortality to downstream moving fish of about 24 percent. The Applicant has acknowledged, based on their initial review of other studies, that tens of thousands of resident fish are likely entrained annually at each of the unscreened mainstem Klamath River developments ((PacifiCorp 2004a)a, Exhibit E 4-113). It is estimated that "several tens of thousands of resident fish" are annually entrained at "each of the Projects" facilities (ALJ Decision at 28, FOF 4-2). It is anticipated that annual entrainment of anadromous fish would be on the same order of magnitude, if not greater. Once entrained, the fish face a high risk of mortality. For juvenile fish, the risk is between 10 to 30 percent (ALJ Decision at 29, FOF 4-5).

Achieving suitably high rates of collection efficiency over the range of flows and other environmental conditions that occur as fish move downstream is perhaps the greatest challenge in designing downstream trap and haul systems. Collection efficiencies on the order of those obtained for adults (e.g., 95 percent or greater) are unlikely to be achieved using technology available today. Fish collection efficiencies at most downstream collection facilities are typically low – often too low to sustain self-perpetuating populations – and typically remain at unacceptably low levels despite efforts to improve them through mechanical and operational manipulations. For example, at the Cowlitz Falls Dam, Lewis County, Washington where managers have identified a goal of 95 percent collection efficiency for outmigrating juvenile salmonids, measured efficiencies were in the range of 19-65 percent for age-1+ steelhead, 17-45 percent for age-1+ coho, and 17-24 percent for subyearling spring chinook. In the decade since the dam was built,

attempts to improve juvenile collection efficiency at Cowlitz Falls have met with little success (Steward and Associates 2007).

Fish that are not collected successfully either pass the dam via spill or turbine passage. Passage via turbines causes high mortality, though survival differs by species and by turbine type.

Under PacifiCorp's trap and haul Alternative the collection facility would be located at or above J.C. Boyle Dam (PacifiCorp 2006 at 57, last paragraph). The facility would be able to screen only the flow being routed into the location's power canal intake. Fish that move downstream with flow that passes over the spillway would not be collected. PacifiCorp cites an estimate that 20 percent of migrants would be spilled (PacifiCorp 2006 at 60, second paragraph). Under PacifiCorp's Alternative, spilled juvenile anadromous fish would then be entrained at each facility below J.C. Boyle Dam, as these facilities would not include screens. Once entrained, these fish face a high risk of mortality (see subsection 12 below).

5c. PacifiCorp's Alternative Provides Less Protection from Entrainment at J.C. Boyle Dam

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions protect downstream migrating fish from entrainment and mortality at the J.C. Boyle facility.
- PacifiCorp's Alternative is less protective because the existing screens and bypass facility, which fail to meet current criteria to protect resident and anadromous fish, would be used at the J.C. Boyle facility.

With restored upstream anadromous fish migration at J.C. Boyle Dam, salmon, and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005; ALJ Decision at 12, FOF 2A-3 through FOF 2A-5; ALJ Decision at 14, FOF 2A-12; ALJ Decision at 33, FOF 6-4 and FOF 6-10; ALJ Decision at 34, FOF 6-11 and FOF 6-14; ALJ Decision at 35, FOF 7-9; ALJ Decision at 36, FOF 7-15). However, the progeny of these fish must negotiate not only the reservoir but the dam, powerhouse, and spillway during their outmigration. J.C. Boyle Dam has fish screening and bypass systems in place, but they do not conform to current criteria for resident and anadromous fish (ALJ Decision at 29, FOF 4-8). The seals at the J.C. Boyle Dam have rendered the fish screens partially ineffective, allowing fish to be entrained in the turbines (ALJ Decision at 29, FOF 4-9). An Electric Power Research Institute (EPRI) report indicates that entrainment mortality at hydro Projects using Francis turbines (such as J.C. Boyle) with operational head greater than 335 feet ranged from 33 to 43 percent (ALJ Decision at 29, FOF 4-10). In light of the large percentage of river flow that is diverted into the J.C. Boyle power canal, the operation of Francis turbines, and the high operational head of 440 feet, fish mortality from entrainment at the J.C. Boyle facility is likely in the higher end of the mortality range as described in the EPRI report (ALJ Decision at 30, FOF 4-11). The J.C. Boyle reservoir contains shortnose and Lost River

suckers that are listed under the federal Endangered Species Act that are susceptible to entrainment (ALJ Decision at 30, FOF 4-16). While the vast majority of fish entrained consists of small juvenile fish, the record shows that adult fish are also susceptible to being entrained and killed (ALJ Decision at 31, FOF 4-22). PacifiCorp's Alternative would not provide for adequate protection at J.C. Boyle Dam during downstream migration.

5d. PacifiCorp's Alternative Would Cause Increased Mortality of Outmigrating Fish Associated with Premature Downstream Migration

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions would not cause increased mortality associated with premature downstream migration of juvenile fish.
- PacifiCorp's Alternative is less protective because transported juvenile fish often suffer significant levels of mortality after transport.

Outmigrating juvenile salmonids and lampreys undergo physiological changes in preparation for entering the ocean. Juveniles moving down river naturally have more time to accomplish these changes than do juveniles transported artificially. On the Columbia River the fate of transported outmigrant Chinook once they have been hauled has been carefully studied (Budy et al. 2002; Fish Passage Center and Comparative Survival Study Oversight Committee 2006; Keefer et al. 2006; Marmorek et al. 2004). Indications are that these fish smolt as they migrate (Marmorek et al. 2004). Outmigrants that were given insufficient time to complete smoltification, such as transported outmigrants, experience high energetic costs in attempting to osmoregulate in salt water, resulting in decreased resistance to pathogens and increased susceptibility to predators (Marmorek et al. 2004). Transported Chinook have been shown to suffer greater delayed mortality than outmigrants that pass through the river and hydrosystem facilities. Delayed mortality of transported wild spring and summer Chinook was substantial most years relative to that of in-river migrants. Transport provided little or no benefit to wild Chinook during most years during 1994-2004 (except during the severe drought year 2001) (Fish Passage Center and Comparative Survival Study Oversight Committee 2006). With the exception of 2001, transported smolts died at twice the rate as in-river migrants once they passed the lowermost dam (Fish Passage Center and Comparative Survival Study Oversight Committee 2006). Overall, in an average year in the Columbia River system, Chinook that outmigrate in river have better survival to adulthood than fish that are transported (Budy et al. 2002).

Accordingly, based on this evidence, transported Chinook in the Klamath would face greater risk of mortality than would volitionally passed fish.

5e. PacifiCorp's Alternative Does Not Minimize Spillway Mortality

- The Service's Prescriptions are more protective than PacifiCorp's Alternative because the Service's Prescriptions minimize injury and mortality in spillways.

- PacifiCorp's Alternative is less protective because spillways would not be modified to minimize mortality.

PacifiCorp (2006, page 57) states that downstream migrating anadromous fish would be transported to below Iron Gate Dam and would not be required to migrate through the spillway. However, PacifiCorp (2006, page 60) also states that the estimated percentage of migrants that would be spilled is 20 percent, because the Boyle facility would only be able to screen the flow being routed into the power canal intake. If this estimated percentage was based on flow alone, it is likely that more than 20 percent of migrants would be spilled. Migration events are triggered by and primarily occur during high flow events, and simply determining what percentage of water is spilled will underestimate the percentage of migrants spilled. In PacifiCorp's Alternative, flow that is passed over each spillway would not be screened. Fish would, therefore, be spilled over J.C. Boyle Dam and each successive downstream dam, depending on spill conditions, as described below.

During the winter and spring in average and above average water years, Project operations become run-of-river such that all hydroelectric facilities operate at full hydraulic capacity and excess water is spilled at each of the dams (PacifiCorp 2004a). Spill at Keno Dam is continuous. Spill occurs at J.C. Boyle Dam when incoming river flows are greater than 2,850 cfs. Downstream at Copco No. 1 and No. 2, spill occurs when flow is greater than 3,200 cfs. Flows greater than 1,750 cfs at Iron Gate Dam will spill over the spillway dependent on reservoir elevation. Spill may also occur at J.C. Boyle, Copco 1, Copco 2, and Iron Gate Dams during unscheduled turbine shutdowns (PacifiCorp 2004a).

Spill survival estimates for juvenile salmonids are numerous and range from 70 percent to 100 percent, depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (Bell and DeLacy 1981 in National Marine Fisheries Service 2000). Fish passing over spillways may be injured by strikes or impacts with solid objects (e.g., baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water. This trauma may render fish more susceptible to predation or disease. Spillways may also significantly delay the upstream migration of adults by providing false attraction away from ladder entrances.

Fish passing down a spillway may also experience chemical and biological effects. Turbulent mixing of spilled water with receiving waters may result in gas supersaturation and resultant gas bubble disease in fish. Dissolved nitrogen concentrations of more than 130 percent of normal equilibrium levels have been measured in tailwaters (Ebel and Raymond 1976). The threshold value for significant mortality among juvenile Chinook salmon and steelhead trout occurs when nitrogen gas levels are about 115 percent of normal. Along the Columbia River, where many spillways discharge from a given dam and there are many consecutive dams along the stream course, supersaturation increases cumulatively from one dam to the next. Losses of salmon and steelhead trout in this river due to supersaturation have been severe in years of high spillage (Ebel and Raymond 1976).

Under the Services' Prescriptions and PacifiCorp's Alternative, resident and anadromous fish passage through the spillway at Keno Dam will be necessary for juveniles and some adults. The Services' Prescriptions include spillway modifications at Keno Dam, but PacifiCorp's Alternative does not. All water passing Keno Dam passes through undershot spill gates except for the water supplying the existing fishway. These undershot gates may injure adult (primarily migrating steelhead) and juvenile fish as they are jetted through a narrow opening and under pressure. Mechanical injury due to impact or pressure changes may occur. The spillway receiving waters consist of a very shallow, wide bedrock area that may induce avian predation. Current spillway operations may attract fish away from the ladder entrance and cause delay. PacifiCorp's Alternative will not prevent these impacts and is therefore less protective.

The Services' Prescriptions include spillway modifications at J.C. Boyle Dam. At J.C. Boyle Dam, the spillway drop is significant and the receiving waters appear shallow and turbulent. The Services expect mechanical abrasion, trauma and increased predation as juvenile and adult fish pass over J.C. Boyle spillway. PacifiCorp's Alternative does not include spillway modifications at J.C. Boyle and is, therefore, less protective.

Copco 1 has perhaps the most considerable spillway configuration, with the most height and a series of stair steps down to the water that would appear to present multiple opportunities for injury or abrasion. Copco 2 does not have obvious spillway configuration problems, but minor operational or structural modifications to the spillway may reduce injury or delay. Iron Gate Dam has an ungated concrete spillway 730 feet long leading to a large spill canal that may cause sheet flow and extensive abrasion. The Services' Prescriptions minimize mortality by including spillway modifications at each spillway. PacifiCorp's Alternative does not include spillway modifications at any facility and is therefore less protective.

In the Preliminary Prescriptions, the Services based specific spillway prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, PacifiCorp disputed facts supporting the spillway prescriptions. PacifiCorp subsequently withdrew its request for hearing regarding spillway prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number

2006-NMFS-0001, Order Granting PacifiCorp's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the spillway prescriptions in the Modified Prescriptions to allow PacifiCorp to study the need for and design of spillway modifications for anadromous and native resident fish. PacifiCorp must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the spillway modifications in order to inform the need for and design of spillway modifications. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that spillway modifications are necessary for safe, timely, and effective fish passage where prescribed. PacifiCorp's Alternative is less protective because it does not provide for spillway modifications to minimize anadromous and resident fish mortality at those facilities.

5f. The Services' Prescriptions Provide for the Migratory Needs of Fish Based on Valid Modeling Comparisons of Passage Alternatives.

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because they are based upon modeling with a sufficient level of documentation and transparency, and take into account valid comparisons of passage alternatives.

- PacifiCorp's alternative is less protective, as demonstrated by modeling, when existing models are appropriately applied.

Ecosystem Diagnosis and Treatment (EDT) is a habitat-based model of salmon life histories. It has been reviewed critically in the Columbia River Basin as being over-parameterized (having too many inputs), but offers a structured basis for assessing habitat restoration and protection opportunities with an eye toward improving the biological performance of fish populations [NMFS/FWS-Issue 6-Huntington-Dir.-Ex. 1 at 8]. When the EDT model inputs are reviewed by experts, when runs are appropriately checked for errors, and if predicted patterns are adequately corroborated, it can be used for relative comparisons of production across the landscape [NMFS/FWS-Issue 6-Huntington-Dir.-Ex. 1 at 1].

KlamRas is a newer, stochastic life cycle model, developed specifically to simulate the outcomes of alternative fish passage options for fall-run Chinook at the Klamath Hydroelectric Project. KlamRas in this situation relies, in part, on productivity inputs from EDT. KlamRas, where used in conjunction with EDT, is referred to KlamRas/EDT [NMFS/FWS-Issue 6-Huntington-Dir.-Ex. 1 at 8].

Neither EDT nor KlamRAS/EDT produces outputs whose absolute values are expected to be a perfect reflection of reality (Oosterhout 2005b). At best, and if properly used, the model results available at present can provide structured but rough answers to questions about interactions between fish passage measures at the Klamath Hydroelectric Project

and their potential effects on the future performance of fall-run Chinook populations above Iron Gate Dam [NMFS/FWS-Issue 6-Huntington-Dir.-Ex. 1 at 9].

The multi-species, anadromous fish modeling effort associated with the relicensing process for the Klamath Hydroelectric Project began as a collaborative effort that included a Habitat Modeling Group (HMG). However, eventually the Applicant submitted new EDT model results for three species (fall-run Chinook, spring-run Chinook, and steelhead) to FERC in December 2005. The HMG was not involved with the modeling efforts that produced these results [NMFS/FWS-Issue 6-Huntington-Reb.-Ex. 1 at 8]. The Service does not support the assumptions or the premise that this model is appropriate for any species as applied on the Klamath River by the Applicant. (USDI Fish and Wildlife Service 2005a) (October 17, 2005)

In their Alternative, PacifiCorp (2006, pages 62, 65, 68, 69 (and Table 4), 74 (and Table 5), 76, and 77 (Table 5)) refers to KlamRAS/EDT and EDT rankings and estimates of cumulative rates of survival to contend that bypassing salmon around historic habitat using collection and transport has benefits over volitional passage. This is an inappropriate use of the KlamRAS/EDT model. The KlamRAS/EDT estimates are specific to fall-run Chinook and do not apply to spring-run Chinook, coho salmon, steelhead, or Pacific lamprey.

The Service is on record (USDI Fish and Wildlife Service 2005a) (October 17, 2005) that the KlamRas/EDT modeling effort had a sufficient level of documentation and transparency for modeling fall-run Chinook for the relative evaluation of fish passage scenarios; however, the EDT model, as applied on by PacifiCorp, was not similarly documented or transparent and was thus not valid.

The Klamath Tribes raised additional substantive doubts about the Applicant's EDT modeling results during the Trial Type Hearing [NMFS/FWS-Issue 6-Huntington-Reb.-Ex. 1 at 6]. In the Discovery process for the Trial Type Hearing proceeding, the Applicant released to the Klamath Tribes previously undisclosed modeling information (analytical details of selected model runs) underlying its EDT-based approximations of the potential future performance of fall-run Chinook and steelhead above Iron Gate Dam, if fish passage were provided [NMFS/FWS-Issue 6-Huntington-Reb.-Ex. 1 at 6]. These are the same EDT-based approximations that were submitted to FERC by the Applicant. These results suggest that stocks of fall-run Chinook and steelhead trout, with characteristics similar to stocks present below Iron Gate Dam, would find suitable habitat in multiple areas above the dam(s) [NMFS/FWS-Issue 6-Huntington-Reb.-Ex. 1 at 7]. However, the Applicant did not include these results in the testimony on "unsuitable" habitat above Iron Gate Dam, nor did the Applicant include these results in their Alternative [NMFS/FWS-Issue 6-Huntington-Reb.-Ex. 1 at 7]. The Applicant's Alternative is based upon a selective presentation of a portion of the modeling results.

In particular, the misapplication of the EDT model provides problematic results with respect to steelhead. Steelhead have broad habitat tolerances and should find abundant

habitat in the river and tributaries above Iron Gate Dam. The Klamath Tribes' analysis of PacifiCorp's latest EDT model indicates that the ability of Spencer Creek, and other Klamath tributaries, to produce juvenile steelhead is under-estimated [NMFS/FWS-Issue 6-Huntington-Dir.-Ex. 1 at 7]. In fact, the model suggests zero production potential for steelhead in many areas above Iron Gate Dam [NMFS/FWS-Issue 6-Huntington-Reb.-Ex. 1 at 10].

KlamRas/EDT, when appropriately developed and reviewed, as it has been for fall-run Chinook on the Klamath River, is a more valid methodology for comparing passage alternatives. Using KlamRas/EDT, Oosterhout (Oosterhout 2005b) examined 13 scenarios for passage of fall-run Chinook for the Klamath River. She concluded that of the scenarios evaluated, those that relied on volitional passage to move juveniles and adults around dams generally ranked higher, with one exception, than options that relied on trapping and hauling them. The lowest ranked options for moving fish around the one to five lower dams in both the 'existing' and 'restored' scenarios were for trap and haul, rather than volitional passage (Oosterhout 2005b).

Among the trap and haul alternatives analyzed in the modeling, the one exception (1F-trap and haul of adults to above Upper Klamath Lake; juveniles collected at Link River) that performed fairly well assumes a high (90 percent) collection efficiency for juvenile fish at Link River Dam, No basis is provided for this unrealistic assumption. When this scenario was modeled using the same collection efficiency rates (50-78 percent) as used in the other model scenarios (Oosterhout 2005a), this option did not rank nearly as high and was about the same as volitional (Oosterhout 2005a),

The scenario that resulted in this exception is not the same as the Applicant's trap and haul Alternative from J.C. Boyle to below Iron Gate Dam. The other trap and haul model outputs did not increase passage survival enough to compensate for losing access to spawning and rearing habitat bypassed by transporting fish past it (Oosterhout 2005b). In this evaluation, for both existing and restored habitat, the Services' Prescription (1A-volitional) ranked higher, in terms of the number of spawners on average, over years 11–50 of 50 year simulations, than PacifiCorp's Alternative to trap and haul downstream migrants from J.C. Boyle (1C – screens-T&H JCB-below IGD) (Oosterhout 2005b).

While the results for restored habitat for the Applicant's Alternative were very close to the Services' Prescription, in fact, Klamath River fish would need to be hauled a greater distance than assumed in the model, and thus, trap and haul mortality would be higher than assumed. Long term trap and haul performance is less certain under Klamath River conditions. Thus, it is reasonable to conclude that the Services' Prescriptions would likely better provide for the migratory needs of fish and be more protective under restored conditions, rather than less protective.

Estimated adult survival is only one factor of many important to overall fish passage survival and returns. Bypassing historic habitat in a collection and transport scenario may decrease other measures of population viability (i.e., abundance, productivity,

diversity, and spatial structure). PacifiCorp's collection and transport Alternative bypasses nearly all historical habitat for coho salmon, a federally listed species. PacifiCorp's Alternative is not feasible for lamprey and steelhead. Collection and transport may negatively impact behavioral traits of fish, such as when and where to migrate; whereas volitional passage provides fish the opportunity to move when they are ready. Finally, PacifiCorp's assessment does not take into account the uncertainties of trap and haul, such as human error, uncertainties in funding, or mechanical failure. Therefore, the PacifiCorp Alternative is less protective than the Services' Prescriptions.

6. PacifiCorp's Alternative is More Likely to Exacerbate Pathogen and Fish Disease Risks to Anadromous Fish

- The Services' Prescriptions are more protective than PacifiCorp's Alternative. Most pathogens in the lower basin are already present in the upper basin, therefore, establishing volitional fish passage will not increase the risk of disease. Volitional ladders easily pass large numbers of fish and avoid the risks of handling, stress, and delay.
- PacifiCorp's trap and haul Alternative is less protective because stress associated with trap and haul has been shown to increase the potential for disease, injury, and mortality.

PacifiCorp contends that the Services' joint preliminary prescriptions for volitional fishways increase the potential for reintroduced fish to bring disease to the upper Klamath basin, resulting in possible catastrophic losses of native fish (PacifiCorp 2006, pages 28, 47, and 54).

The ALJ found that the weight of the evidence shows that many pathogens are already present in the upper and lower Klamath Basin (ALJ Decision at pages 60-61) and Ultimate Finding of Fact #4 (ALJ Decision at page 85, UFOF 4). Thus, establishing fish passage will not increase the risk of disease. (ALJ Decisions at page 20, FOF 2B-2; page 21, FOF 2B-10; page 22, FOF 2B-11; page 22, FOF 2B-17; and page 23, FOF 2B-22). *C. Shasta and P. minibicornis* exist throughout the Klamath River System in both the upper and lower basins, so migration of wild anadromous fish upstream from below Iron Gate Dam would not increase the risk of introducing pathogens to resident trout residing above Iron Gate Dam (ALJ Decision at page 22, FOF 2B-11; page 22, FOF 2B-17; and page 23, FOF 2B-22). This is especially true given the fact that trout are resistant to *C. Shasta* and the remaining known pathogens (except *F. columnaris* and *Ich)* do not impact non-salmonids (ALJ Decision at page 23, FOF 2B-20).

The ALJ also found that there is insufficient evidence to determine whether IHN exists in either the lower or upper basin of the Klamath River. (ALJ Decision at page 21, FOF 2B-4). The record evidence shows that there has only been a single detection of IHN documented in the lower basin in 1997, and since then there has been no further detection. (ALJ Decision at page 20, FOF 2B-3). The virus was detected in one adult Chinook salmon returning to Iron Gate Hatchery. (Id). The ALJ did not find a single

detection nearly ten years ago in a fish suspected to be a "hatchery fish" to be significant or cause for alarm given the Chinook salmon population size existing in the lower basin. Moreover, to date, there has been no work or surveys completed concerning the actual occurrence of IHN in the upper basin. (ALJ Decision at page 21, FOF 2B-4). Therefore, any suggestion that IHN exists in either the lower or upper Klamath Basin would be mere speculation.

Further, the ALJ found that there is insufficient evidence to determine whether *R. salmoniranrum* exists in the upper Klamath Basin. Like *IHN*, no research or studies have been performed to detect the occurrence of *R. salmoniranrum*. (ALJ Decision at page 21, FOF 2B-7). Consequently, PacifiCorp failed to prove that facilitating the movement of anadromous fish would present a high risk of introducing pathogens to resident fish inhabiting the basin above Iron Gate Dam.

The preliminary findings of fact and underlying evidence lead to the ALJ's ultimate finding of fact #4 "Facilitating the movement of anadromous fish via prescribed fishways presents a relatively low risk of introducing pathogens to resident fish above Iron Gate Dam. Many of the pathogens (such as C. Shasta, F. Columnaris, P. minibicornis, and Ich) present below Iron Gate Dam, are also present above the dam. The evidence is inconclusive as to whether IHN exists either above or below Iron Gate Dam. The evidence is also inconclusive as to whether R. salmoniranrum exists above Iron Gate Dam." (ALJ Decision at page 85, UFOF #4)

PacifiCorp contends that their proposed collection and transport (trap and haul) program is designed to provide the greatest possible opportunity for successful reintroduction in the upper basin and would be able to address concerns about the introduction of fish diseases to upper Klamath basin. (PacifiCorp 2006, pages 54 and 88)

However, trap and haul associated fish stress has been well documented (Carmichael et al.1984 [cited in Steward and Associates 2007]; Congleton et al, 2000; Kelsey et al. (2002);Shrimpton et al. 2001; [cited in Steward and Associates 2007]; Clements et al. 2002; Chandroo et al. 2005). Decreased disease resistance generally follows stress in fishes and the delayed effects of stress may include the activation of latent disease organisms (Wedemeyer 1970). Capture, crowding, marking or tagging, loading, transport, and release of juvenile fish as the Applicant has proposed would result in exposure to handling stress and, thus, increase the risk of disease. Trap and haul relies on extensive handling and sorting of fish, as well as crowding fish in holding ponds and transport trucks, all of which cause stress to fish (Oregon Department of Fish and Wildlife 2006). For example, carbon dioxide use may contribute to physical injuries in adult salmon as they thrash in the anesthetic bath during handling.

This stressful behavior can cause injuries that are not readily apparent when fish are released, but may show up as fungal infections in the following weeks (Beidler and Knapp 2005). Fish that are held in pools are often over-crowded, increasing stress, risk of disease transfer, and the potential for injury or mortality (Oregon Department of Fish

and Wildlife 2006). Delayed adult mortality due to transportation varies substantially and is affected by water temperature. Where water is relatively warmer (such as the Klamath River) trucking adult fish around dams can be problematic both because of the stress of the warm water on them and the shock of refrigerated trucks, followed by release into warmer water (Oregon Department of Fish and Wildlife 2006). Disease problems can be exacerbated with trucking because of crowding. The extensive handling of fish when stream temperatures are high will exacerbate the effects of stress and disease, resulting in higher pre-spawning mortality (Oregon Department of Fish and Wildlife 2006).

In contrast, volitional ladders easily pass large numbers of fish and avoid the risks of handling, stress, and delay. These are the primary reasons ladders are used for upstream passage on the Columbia River instead of other options, including trapping and hauling (Gary Fredricks, NMFS, pers. comm.).

In the DEIS, FERC Staff conclude that unless the disease issues are addressed "implementing fish passage through the project may yield little or no benefit." DEIS at 3-297. We concur that there is a need to remedy the situation. However, our comments to the DEIS ((U.S. Department of the Interior 2006a) DOI Response to DEIS, pages 23–25) demonstrate that the DEIS provides no clear indication that an increased prevalence of disease pathogens may affect salmonids other than late outmigrating fall-run Chinook and does not provide any analysis or examples from other river systems showing that a disease monitoring and management plan would be an effective remedy, especially in combination with the increased disease risks of trap and haul practices.

7. PacifiCorp's Alternative Provides No Protective Measures for Fish at Keno Dam and Link River East Side/West Side Powerhouses

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because they provide passage at the Keno Dam, and the East Side/West Side Powerhouse.
- PacifiCorp does not propose any action be implemented to provide protective measures at Keno Dam and the Link River East Side/West Side Powerhouses.

PacifiCorp does not propose any action be implemented to provide protective measures at Keno Dam and Link River East Side/West Side Powerhouses because they believe that the Commission lacks authority to re-license Keno Dam and they propose to decommission Link River East Side/West Side Powerhouses[10].

[10] PacifiCorp asserts that the Services have no authority to prescribe fishways at Keno or Link River Dams because, in its view, the East Side and West Side powerhouses and Keno Dam will not be included in the new Project license or in the FERC boundary. PacifiCorp at 105. This is not an issue that is appropriate for discussion or resolution in the Alternatives Analysis process. Rather, it is a jurisdictional question that is entrusted to the Federal Energy Regulatory Commission for determination, not to the Services. Obviously, if FERC determines that any or

The Services' Prescriptions are predicated upon the retention of the Keno facility as a licensed development within the Project. Based on this predicate, the Service's Prescriptions are more protective than PacifiCorp's Alternative because they provide protective measures for the Keno facility, and the Alternative includes no protective measures for Keno Dam.

The Service's Prescriptions are more protective than PacifiCorp's Alternative because they include improved fishways at Keno Dam and the Link River East Side and West Side Powerhouses to benefit fish resources; the Alternative includes no protective measures at these facilities.

The Service's Prescriptions are more protective than PacifiCorp's Alternative because they provide for fish screens and bypass facilities that reduce entrainment mortality of resident fish, including endangered suckers, at the Link River East Side and West Side Powerhouses; the Alternative includes no protective measures at these facilities.

The Service's Prescriptions are more protective than PacifiCorp's Alternative because they provide tailrace barriers at the East Side and West Side Powerhouses to reduce migration delays of migrating fish; the Alternative includes no protective measures at these facilities.

The Service's Prescriptions are more protective than PacifiCorp's Alternative because they include a volitional fishway at Keno Dam to restore connectivity of resident redband populations in the mainstem Klamath River with those in Keno Reservoir/Lake Ewauna, Link River, and Upper Klamath Lake and provide for the safe, timely, and effective upstream passage of anadromous fish to be reintroduced; the Alternative includes no protective measures at these facilities.

The Service's Prescriptions are more protective than PacifiCorp's Alternative because they include a spillway modification at Keno Dam to provide for the safe, timely, and effective downstream passage of resident redband trout and anadromous fish to be reintroduced; the Alternative includes no protective measures at these facilities.

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all of the noted developments are non-jurisdictional and thus not included in any new license issued for the Klamath Project, the Services' section 18 fishway prescriptions would not apply to those excluded facilities. If, on the other hand, the Commission determines that any or all of the developments are jurisdictional, the Services' prescriptions would apply to the jurisdictional facilities. Since ultimate resolution of this issue is with the Commission, PacifiCorp's arguments regarding jurisdiction are not considered herein.

PacifiCorp (2006, page 110) states that "there is nothing to suggest that passing resident fish – and in the future, anadromous fish – require any additional protections at Keno Dam", as required in the Services' Prescriptions.

However, at Keno Dam the existing fishway does not meet current criteria to accomplish lamprey passage because corners and ladder steps are not rounded (USDI Fish and Wildlife Service 2005b). The Keno Dam currently has a fishway that conforms to slope and energy dissipation criteria for salmonids, but does not meet current criteria to accomplish lamprey passage and does not meet slope guidelines for sucker passage (USDI Fish and Wildlife Service 2005b). Downstream spillway passage at Keno needs to be improved for all species to be consistent with current criteria (U.S. Department of the Interior 2006b).

The Services' Prescriptions would require that PacifiCorp conduct trap and haul operations at Keno Dam to transport upstream migrant fish to the upper Klamath basin during times when water quality conditions in portions of Lake Ewauna would be potentially fatal to fish. PacifiCorp (2006, page 111) states that FERC lacks jurisdiction for this requirement, but PacifiCorp's Alternative trap and haul operation can provide a similar benefit by releasing trapped fish higher in the basin during periods of harmful water quality.

During most years, the Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) has dissolved oxygen concentrations greater than 6 mg/L and temperatures less than 20EC from mid-November through mid-June (Jason Cameron, BOR, pers. comm.). These conditions are within the criteria for migrating adult anadromous salmonids for these months (U. S. Environmental Protection Agency 2003). During most years, the Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) has dissolved oxygen concentrations less than 6 mg/L and temperatures greater than 20°C from mid-June through mid-November (Jason Cameron, BOR, pers. comm.). Transporting outmigrant anadromous salmonids around Keno Reservoir during this period would avoid poor water quality during summer months until restoration efforts improve reservoir dissolved oxygen and water temperatures.

The Services expect trap and haul to be an effective interim, seasonal fish passage method for Chinook salmon under these summer conditions because only this species would be transported and only for a short distance. Migrating suckers and lamprey, which tolerate a greater range of water quality conditions than salmonids, make use of habitat in Lake Ewauna as long as water quality is adequate (i.e. outside of July, August, September (Rich Piaskowski, BOR, pers. comm). Downstream migrating suckers captured during periods when water quality is inadequate in Keno Reservoir\Lake Ewauna would be returned to Upper Klamath Lake. Other species need volitional fishways to access habitat in Keno Reservoir\Lake Ewauna and Link River year round. Water quality is expected to improve over the term of a new Project license through the implementation of the Total Maximum Daily Load (TMDL) process, imposition of state

water quality certification conditions, and provisions of a new license (the inclusion of 10(j) recommendations).

PacifiCorp (2006, page 110) states that PacifiCorp does not propose to subsample fish on a daily basis for size, species identification, age determination, and condition as described in the Services' Prescription because such fish handling would merely add to the already stressful conditions that these fish encounter, thereby further jeopardizing the success of the anadromous fish reintroduction effort.

The Services' prescriptions require the Licensee to construct, operate, and maintain a holding and sorting facility to accommodate upstream interim, seasonal trap and haul for anadromous salmonids at Keno Dam. In addition, the modification shall include features to trap, hold, and sort anadromous salmonids by age and species, as well as accomplish the transfer of these fish upstream above Link River Dam between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. The auxiliary water system (AWS) shall be designed to provide the correct water temperature and water quality as to attract fish, and the ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). These important design features, in conjunction the requirement that the monitoring be conducted when water quality is conducive to sampling, will minimize handling stress for fish.

PacifiCorp (2006, page 112) states that their "Alternative of implementing none of the Services' Prescriptions at the East Side and West Side powerhouses is no less protective of anadromous and resident fish in the upper Klamath basin" because they intend to "cease generating and decommission the powerhouses, which will eliminate any adverse effects to fish passage."

In their Prescriptions, the Services address fish passage requirements under current conditions for all of the facilities covered by the license. If the East Side and West Side Powerhouse remain in the license, anadromous and resident fish (including Federally listed suckers) would require fish passage for the reasons outlined in this Section. PacifiCorp has provided no protective mechanisms for fish in this circumstance. Accordingly, the Services' Prescriptions are more protective for all species of fish than is the PacifiCorp alternative.

Pacific Lamprey

8. PacifiCorp's Alternative Would Bypass Habitat for Pacific Lamprey in the Project Reach

- The Services' Prescriptions are more protective because they provide access to habitat for Pacific lamprey in the Project Reach.

- PacifiCorp's Alternative is less protective for Pacific lamprey because it would bypass much of this habitat.

While the historical upstream distribution of Pacific lamprey is unclear, it is clear that suitable habitat for spawning and juvenile rearing is available within tributaries and stream reaches in the Project area (Hamilton et al. 2005, ALJ Decision at 13, FOF 2A-7; ALJ Decision at 37, FOF 8-1, FOF 8-3, FOF 8-5; ALJ Decision at 86, Ultimate Finding of Fact 10).[11] Lampreys occur long distances inland in the Columbia and Yakima river systems (Wydoski and Whitney 2003) and would likely do so in the Klamath River system as well, as habitat conditions are similar. Access to the additional habitat within the Project reach would benefit Pacific lamprey populations (ALJ Decision at 38, FOF 8-9), and would not be available to Pacific lamprey under PacifiCorp's Alternative. Therefore, PacifiCorp's Alternative is less protective of this species.

9. PacifiCorp's Alternative Would Rely on Passage Methods for Pacific Lamprey That Have Not Been Established

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions would rely on methods of passage for adult and juvenile Pacific lamprey that are in use elsewhere.
- PacifiCorp's Alternative is less protective because the technology for large scale trap and haul of adult or juvenile Pacific Lamprey has not been established.

Lampreys occur long distances inland in the Columbia and Yakima river systems (Wydoski and Whitney 2003) and habitat conditions above the dams on the Klamath are similar. If access was provided through fishways, Pacific Lamprey from below Iron Gate Dam would migrate above the dam (ALJ Decision at 37, FOF 8-7). However, PacifiCorp (2006, page 79) states that while they would expect few lamprey to use any fishway at the Dam, its Alternative would likely provide a greater probability of success compared to the Services' Prescription because the all-volitional ladder would be much longer than the existing partial ladder to the collection facility. This assessment is inaccurate because the Services' Prescription incorporates design elements that are in use elsewhere and PacifiCorp's alternative relies on the use of a ladder designed for adult salmonids only. For example, research on Columbia River fish ladders has found that the efficiency of existing ladders improves with simple design changes, and has resulted in the permanent

[11] The ALJ found in favor of the Services on the overall question stated for trial (whether access to habitat within the Project would benefit Pacific Lamprey), although the ALJ found that the evidence is nconclusive as to whether Pacific lamprey were historically present above Iron Gate Dam (ALJ Decision at 2, 70, and 86, Ultimate Finding of Fact 10). However, the ALJ also found the evidence shows that Pacific Lamprey occur in the Lower Klamath River, below Iron Gate Dam (ALJ Decision at 13, Finding of Fact2A-7), and Pacific Lamprey below Iron Gate Dam would migrate above the dam if access were provided through fishways (ALJ Decision at 37, Finding of Fact 8-7). Because Pacific Lamprey that are currently below Iron Gate Dam would migrate past the dam if access were provided through fishways, the Services conclude that Iron Gate Dam currently blocks passage of Pacific Lamprey, and the Services' Prescriptions related to Pacific Lamprey address this Project impact.

installation of a Lamprey Passage Structure at Bonneville Dam in 2006. This device allows adult lamprey to pass volitionally at rapid rates and with high (>90%) passage success [NMFS/FWS-Issue 8- Moser, Ex.1 at 3,4].

PacifiCorp also reports the results of recent studies which indicate that net upstream passage efficiency is about 50 percent on average for Pacific lamprey through contemporary fishways designed for anadromous salmonids (review in Stevenson et al. 2005). However, the report states that an additional 16 percent of these tagged Pacific lamprey were probably lost into the Attraction Water System at Rocky Reach Dam, which was designed to exclude adult salmonids only. The final report for this study (Golder Associates 2006) demonstrates the substantial deficiencies in existing ladders, but "Numerous opportunities exist to improve upstream passage of adult lamprey" including ramps (section 4.1.1), fishway bottom improvements (4.1.2), rounded bulkhead wall ends (4.1.3), maintenance practices (4.1.4), orifice openings (4.1.5), and powerhouse entrance/spillway gate openings (4.1.6). Juvenile passage at conventional screen systems also has been problematic (Kostow 2002), however Golder Associates (2006) also provides recommendations for these issues as well.

PacifiCorp's conclusion relies upon its assertion that "Pacific lamprey are more likely to utilize the [hatchery] ladder" because it is shorter (PacifiCorp 2006). However, Pacific lamprey are known to be able to swim through 9 ladders to the limit of anadromy on the Columbia River (Chief Joseph Dam), more than 500 miles from the Pacific Ocean (Hamilton et al. 2005). The recommendations in Golder Associates (2006) emphasize improvements to design features, not ladder length. Although the Columbia mainstem ladders need improvements, many Pacific lamprey are nonetheless able to ascend all of them and would likely swim further if given the opportunity. PacifiCorp fails to provide justification as to why its "shorter is better" argument applies.

Design features in ladders can provide partial or complete passage of one species efficiently while excluding others entirely. PacifiCorp fails to explain why the features of the existing hatchery ladder would not hinder passage to the same or greater degree that the existing Columbia River ladders do. For instance, (Stevenson et al. 2005) and Golder Associates (2006). found that 16% of the Pacific lamprey likely were lost into the auxiliary water system at Rocky Reach dam; the Alternative provides no provision to ensure that this doesn't happen at Iron Gate Dam.

Therefore, PacifiCorp's assertion that its trap-and-haul alternative will pass Pacific lamprey more efficiently than the Services' prescription is largely unsubstantiated. The Services intend to use improved designs for volitional fishways, which are more protective than the speculative design provided in the Alternative.

10. It Is Unlikely that PacifiCorp's Alternative Would Provide Migratory Cues Necessary for the Attraction of Adult Pacific Lamprey.

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions promote the establishment of continuous, healthy populations of resident and anadromous lamprey in the areas between the dams, which will, in turn, provide sufficient levels of juvenile pheromone production to attract robust numbers of adults to the trap at Iron Gate Dam.
- PacifiCorp's trap and haul Alternative is less protective because it precludes the establishment of the pheromone cues necessary for the attraction of adult Pacific lamprey.

Pacific lamprey, being ectoparasitic, often do not return to their natal stream to spawn, and their movements appear to be dependent upon the movements of their host fish. Adult attraction to a particular stream is facilitated by pheromones from lamprey juveniles (but not adults) of several species of resident and anadromous lamprey that produce and release a suite of bile acids that serve as migratory attractants to adults. The bile acids are strong attractants even at low concentrations and the pheromones are not species-specific.. Larval pheromones are not particularly stable, with a half-life estimated as approximately one day in laboratory conditions. This suggests that pheromones produced above the bypassed Project habitat will not persist until they can be passed through Iron Gate Dam (Steward and Associates 2007). It appears unlikely that current populations of resident lamprey in the lower reservoirs and their tributaries are sufficient to attract large numbers of adult Pacific lamprey to the trap at Iron Gate. Therefore, if the passage system does not promote the establishment of continuous, healthy populations of resident and anadromous lamprey in the areas between the dams, there may be an insufficient level of juvenile pheromone production to attract robust numbers of adults to the trap at Iron Gate. If, on the other hand, tributaries begin to produce higher numbers of anadromous juveniles, adults will be attracted in greater numbers, leading to a greater likelihood of reintroduction success (Steward and Associates 2007).

The role of migratory pheromones highlights the importance of a continuum of habitat utilization as a key factor for lamprey reestablishment in the Klamath River above Iron Gate Dam (Steward and Associates 2007). The presence of juvenile Pacific lamprey in the Project reach would likely be very important to providing the cues necessary for the attraction of adult Pacific lamprey. In the Project reach, the Services' Prescriptions would provide these cues coming from juvenile Pacific lamprey; PacifiCorp's Alternative would not.

Attraction flow at the ladder entrance is critically important to all upstream-migrating fishes (Federal Energy Regulatory Commission 2004). The existing ladder incorporated into the Alternative would use its existing auxiliary water supply (page 81), which provides substantially less flow than the Services' prescription. The Alternative does not claim that this lesser flow would equal the prescription's capability of attracting fish. Indeed, the Alternative's attraction water supply would clearly attract fewer Pacific

lamprey (as well as other up-migrating fishes) to the ladder. Here again, the Alternative is less protective than the Services' prescription.

Coho Salmon

11. PacifiCorp's Alternative Provides Lesser Population-level Benefits for the Upper Klamath Coho Population and for the Federally Listed SONCC Coho ESU

- The Services' Prescriptions provide greater population-level benefits.
- PacifiCorp's Alternative provides lesser population-level benefits.

Access to the historical habitat of the Upper Klamath coho salmon population, part of the federally listed SONCC (Southern Oregon/Northern California Coast) coho ESU (Evolutionarily Significant Unit), was significantly reduced when Project dams blocked access (Williams et al. 2006). In general, one assumes greater risk of extinction when less habitat is available across an ESU. Access to less habitat constrains the abilities of populations within the ESU, and the ESU as a whole, to persist (McElhany et al. 2000). The Services' Prescriptions provide access to suitable coho tributary and main stem habitat above Iron Gate Dam, including important rearing habitat in the Project tributaries and main stem, and cold water refugia below J.C. Boyle Dam. This includes Spencer, Fall, Beaver, Deer, Shovel, Scotch, and Jenny Creeks (ALJ Decision at 35, FOF 7-9). Historically, coho salmon spawned in Fall Creek (ALJ Decision at 12, FOF 2A-6). In addition, there are approximately 28 miles of suitable spawning habitat for anadromous fish in the main stem provided gravel augmentation occurs in those areas (ALJ Decision at 33, FOF 6-10). Out of the streams specifically listed above from the ALJ's Decision, PacifiCorp's Alternative provides access only to Spencer Creek.

The comparatively small amount of upstream habitat made available by Pacificorp's Alternative diminishes the likelihood that the Upper Klamath coho salmon population will be a functional component of the SONCC coho salmon ESU. In other words, when considering the various measures of viability (i.e., abundance, productivity, diversity and spatial structure) outlined in McElhany et al. 2000 (McElhany et al. 2000), the lesser amount of re-claimed habitat realized under Pacificorp's Alternative is more likely to preclude the Upper Klamath population from becoming a Functionally Independent sub-population of the larger Klamath River coho population.

The ALJ Decision provides support for this position, because the ALJ found that, over time, access to habitat above Iron Gate Dam would benefit the coho salmon population by: a) extending the range and distribution of the species thereby increasing the coho salmon's reproductive potential; b) increase genetic diversity in the coho stocks; c) reduce the species vulnerability to the impacts of degradation; and d) increase the abundance of the coho population (ALJ Decision at 36, FOF 7-16). Coho salmon below Iron Gate Dam would migrate above the dam if access was provided through fishways (ALJ Decision at 35, FOF 7-15).

PacifiCorp (2006, pages 54-56) states that access to Project-area habitat may further impede recovery of ESA-listed coho salmon because the vast majority of habitat in tributaries above Iron Gate and Copco 1 and 2 Dams is no longer suitable for juvenile rearing, and would require juveniles to move into reservoirs where they would face significant hazards, such as predation, disease, impaired water quality resulting from nutrient load in Upper Klamath Lake, and juvenile screening and bypass facilities. PacifiCorp (2006, page 71) makes the same argument again later in the document, adding that their Alternative "would allow adult coho salmon to be sorted and distributed to desired locations (e.g., Spencer Creek above J.C. Boyle Dam or habitat below Iron Gate Dam, as appropriate)."

The Services' disagree with this position. Coho salmon depend heavily on tributaries to complete their life histories and sustain their populations (National Research Council 2004). The Services' Prescriptions provide access to significantly more tributary and mainstem habitat than PacifiCorp's Alternative. Although portions of the habitat above Iron Gate Dam have been degraded, much of this habitat remains suitable and restoration projects are currently in progress or planned (ALJ Decision at 35, FOF 7-7). Further, coho salmon below Iron Gate Dam still use the habitat below the dam even though it has suffered degradation commensurate with that above the dam (ALJ Decision at 35, FOF 7-6). Although water temperature in the summer above Iron Gate Dam could be an issue, the evidence on record shows that water temperature will not preclude coho salmon from successfully utilizing the habitat within the Project area (ALJ Decision at 36, FOF 7-12). Similarly, when juvenile coho migrate through reservoirs, predation rates may increase. However, reservoir predation could be minimized through use of remedial measures (ALJ Decision at 36, FOF 7-13). Finally, juvenile screening and bypass facilities constructed to NMFS criteria, as specified in the Services' Prescriptions, function at very high efficiencies (National Marine Fisheries Service 2000b).

12. PacifiCorp's Alternative Does Not Protect Federally Listed Coho Salmon From Entrainment at the Copco 1, Copco 2, and Iron Gate Turbine Intakes

- The Services' Prescriptions are more protective because they protect federally listed coho from turbine mortality at Copco 1, Copco 2, and Iron Gate facilities.
- PacifiCorp's Alternative is less protective because juvenile coho salmon that pass downstream with spill at J.C. Boyle would not be screened from turbines at Copco 1, Copco 2, and Iron Gate Project facilities.

Under PacifiCorp's Alternative, a juvenile collection and transport facility would be located at or above J.C. Boyle Dam (PacifiCorp 2006 at 57, last paragraph). The facility would be able to screen only the flow being routed into the location's power canal intake. Flow that occasionally passes over the spillway would not be screened. PacifiCorp cites an estimate that 20 percent of migrants would be spilled (PacifiCorp 2006 at 60, second paragraph). Under PacifiCorp's Alternative, spilled coho juveniles could be entrained at each facility below J.C. Boyle Dam, as these facilities would not include screens. Once entrained, juvenile coho face a high risk of mortality. The Copco 1, Copco 2, and Iron

Gate facilities are all equipped with Francis turbines with between 123 and 158 feet gross head at the powerhouses (PacifiCorp 2004a). A 1987 report prepared by the Electric Power Research Institute (EPRI) concluded that mortality from entrainment at hydroelectric projects using Francis turbines averaged 24 percent. The EPRI report also found that entrainment mortality at hydroelectric projects using Francis turbines with operational head greater than 335 feet ranged from 33-48 percent. The ALJ found that for juvenile fish entrained in the Project, the risk of mortality is between 10-30 percent (ALJ Decision at 29, FOF 4-5).

The expected losses of federally listed juvenile coho spilled at J.C. Boyle under PacifiCorp's Alternative are significant. It is reasonable to assume that nearly all fish spilled downstream will be entrained at each of the three facilities downstream, as there is negligible spill at Copco 1, Copco 2 and Iron Gate Dams leaving no routes of egress other than through the turbines[12]. Assuming 20 percent spill and 100 percent entrainment at each of the three facilities downstream, an estimated 48 percent of all spilled fish would be lost to entrainment mortality[13]. Given PacifiCorp's estimate that 20 percent of all fish will be spilled, approximately 10 percent of all juvenile coho outmigrants will be lost to entrainment mortality.

Under the conditions specified in the Services' Prescriptions, downstream migrants would be collected and transported downstream at each dam by screens and bypasses rather than entrained into the turbines. Positive exclusion barrier screens and bypass facilities designed to NMFS fish passage criteria have consistently resulted in guidance efficiencies of over 98 percent, or less than 2 percent loss (National Marine Fisheries Service 2004a). This less than 2 percent loss is compared to the 10-30 percent entrainment mortality estimated for PacifiCorp's Alternative. The Services' Prescriptions are therefore more protective for spilled juvenile coho outmigrants. Given that the SONCC coho ESU is listed as threatened under the ESA, measures to minimize loss of

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[12] Any predation, mortality or residualization of spilled fish that would occur during reservoir passage would likely be the same under PacifiCorp's Alternative and the Services' Prescriptions, and is therefore not addressed here.

[13] Assuming (for analytical purposes only) that 1000 juvenile outmigrants are present in J.C. Boyle Reservoir and 20 percent are spilled, then 0.2 (1000) or 200 juveniles will be spilled over J.C. Boyle Dam. Assuming that all 200 survive the spill (spill mortality is addressed in a separate subsection), it is reasonable to assume nearly all 200 will be entrained into the turbines at Copco 1, as there is negligible spill at Copco 1 and there is no other route of egress except through the turbines. Here they will undergo 10-30 percent entrainment mortality. Assume the midpoint of 20 percent entrainment mortality for simplicity, 20 percent of 200 is 0.2 (200) or 40 entrainment mortalities and 160 survivors at Copco 1. Assuming all 160 survivors are entrained at Copco 2 (again, there is negligible spill at Copco 2 and there is no other route of egress except through the turbines), there will again be 20 percent entrainment mortality at Copco 2. 20 percent of 160 is 0.2 (160) or 32 mortalities and 128 survivors at Copco 2. Finally, with the same assumptions of 100 percent entrainment and 20 percent entrainment mortality at Iron Gate dam, there will be 0.2 (128) or 26 mortalities and 102 survivors below Iron Gate Dam. Given the assumptions above, then 40+32+26 = 98 fish are entrainment mortalities of the original 200 fish spilled. In other words, about one half of all fish spilled over J.C. Boyle Dam will be lost to entrainment mortality while passing through the Project.

coho will be necessary in accordance with the ESA, and the comparison of entrainment mortality estimates described above is an especially important consideration.

Resident Fish

13. PacifiCorp's Alternative Risks Inadvertent Transport of Resident Trout and Lamprey

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions would not risk the inadvertent transport of resident redband trout which cannot be distinguished from outmigrating steelhead juveniles or non-anadromous lamprey species which cannot be distinguished from anadromous Pacific lamprey.
- PacifiCorp's Alternative is less protective because juvenile resident redband trout and non-anadromous lamprey would be inadvertently transported downstream.

Outmigrating juvenile anadromous steelhead and Pacific lamprey are indistinguishable from resident stocks in collection facilities. Under the Services' Prescriptions, these fish would decide when they were ready for migration, if at all, and the distance to be traveled. Under PacifiCorp's alternative, many of these fish would be inadvertently transported. These individuals may be displaced and moved greater distances than conducive to their needs and survival.

14. PacifiCorp's Alternative Provides Little Protection from Entrainment for Resident Trout

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the Services' Prescriptions include adequate fish screens at J.C. Boyle Dam, and accommodate downstream protection at Copco 1, Copco 2, and Iron Gate Dams.
- PacifiCorp's Alternative is less protective because the existing screens at J.C. Boyle have been shown to be inadequate and would not be upgraded; and no screening and bypass systems would be provided for downstream protection of resident fish at Copco 1, Copco 2, and Iron Gate Dams.

Unscreened flow through Project turbines results in mortality of juvenile and adult trout migrating downstream; and the inability to effectively migrate adversely affects the genetic health and long term survival of the resident species (ALJ Decision at 86, Ultimate Finding of Fact 6). J.C. Boyle Dam has fish screening and bypass systems in place, but they do not conform to current fish screen criteria for resident and anadromous fish (ALJ Decision at 29, FOF 4-8). The seals at the J.C. Boyle Dam have rendered fish screens partially ineffective, allowing fish to be entrained in the power canal and turbines (ALJ Decision at 29, FOF 4-9). PacifiCorp recognizes that entrainment at the J.C. Boyle Dam is a "problem that needs to be addressed" (ALJ Decision at 30, FOF 4-12). Precise

estimates of the number of fish entrained at the facilities are not available. However, extrapolating from data at other comparable FERC Facilities, PacifiCorp estimates a median annual entrainment of 75,655 fish for reservoirs the size of J.C. Boyle, and 115,979 fish for reservoirs the size of Copco and Iron Gate (ALJ Decision at 30, FOF 4-14).

PacifiCorp states approximately 20 percent of flow is spilled at J.C. Boyle Dam (PacifiCorp 2006 at 60, second paragraph). It is reasonable to assume that resident fish would be spilled with these flows. Resident fish migrate seasonally to maximize habitat, survival and growth. Under PacifiCorp's Alternative, spilled resident fish would be subject to entrainment at each facility below J.C. Boyle Dam, as these facilities would not include screens. Once entrained, resident fish face a high risk of mortality. The Copco 1, Copco 2, and Iron Gate facilities are all equipped with Francis turbines with between 123 and 158 feet gross head at the powerhouses (PacifiCorp 2004). A 1987 report prepared by the Electric Power Research Institute (EPRI) concluded that mortality from entrainment at hydroelectric projects using Francis turbines averaged 24 percent. The ALJ found that for juvenile fish entrained in the Project, the risk of mortality is between 10-30 percent (ALJ Decision at 29, 4-5). The risks of entrainment under PacifiCorp's Alternative are cumulative below J.C. Boyle Dam, as described in detail with respect to federally-listed coho salmon (see Section 12 above).

Unlike PacifiCorp's Alternative, the Services' Prescriptions include screens and bypasses at all downstream facilities, decreasing entrainment and allowing greater habitat connectivity. Resident fish would be able to migrate in order to maximize habitat, survival and growth, as they would be collected and transported downstream at each dam by screens and bypasses rather than entrained into the turbines. Under the Services' Alternative, entrainment is virtually eliminated with positive exclusion barrier screens at all facilities. The Services' Prescriptions are therefore more protective for resident fish that will be entrained under PacifiCorp's Alternative.

15. Unlike the Services' Prescriptions, PacifiCorp's Alternative Would Not Reduce the Project's Impacts on the Resident Trout Fishery

- The Services' Prescriptions would improve the resident trout fishery by re-establishing the ability of resident trout to move among habitat areas to meet their life history requirements.
- PacifiCorp's Alternative would perpetuate the impacts of the Project on resident trout by not providing passage options to fish residing in river reaches between dams and in tributaries above dams.

PacifiCorp (2006, page 3) states that resident trout populations would not benefit from habitat connectivity and increased genetic diversity that fishways would provide because the populations are currently healthy and sustaining and support a premier sport fishery in the J.C. Boyle peaking reach. PacifiCorp (2006, page 92) cites National Park Service ((U.S. National Park Service - Pacific Northwest Region 1994), pages 12 and 18)

indicating that the Klamath River below the J.C. Boyle Powerhouse to the Oregon/California border "provides an exceptional trout fishery and is reputed to be one of the better fly fishing rivers in Oregon…[and] offers an excellent fishery for wild rainbow trout with a size and catch rate among the highest in the state [with] nearly unlimited shoreline access [and a] year-round fishing season."

However, information from ODFW (Tinniswood 2006) and FERC (Federal Energy Regulatory Commission 1990) show that the trout populations within the project reaches are not healthy and sustaining and the fishery is not premier. After reviewing the available information, the ALJ found that Project operations have and continue to adversely affect the resident trout fishery by, among other things: a) confining the resident trout between the Project dams and associated reservoirs, thereby impairing their utilization of the full range of life history strategies and spawning productivity; b) unscreened flow through Project turbines result in mortality of juvenile and adult trout migrating down stream; and c) the inability to effectively migrate adversely affects the genetic health and long term survival of the resident species (ALJ Decision at 86, UFOF 6).

PacifiCorp (2006, page 96) states that their Alternative includes no fishways for resident trout at Iron Gate and the Copco Dams because there is no evidence that the few trout in the areas of Iron Gate and Copco Reservoirs require access to additional habitat, or that trout outside the reservoirs would benefit from access to habitat within the reservoirs. This view ignores the point that the trout population segments between and inside the reservoirs all would benefit from individual fish being able to disperse among these areas to select the most advantageous habitat areas under different hydrologic or other weather pattern conditions and life stages, and discounts the benefits to population genetic diversity that would result.

PacifiCorp (2006, page 96-97) suggests that providing fish passage at Iron Gate Dam may allow genetic introgression between coastal rainbow and Klamath redband trout. However, after review of the scientific evidence presented, the ALJ found that "[T]here are no scientific studies of the Klamath basin demonstrating that reintroduction of anadromous steelhead trout would detrimentally affect the genetic makeup of the resident trout fishery"(ALJ Decision at 25, FOF 2C-9). The ALJ also found that "[T]here are many examples from nearby river systems in the Pacific Northwest that show wild anadromous steelhead trout and resident rainbow/redband trout can co-exist and maintain abundant populations without adverse consequences. The Deschutes River in Oregon, the Yakima River in Washington, and the river systems in Idaho are examples" (ALJ Decision at 25, FOF 2C-11).

Shortnose and Lost River Suckers

16. PacifiCorp's Alternative Does Not Protect or Bypass Federally Listed Suckers

- The Services' Prescriptions are more protective than PacifiCorp's Alternative because the screens prescribed by the Services meet current criteria for salmonids, and also meet the same specifications as those designed to protect the life stages of federally listed suckers and other resident fish.
- PacifiCorp's trap and haul Alternative is less protective because it does not provide downstream screens or bypass facilities at the Eastside Development, Westside Development, Copco 1 Dam, Copco 2 Dam, and Iron Gate Dam for suckers or other resident fish.

PacifiCorp (2006, page 98) states that "[B]ased on the fact that listed sucker species in Iron Gate and Copco Reservoirs are either too large to enter the powerhouses or too small to be effectively and safely screened with the Services' Prescribed facilities, it is clear that PacifiCorp's Alternative of not including downstream fish facilities at Copco 1, Copco 2, and Iron Gate Dams is no less protective for suckers."

PacifiCorp's alternative does not call for downstream screens or bypass facilities at the Eastside Development, Westside Development, Copco 1 Dam, Copco 2 Dam, and Iron Gate Dam (page 97). Screens and bypass systems at J.C. Boyle, Copco 1 and 2, and Iron Gate Dams would have benefits in guiding federally listed sucker movements downstream. Suckers in the Project reservoirs may assist recovery efforts for the listed suckers in the future if reintroduction efforts become necessary (National Research Council 2003). Because these four dams lack screens and bypass systems, these fish are at risk.

Precise estimates of the number of fish entrained at [each] facility are not available. However, extrapolating from data at other comparable FERC Facilities, PacifiCorp estimates a median annual entrainment of 75,655 fish for reservoirs the size of J.C. Boyle, and 115,979 fish for reservoirs the size of Copco and Iron Gate (ALJ Decision at 30, 4-14).

At the Eastside Development and Westside Developments, significant numbers of resident fish are presently moving downstream from Upper Klamath Lake and being entrained by PacifiCorp's Eastside and Westside developments, including tens of thousands of larvae and juveniles of federally listed suckers annually (Gutermuth et al. 2000).

At the J.C. Boyle facility, PacifiCorp's alternative would continue to use the existing downstream screening facilities to bypass resident fish until a decision is made regarding the details of a collection and transport system for downstream migrating salmonids (page 91). J.C. Boyle Dam has fish screening and bypass systems in place, but they do not conform to current criteria for resident and anadromous fish (ALJ Decision at 29, FOF 4-8). The seals at the J.C. Boyle Dam have rendered the fish screens partially ineffective, allowing fish to be entrained in the turbines (ALJ Decision at 29, FOF 4-9). An Electric Power Research Institute (EPRI) report indicates that entrainment mortality at hydro projects using Francis turbines (such as J.C. Boyle) with operational head

greater than 335 feet ranged from 33 to 43 percent (ALJ Decision at 29, FOF 4-10). In light of the large percentage of river flow that is diverted into the J.C. Boyle power canal, the operation of Francis turbines, and the high operational head of 440 feet, fish mortality from entrainment at the J.C. Boyle facility is likely in the higher end of the mortality range as described in the EPRI report (ALJ Decision at 30, FOF 4-11). The J.C. Boyle Reservoir contains shortnose and Lost River suckers that are listed under the federal Endangered Species Act that are susceptible to entrainment (ALJ Decision at 30, FOF 4-16). While the vast majority of fish entrained consists of small juvenile fish, the record shows that adult fish are also susceptible to being entrained and killed (ALJ Decision at 31, FOF 4-22). Records from canal salvage operations at the J.C. Boyle power canal show that resident fish, in particular resident trout and suckers, are entrained and possibly killed in the power canal each year (ALJ Decision at 31, 4-18).

The Services' Prescriptions, which include screens that meet salmonid criteria, meet the same specifications as those designed to protect the life stages of federally listed suckers in which the Service is interested. The Service has consulted with the Bureau of Reclamation regarding the installation of screens that meet salmonid criteria at the A-canal diversion, and authorized take of larval suckers subject to these screening criteria (USDI Fish and Wildlife Service 2002).

Conclusion

After fully analyzing PacifiCorp's Alternative in comparison to the Services' Prescriptions, and considering all the available evidence and information and for the reasons outlined herein, the Services conclude that PacifiCorp's Alternative would be less protective than the Services' Prescriptions.

***Criteria 2* – Would the Alternative, as compared to the Services' Prescriptions, be significantly less costly to implement or result in improved operation for electricity production?**

PacifiCorp's alternative would be significantly less costly to implement, according to engineering cost estimates provided by PacifiCorp. PacifiCorp states that the Services' Prescription ladders and screens at and between Iron Gate, Copco 1, Copco 2, and J.C. Boyle (including a tailrace barrier at Fall Creek) would cost approximately $300,792,000 (2006, page 84), plus an additional $3.1 million for fishways at Fall and Spring Creek for resident fish (2006, page 100), plus an additional $60 million should fishways be required at Keno and Link Dams (2006, page 112).

PacifiCorp states that its alternative, including initial studies pursuant to the adaptive reintroduction program, would cost approximately $49,440,000 (2006, page 84), plus $4.7 million for fishways at Fall and Spring Creeks and modifications to the existing J.C. Boyle fish ladder (2006, page 101).

The Services' do not have access to all of the documentation and assumptions underlying PacifiCorp's estimates, and have not independently verified the specific cost estimates PacifiCorp presents. However, the Services are not aware of information that would discredit the general conclusion that it would cost significantly less to implement PacifiCorp's proposed Alternative (April 2006) than to implement the Services' Preliminary Prescriptions (which are essentially adopted as the Modified Prescriptions, as discussed in prior sections). Therefore, for the limited purpose of carrying out this comparative Section 33 analysis, the Services accept the information as showing that PacifiCorp's Alternative would likely be less costly.

Conclusion

As noted above, to satisfy FPA section 33's standards for when an alternative proposal must be accepted, a proposed alternative must *both* be equally protective of species *and* either significantly less costly to implement or resulting in improved operations for electricity production. Here, as discussed above, the overwhelming substantial evidence in the record indicates that PacifiCorp's proposed alternative is significantly *less* protective of the species than the Services prescriptions. . We do not find substantial evidence that PacifiCorp's Alternative would be no less protective than the Services' prescriptions. Therefore, the Services conclude that the proposed Alternative fails to satisfy the standards of Section 33 and should not be accepted, even though we assume for purposes of the analysis that the proposed Alternative would be significantly less costly to implement.

C. Equal Consideration of Effects Demonstration

The Services have conducted the appropriate analysis of effects in accordance with the factors set forth in Section 33 of the FPA (16 U.S.C. § 823d(b)(4)) and implementing regulations (43 C.F.R § 45.73 (Interior); 50 C.F.R. § 20.73 (Commerce)) and have determined the following.

1. Energy supply, distribution, cost, and use

Neither the Services' prescriptions nor the Alternative condition has a significant impact on energy supply, distribution, cost or use.

<u>Supply:</u> Although the fishway prescriptions will minimally reduce the generating capability of the project, the impact is insignificant when compared to the total customer requirements supplied by PacifiCorp, and *de minimis* in the context of regional energy supply. The project is a system resource, meaning that it has no function other than the provision of electric energy to the applicant's system as a whole. PacifiCorp's engineering cost estimate (2006, Attachment E) states that the prescriptions would reduce total generation by 22,000 megawatt hours (MWh) annually, amounting to 3 percent of

the 656,000 MWh average annual power generation from the project. This amount is 0.03 percent of the total MWh hours supplied by PacifiCorp in 2004, the latest year for which data were available. Moreover, PacifiCorp's transformer and line losses in 2004 were 3,741,391 MWh, which were considered acceptable, predictable and consistent with PacifiCorp's system planning criteria. Thus the prescriptions would reduce total generation by only 0.6 percent of current, planned energy losses. Particularly taking into account that PacifiCorp is only one a number of energy suppliers in the Northwest, the impact on total regional energy supply must be considered *de minimis*. Although PacifiCorp provided no information regarding the impact of its proposed alternative on regional energy supply, we note that project generation, in total, represents less than 1 percent of total system generation, and a little over one-sixth of transformer and line losses. Accordingly, the Klamath Project itself makes an insignificant contribution to PacifiCorp's energy supply, and makes a *de minimis* contribution to regional energy supply. Thus, neither the prescriptions nor the alternative would have a significant impact on energy supply, either in the region or on the applicant's system.

Distribution: PacifiCorp provided no information regarding the impact of its proposed alternative on the distribution of energy. The Services have no other information indicating any impact of PacifiCorp's alternative on energy distribution. The fishway prescriptions do not address energy distribution facilities, and therefore do not have any direct impact on the distribution of energy. Moreover, as regional energy supply impacts are *de minimis*, there is no basis to support an inference that there will be any measurable indirect impacts on energy distribution.

Cost: The impact of fishway prescriptions on energy cost is judged not significant. PacifiCorp's filings in its recent rate case in California explains that the project is an unreliable source of power and that its energy, when available, is used to displace other, more expensive sources.[14] Accordingly, PacifiCorp views the replacement value of project energy as PacifiCorp's decremental generation cost, which is unaffected by any changes in Klamath Project operations.[15]

Use: Neither the fishway prescriptions nor PacifiCorp's proposed alternative are expected to have any impact on energy use. PacifiCorp did not submit information to suggest such an impact, and the Services are not otherwise aware of particular information that would suggest any impact on patterns of consumption of energy.

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[14] See for example PacifiCorp in its Opening Brief in U-901-E before the Public Utilities Commission of the State of California, filed August 28, 2006, included in the record in the filing of the California Energy Commission on December 1, 2006.

[15] "Decremental Generation Cost" is a term used by PacifiCorp in its Opening Brief in U-901-E before the Public Utilities Commission of the State of California, filed August 28, 2006. It refers to the cost that would otherwise be incurred but for the availability of the Klamath power. Since the most readily available alternative to Klamath would be for PacifiCorp to purchase additional power under its existing supply arrangements, the average cost of purchased power reflects this decremental generation cost. See especially pages 30 – 35.

2. Flood control

Because the Project's reservoirs are relatively small compared with the Klamath River's annual runoff (e.g., Iron Gate reservoir impounds only 4 percent of annual runoff, and Copco No. 1 reservoir only 5 percent), the Project reservoirs are generally *not* operated for flood control ((PacifiCorp 2004b), Ex E, Page 3-181). While Project reservoirs are drawn down to some extent prior to spring runoff, this can provide only very limited flood control during high flow events. (PacifiCorp 2004, Ex B Page 2-7).

PacifiCorp identified no difference in flood control between the Services' prescription and PacifiCorp's proposed alternative for anadromous fish, resident fish, and Keno(PacifiCorp 2006, Page 87, 102, and 113). None of the alternatives analyzed in this section would result in any change to the currently very limited flood control.

3. Navigation

There is no large-scale commercial navigation on the Klamath River, as the dams are not equipped with locks for barges.

PacifiCorp identified no difference between the Services' prescriptions and PacifiCorp's proposed alternatives (PacifiCorp 2006, Page 87, 103 and 113). None of the alternatives analyzed in this section would result in any change to navigation.

4. Water Supply

PacifiCorp's Final License Application did not identify any Project-induced effects on municipal or irrigation water supply (PacifiCorp 2004b), Exhibit E, Page 9-54). PacifiCorp identified no difference between the Services' prescriptions and PacifiCorp's proposed alternative for resident fish or the Keno reach (PacifiCorp 2006, Page 103 and 113).

The Applicant includes fishways at Fall or Spring Creek in their Alternative (page 101). At Fall Creek and Spring Creek, pursuant to Section 18, the Service has prescribed that the ladder, and the screen and bypass facilities, shall provide for the uninterrupted passage of fish over the full range of flows. The Department notes the City of Yreka's (City) concerns that the impacts to the City's water facilities are appropriately considered and mitigated (City of Yreka, letter to FERC dated November 29, 2006).

No flows to meet the fishway requirements are specified. However, assuming that the Applicant still proposes an instream flow of 5 cfs for the bypassed reach of Fall Creek (this is unclear), no additional water in addition to the 5 cfs would be necessary to meet the requirement for fish passage. The Applicant's proposed instream flow would divert the 5 cfs to a point downstream from the City of Yreka's water intake structure and the fish hatchery intake structure. However, given that flows in Fall Creek rarely drop below 30 cfs (Coots 1954) and the difference between 5 cfs and the minimum 30 cfs would accommodate the City's 15 cfs water right, neither the Applicant's Alternative nor the Service's Modified Prescriptions for fishways pursuant to Section 18 would impact the

quantity of water the City has a right to or impact facilities necessary to manage the City's water supply. The Applicant's Alternative for fishways may impact water quantity to the California Department of Fish and Game hatchery at Fall Creek. However, it appears that if it were necessary to return a portion of the 5 cfs to a point above the fish hatchery intake structure (or the City of Yreka's water intake structure) this could be engineered with minimal cost or difficulty.

The Services have also prescribed a tailrace barrier at the Fall Creek powerhouse, unless studies show that it is not necessary. Should construction of a tailrace barrier be necessary, this location lies immediately above the City's water supply intake and the fish hatchery intake structure. Impacts to water quality for these facilities could be avoided by diverting penstock water around the powerhouse or limiting construction to periods of low water demand and hatchery shut down.

None of the alternatives analyzed in this section would result in any change to the water supply.

5. Air Quality

PacifiCorp stated that there is no difference in the effects of the Services' prescription and their alternative on air quality (PacifiCorp 2006, Page 88, 103, and 113). None of the alternatives analyzed in this section would result in any change to air quality.

6. Preservation of Other Aspects of Environmental Quality

PacifiCorp claimed that the Services' Prescriptions negatively affect Iron Gate Hatchery operations, disease in the lower river, and trout genetics (PacifiCorp 2006, Page 88,103). However, we disagree with PacifiCorp's position on these issues. The Services' Prescriptions would not impact operations of Iron Gate Hatchery (see our Subsection 4e in Section 3, above). PacifiCorp's Alternative is more likely to exacerbate pathogen and fish disease risks to anadromous fish (see our Subsection 6 in Section 3, above). PacifiCorp is incorrect in stating that a major concern of genetic introgression between coastal and redband trout exists (see our Subsection 15 in Section 3, above). With respect to its alternative for Keno and Link River, PacifiCorp did not identify any differences in effects to other aspects of environmental quality from the Services' prescriptions (PacifiCorp 2006, Page 114).

Other aspects of environmental quality that would be improved by volitional passage in the Klamath River include ecosystem benefits such as the re-establishment of marine nutrient transfer to upstream ecosystems through migration of anadromous fish. This nutrient addition could significantly increase production of fish and other plant and animal populations in upstream areas.

Section 4. Response to Comments

The joint regulations implement the statutory direction to consider evidence available to the Secretary. The regulations direct the Services to "consider evidence and supporting material provided by any license party or otherwise available to" the Agencies, including but not necessarily limited to certain categories of documents. *See* 50 C.F.R. § 221.73(a); 43 C.F.R. § 45.73(a). Among the sources of potentially relevant evidence and supporting material are the following listed sources: (1) any evidence on the implementation costs or operational impacts for electricity production of the proposed alternative; (2) any comments received on the Services' preliminary prescription; (3) any ALJ decision on disputed issues of material fact; (4) comments received on any draft or final NEPA documents; and (5) the license party's proposal filed pursuant to the regulations. *See* 50 C.F.R. § 221.73(a)(1)-(5); 43 C.F.R. § 45.73(a)(1)-(5).

Accordingly, the Services have considered, *inter alia*, comments received on the Preliminary Prescriptions and the FERC DEIS, to the extent they provide substantive information relevant to the evaluation of PacifiCorp's Proposed Alternative and to the development of the Modified Prescriptions. The comments reviewed include:[16]

1) *PacifiCorp's Alternative to the Joint United States Fish and Wildlife Service and National Marine Fisheries Service Preliminary Fishway Prescriptions, dated April 25, 2006 (*Alternative) *and PacifiCorp's December 1, 2006, Addendum to PacifiCorp's Alternative to the Joint United States Fish and Wildlife Service and National Marine Fisheries Service Preliminary Prescriptions* (Addendum).

2) *PacifiCorp's Response to Comments and Documents Submitted by Stakeholders on the FERC DEIS related to Fish Passage, Water Quality, Instream Flows, and Ramping Rates*, dated December 29, 2006 (PacifiCorp DEIS Response Comments).

3) Various comments by Stakeholders other than PacifiCorp that concern the Preliminary Fishway Prescriptions were filed with the Commission, some of which were in direct response to the DEIS, or were received directly by the Services. Comments that raise substantive issues concerning the Preliminary Prescriptions were received from the City of Yreka (Comment on the DEIS filed with FERC), the Hoopa Valley Tribe (responding to the PacifiCorp Alternative and Addendum, submitted directly to the Services), Oregon Department of Fish and Wildlife (responding to the PacifiCorp Alternative and submitted directly to the Services), the Conservation and Fisheries Groups (commenting on

[16] The Services note that they received *PacifiCorp's Comments Regarding the Williams Report (2007), the Steward Report (2007) and Related Issues*, which was dated January 25, 2007. Due to the Services' regulatory deadline for filing the Modified Prescriptions and Alternatives Analysis, and the logistical steps required to timely meet that deadline, and PacifiCorp's extremely late filing of these comments, PacifiCorp did not provide the Services a reasonable opportunity to analyze and respond to these comments in this filing. However, the Services will review the comments and, to the extent the comments set forth evidence and supporting material bearing on the Services' basis for this decision document, the Services may supplement or amended this filing.

PacifiCorp's Alternative and Addendum and submitted directly to the Services), and the Yurok Tribe (commenting on the Alternative and Addendum and submitted directly to the Services). In addition, as discussed below, numerous other comments submitted to FERC in response to the DEIS were reviewed to ensure that all substantive comments relating to the prescriptions are considered.

PacifiCorp Comments Dated April 25, 2006 and December 1, 2006

PacifiCorp's Alternative to the Joint United States Fish and Wildlife Service and National Marine Fisheries Service Preliminary Fishway Prescriptions dated April 25, 2006, and PacifiCorp's Addendum to PacifiCorp's Alternative to the Joint United States Fish and Wildlife Service and National Marine Fisheries Service Preliminary Prescriptions dated December 1, 2006 provide extensive comments, which have been fully considered in the analysis and development of the Services' Modified Prescriptions. Specific comments relating to the analysis of the Alternative under section 33 of the FPA are addressed in Section 3 of this document; other comments are addressed here or incorporated into the Modified Prescriptions. As discussed above in reference to Section 3 of this document, the Addendum does not constitute an Alternative under the FPA section 33 and implementing regulations, as it was submitted beyond the regulatory deadline. The Services have reviewed the Addendum and include herein responses to substantial new information that it raises.

The Services note first that PacifiCorp raised many of the issues it asserts here to support the Alternative in its request for hearing under the FPA. Such issues as the potential spread of disease, introgression of coastal and interior stock, and the availability of donor stock were subjected to a full evidentiary hearing before the ALJ, in which numerous scientific experts offered testimony, and resulted in the ALJ's Decision, and in the adoption of Findings of Fact supporting the Services' view. Accordingly, in response to numerous comments of PacifiCorp which address these same issues that have already been litigated in this process, the Services below cite to the ALJ's Findings and by reference, to the underlying scientific support for the Findings.

Comments Related to Reintroduction Issues:

As discussed above, PacifiCorp confuses the overarching issue of reintroduction of fish to the Klamath River with the Services' actions in this licensing proceeding, which are to mitigate for Project impacts to the passage of fish. Its Alternative and Addendum filings reflect this confusion by emphasizing issues pertaining to reintroduction and not on the immediate issue of fish passage. In Attachment A, page 3 of the Alternative, PacifiCorp quotes a portion of page 38 (Huntington et al. 2006) from what they call the "Intertribal Reintroduction Plan." The connotation is that the Tribes' proposed approach to reintroduction supports PacifiCorp's Alternative. This is not the case. First, as noted previously, reintroduction is a separate process from the Services' goals here to mitigate for Project impacts to fish passage. The Tribes' plan addresses the larger issue, reintroduction, and in that endeavor, the Tribes support an experimental approach for fish passage (not the general reintroduction effort). The Tribes do not support a trap-and-haul alternative (PacifiCorp's Alternative) because it fails to restore fish within the Project reach, and will prevent restoration of steelhead runs. The Intertribal Reintroduction Plan clearly and repeatedly states that dam removals offer the best option for restoring anadromous salmonids. The Tribes' position is that if dams are not removed, then volitional passage is the only approach with the potential to meet Tribal objectives for all anadromous species (Larry Dunsmoor, Klamath Tribe, pers. comm.).

PacifiCorp has taken the Tribes' interest in experimental approaches out of context, by omitting the first two sentences from the paragraph quoted. The full quotation should read:

> **We suggest that a reintroduction effort should begin with early experimentation, before dam removals occur or functional fish passage facilities are provided within the KHP-bounded area. The intent of this early experimentation would be to study test groups of anadromous fish released into areas above Link River Dam that are still isolated from the remainder of the Klamath Basin by the lack of dam passage.** Such experimentation could focus on confirming or refining hypotheses about how the younger freshwater life-stages of the fish to be reintroduced will perform in differing areas, on whether performance differences among particular candidate stocks are as anticipated, or on addressing other issues. Whatever the focus, it would provide an opportunity to test several assumptions and narrow a few uncertainties. The opportunity might be particularly important to future efforts toward spring Chinook reintroduction, because selection of a donor stock for this race of fish may come from what appears to be a group of less-than-optimal candidates. Selection from among these candidates might be aided by tests of fish that managers might initially be hesitant to release into the area unless they are confident that minimal numbers of the fish might end up in the mid-Klamath basin. (Huntington et al. 2006 at 38) (emphasis added).

The Tribes' intent for this section was to emphasize the utility of beginning **immediately** with experimental work, before fish passage is provided through dam removal or other means (Larry Dunsmoor, Klamath Tribe, pers. comm.). By so doing, managers could focus on how best to implement active reintroduction above Upper Klamath Lake.

Fish passage is a necessary precursor to a broader reintroduction effort. The Services see no reliable evidence or analysis suggesting that reintroduction efforts could not succeed.

Chinook and coho salmon, steelhead trout, and anadromous lampreys have persisted in the Klamath River since the completion of Copco 1 Dam (ALJ Decision at 13, FOF 2A-11; ALJ Decision at 37, FOF 8-2). Reintroduced fish would be subject to similar variables in the natural and managed environment that are currently faced by existing runs of these fish (ALJ Decision at 14, FOF 2A-13; ALJ Decision at 35, FOF 7-6). The major differences between existing runs and potential runs above the dams would be passage around and through hydropower facilities and increased migration distances.

Over time, natural recolonization of the Project area, and of the upper Basin, would occur once fish passage is established at Project facilities. Colonization and re-colonization of riverine habitats are considered to be part of the natural evolutionary biology, or strategy, of anadromous salmonid fishes (ALJ Decision at 13, FOF 2A-10; ALJ Decision at 32, FOF 6-3). Straying provides an evolutionary mechanism for salmonids to invade and colonize new habitats.

This may be a slow process to some areas, relying on adequate spawner escapements from ocean and river fisheries, and on within-river straying rates. Hatchery supplementation could considerably increase the recolonization rate, and there are a number of potential stocks available. A cooperative study between the Federal and State agencies has shown that Iron Gate Hatchery fall-run Chinook salmon held in Upper Klamath Lake are physiologically ready to migrate to the ocean and, thus, are suitable as a donor stock for reintroduction efforts (Maul et al. 2007).

Substantial watershed and aquatic habitat restoration efforts are underway, and these efforts are likely to continue (ALJ Decision at 35, FOF 7-7). A key component of the work by State, Federal, and non-governmental organizations in the Klamath River Basin is protection and restoration of the aquatic habitat upon which endangered fish and fish available to Tribal, commercial, and sport fishers depend. Restoration projects include many activities such as stream narrowing, stream bank stabilization, and fencing cattle out of riparian zones. These efforts will have significant benefits to potential anadromous fish habitat as well.

There are numerous examples of successful introductions of anadromous salmonids to new habitats from Alaska (Blackett 1981; Bryant et al. 1999; Wright et al. 1997) (Blackett 1981; Bryant et al. 1999; Wright et al. 1997)as well as New Zealand, Chile, and the Great Lakes (Groot and Margolis 1991). In the Pacific Northwest, reintroduction and/or restoration via dam removal or passage improvement efforts at FERC hydroelectric projects are underway on the Elwha, Deschutes, Lewis, Cowlitz, Skagit, Umpqua, Hood, White Salmon, Sandy, Clackamas, Willamette, and Upper Columbia rivers.

Among other findings that provide support for the Services' Prescriptions, the ALJ found that there are numerous examples from other streams and rivers systems that provide persuasive evidence that anadromous fish possess the capacity and capability to successfully adapt and colonize new habitat or recolonize historic habitat, including streams or river systems with lakes and reservoirs (ALJ Decision at 16, FOF 2A-23; see also ALJ Decision at 16, FOF 2A-24). The Services see no reliable evidence that salmonids cannot be successfully reintroduced in the Klamath above Iron Gate Dam over time. Hydropower project impacts, including fish passage, must be addressed through relicensing. Once this necessary precursor to reintroduction is addressed, Federal, State, Tribal, and local governments, along with other land owners, can exercise their responsibilities to appropriately manage fish occupying new habitat and can plan for their future.

PacifiCorp (2006, page 53-54) states that passage through the Project jeopardizes establishment of viable populations of anadromous fish above Upper Klamath Lake because more and better quality habitat for anadromous fish production occurs in the basin above Upper Klamath Lake than in the Project area and upper basin fish would be forced, both as adult and juvenile migrants, "to encounter significant sources of mortality within the Project area (such as delayed travel time, predators, disease, impaired water quality resulting from nutrient load in UKL, and juvenile screening and bypass systems)." (Alternative, at 54). Similarly, PacifiCorp (2006, page 70) states that its trap-and-haul Alternative provides the best chance of successful reintroduction to the Upper Klamath Basin because it would allow fish to avoid high risk areas in the Project area "so as to provide the greatest possible opportunity for the reintroduction effort in the upper basin to succeed."

As noted above, fish passage is a necessary precursor to the larger reintroduction effort, and the focus in this proceeding is on mitigating Project impacts to the passage of fish. The Services fully intend to manage future reintroduction efforts to optimize benefits to anadromous and resident fish and return native fish to historically occupied habitats. The fishways prescribed herein will be used to adjust and refine the direction of the future reintroduction program. The Services are currently proceeding with studies to determine how reintroduction would best proceed (e.g., Maul et al. 2007). However, such efforts are separate from the Services' prescriptions and beyond the jurisdiction of this licensing proceeding.

We further note that PacifiCorp's comments concerning the risks potentially faced by anadromous fish through volitional passage were addressed in the ALJ hearing process. (See, *inter alia,* the ALJ's Findings of Fact for Issue 2(B), as discussed below in reference to specific PacifiCorp comments concerning the risk of disease; ALJ Decision at 15, Finding of Fact 2A-19 ("Predation of outmigrating salmonids above Iron Gate Dam is likely to be low."); ALJ Decision at 14, Finding of Fact 2A-14 ("Warm water temperatures in the summer and cold water temperatures in the winter will not preclude anadromous fish from successfully utilizing habitat above Iron Gate Dam."); ALJ Decision at 14, Finding of Fact 2A-

17 ("The amount of delay associated with anadromous fish migrating above Iron Gate Dam is uncertain."): ALJ Decision at 15, Finding of Fact 2A-19 ("Predation of outmigrating salmonids above Iron Gate Dam is likely to be low.); ALJ Decision at 15, 2A-20).

PacifiCorp (2006, page 64) states that all of the comparable large-scale reintroduction programs in the western United States rely on trap and haul to pass both juvenile and adult fish life stages, and that these programs have been recommended, developed, or approved by many of the same Federal and State fishery agencies involved here. PacifiCorp believes that there is no legitimate reason for those agencies to propose a different passage scheme for the Klamath River.

The Services prescribe volitional passage as the most effective method for re-establishing fish passage across dams. This is primarily due to the successes achieved with volitional passage in similar river systems in comparison to the risks associated with trap and haul; including the handling and transport of adult upstream migrants, in combination with the long term uncertainty of funding, maintenance and operation of trap and haul programs (National Marine Fisheries Service 2004). Volitional ladders have been accepted as effective and appropriate fishways, whereas trap-and-haul methods are generally considered when ladders are not technically feasible, desirable, or management goals include trapping anyway (National Marine Fisheries Service 2004a). There are numerous examples of successful introductions or reintroductions of anadromous salmonids using ladders (Blackett 1981; Bryant et al. 1999; Wright et al. 1997).

PacifiCorp (2006, page 67) states that their trap-and-haul Alternative would include collection, sorting, inspection for tags, and provisions for fish marking, and thus would help meet the monitoring and assessment needs associated with the reintroduction program.

The Services' Prescription includes hydraulic, water quality, and biological evaluations using Passive Integrated Transponder (PIT) or similar technology to detect and record fish passage and assess the performance of the fishway, including measures for follow-up evaluations of effectiveness and fish survival through fishways. PIT or similar technology is being used increasingly on the Columbia River system for management (Burke and Jepson 2006). This technology has several advantages over radio telemetry and it is critical to representative stocks of fish PIT tagged as juveniles to understand the consequences of hydropower decisions and provide information to manage anadromous populations (Mundy 1994; Burke and Jepson 2006).

PacifiCorp acknowledges the FERC staff conclusion in the DEIS that anadromous fish restoration through access to habitat within the Project area is largely within PacifiCorp's control. (Addendum, at 9, citing DEIS at 5-37). The Services agree with this assessment.

Comments Related to Disease Issues

PacifiCorp (2006, page 74) states that "the available spring Chinook stock in the lower river is known to have been exposed to IHN disease, which could seriously affect the native trout population in UKL." PacifiCorp (2006, page 88) states that "PacifiCorp's Alternative, which includes an adaptive program for reintroducing anadromous fish (Attachment A), would be able to address concerns about the introduction of fish diseases to upper Klamath basin. The Services' volitional fishway Prescription would potentially allow disease organisms found in lower river fish to be introduced into the upper basin, thereby potentially causing significant losses of native fish, such as redband trout, as well as added losses of anadromous fish for which the facilities are intended." PacifiCorp (2006, page 76) states that "[T]he alternative to collecting adults at Iron Gate Dam in the early years of the reintroduction program would be to transfer only eyed eggs or fry to the upper basin for release in areas expected to support juvenile rearing. In this way the eggs and/or fry could be certified as disease-free."

The disease issues were fully addressed in the ALJ hearing process. The ALJ found based on the evidence that many pathogens are already present in the upper and lower Klamath Basin (ALJ Decision at 20, FOF 2B-2; ALJ Decision at 21, FOF 2B-10; ALJ Decision at 22, FOF 2B-11 and 2B-17), and thus concluded that migration of anadromous fish would not be a significant factor contributing to disease in resident fish (ALJ Decision at 23, FOF 2B-22). He further found that there is insufficient evidence to determine whether IHN exists in either the lower or upper basin of the Klamath River (ALJ Decision at 21, FOF 2B-4 and 2B-5). The record evidence indicates that the existence of the virus IHN in the Klamath River system is "exceedingly rare." (ALJ Decision at 20, FOF 2B-3). Moreover, to date, there has been no research or studies completed concerning the actual occurrence of IHN in the upper basin of the Klamath River (ALJ Decision at 21, FOF 2B-4). The ALJ concluded that any suggestion that IHN exists in either the lower or upper Klamath Basin would be mere speculation (ALJ Decision at 62), and that facilitating the movement of anadromous fish through the prescribed fishways presents a relatively low risk of introducing pathogens to resident fish above Iron Gate Dam (ALJ Decision at 85, UFOF 4).

In the Addendum, PacifiCorp states its agreement with a statement in the DEIS that "disease related mortality to anadromous fish within the Klamath basin may have significant impacts on anadromous fish restoration efforts." (Addendum at 44, citing DEIS at 5-38). PacifiCorp goes on to note FERC staff's observation that "neither the Services' joint preliminary prescriptions nor PacifiCorp's April 25, 2006 Alternative sufficiently addresses disease issues in the lower river migratory corridor." (Addendum at 44). As PacifiCorp notes, much of the Commission staff's analysis and conclusions conflict with much of the testimony of the Federal and state fisheries agencies, the Tribes and the Conservation and Fisheries Group during the ALJ hearing process and with the subsequent findings of the ALJ. (Addendum at 45). The Services addressed this issue in their comments on the DEIS (see, for example, the Department of the Interior's DEIS comments at 23, stating that staff's conclusions are overstated and incorrect, and at page 25, expressing concerns with FERC staff's suggested development of a disease monitoring and management plan).

Comments Concerning Introgression

PacifiCorp (2006, page 88) states that "PacifiCorp's Alternative would not allow coastal-lineage steelhead trout to ascend above Iron Gate Dam without assurances that inbreeding with the upper basin interior lineage redband trout could be prevented. The Services' Prescription has no provision for the major concern of genetic introgression between coastal and redband trout."

The issue of introgression was fully addressed in the ALJ hearing process. The ALJ found that "[f]acilitating the movement of wild anadromous steelhead trout above Iron Gate Dam via prescribed fishways presents a low risk of residualization (a phenomenon most common among hatchery steelhead trout)." (ALJ Decision at 86, Ultimate Finding of Fact 5). During the hearing, PacifiCorp's sole witness on this issue conceded that the residualization of steelhead is not really an issue of concern. (ALJ Decision at 61, citing *PAC-Ols-R-1*). The ALJ noted that the issue of concern to PacifiCorp and Siskiyou County is the genetic effects on the resident trout. (ALJ Decsion at 61-62, citing *PAC-Ols-R-1*). He found it to be undisputed that resident trout have the genetic capacity to adopt anadromy and outmigrate to the ocean, where passage exists. (ALJ Decision at 62, citing Finding of Fact 2C-7). The ALJ noted that, historically, anadromous steelhead trout extended up to and used tributaries of Upper Klamath Lake. (ALJ Decision at 62, citing Findings of Fact 2A-3, 2A-5, and 2C-2).

In the Addendum, PacifiCorp asserts that its proposed Fisheries Technical Committee would provide necessary adaptive management to address potential problems with genetic introgression between coastal and redband trout, and claims that the Services' Prescriptions do not have a similar provision. (Addendum, at 46-7). This statement ignores the provision in the Services' Prescription for the upstream fishway at Iron Gate Dam, which includes the language: "The construction shall include features to modify the existing development to hold, count, and mark fish and to sort fish by age, species, and origin for the purposes of fish population restoration and management." These features will allow fishery managers to sort fish and to manage as necessary to deal with the types of potential problems raised by PacifiCorp.

Comments Concerning the Availability of Donor Stock

PacifiCorp (2006, page 76) states that there is not suitable donor stock of steelhead from within the basin that could adapt to the unique environmental conditions in the upper basin.

This issue was fully addressed in the ALJ hearing process. The ALJ found that "[s]tocks of anadromous fish suitable to conditions above Iron Gate Dam are available to use prescribed fishways." (ALJ Decision at 85, Ultimate Finding of Fact 3).

Comments concerning Additional Research and Monitoring Facilities and Operations

In the Addendum, PacifiCorp proposes to adopt certain elements of the Services' Preliminary Prescriptions. However, PacifiCorp then goes on to add that all of these prescribed facilities shall be studied by its consultants and that (following studies) a Fisheries Technical Committee (of unknown composition) shall have the authority to decide (by consensus) on whether to implement construction and operation of new facilities. This unnecessarily delays the design, construction, and operations timelines of needed facilities and improvements. Whether any facilities would be approved by consensus and whether the studies would provide reliable scientific information on which to base decisions remains unclear.

PacifiCorp proposes an extensive suite of multi-year studies aimed at tagging, tracking, monitoring, and managing the health and movements of adult and juvenile fish of different species. PacifiCorp proposes to use radio telemetry to determine the spawning locations of adult fall-run Chinook salmon, coho salmon, and steelhead. The effort and cost required to conduct all of the post-licensing studies proposed by PacifiCorp are considerable. Much of the study and tracking operations, as proposed by PacifiCorp, can be avoided through the Services' volitional fish passage strategies. Costs of these proposed studies, along with facilities necessary for juvenile and adult fish monitoring at numerous locations throughout the Project habitat, are not clearly enumerated.

As discussed in Section 3 of this document, and in this section, PacifiCorp's Alternative was fully considered in the Services' analysis and development of the Modified Prescriptions. In addition, PacifiCorp's Addendum was fully considered as new information in the Services' analysis and development of the Modified Prescriptions.

PacifiCorp Comments Dated December 29, 2006

In their December 29, 2006, filing titled *Response to Comments and Documents submitted by Stakeholders on the FERC DEIS related to Fish Passage Water Quality, Instream Flows, and Ramping Rates*, PacifiCorp provided the Services with comments on *other parties'* comments to the FERC DEIS. (PacifiCorp DEIS Response Comments). The Services note that such a category of document is not specifically recognized in the FERC regulations or the Services' joint regulations implementing the EPAct amendments to the FPA, and these comments do not appear to have been timely filed as comments on the DEIS. Nevertheless, in the time available, the Services have reviewed these comments and have considered any relevant evidence and supporting material provided therein.[17]

[17] With respect to the December 29, 2006, document, the Services respond here only to substantive comments and evidentiary claims relevant to the Services' exercise of mandatory authority to prescribe fishways under FPA Section 18 (*i.e.,* Section II of the document). The material relating instead to the Services' recommendations for instream flows and ramping rates (*i.e.,* Section III of the document) are not at issue in development of the Modified Fishway Prescriptions.

On page 4 of its DEIS Response Comments, PacifiCorp mischaracterizes NMFS' goals and objectives for the Preliminary Prescriptions in several places. The Services' goals and objectives are described in detail on pages A-7 to A-12 of NMFS' Preliminary Prescriptions, and pages C-2 through C-6 of the Service's Preliminary Prescriptions. While the Services' goals are consistent with the Klamath River Basin Fisheries Task Force Long Range Plan (LRP), they encompass a much broader scope than PacifiCorp's simplified suggestion. Further, as discussed in greater detail in Section 1 above, the goal to establish and maintain self-sustaining anadromous fish runs in the Upper Klamath River Basin, while a key part of the region's overall, long-term management objectives, is not the immediate objective of these Prescriptions. Consistent with the focus of Section 18 of the Federal Power Act, the Services' emphasis in this proceeding is to address the impacts of the Project and expand access to historical and currently suitable habitat above Iron Gate Dam.

On page 5, PacifiCorp states "NMFS … fails to reconcile its viewpoint on the high delayed mortality rates of trap-and-haul with its approval and inclusion of a trap-and-haul system in the preliminary prescriptions for use at Keno and Link dams during periods of high water temperatures to increase survival of fish to the upper basin."

Again, at page 8, PacifiCorp states:

> NMFS's DEIS comments also note that trapping and hauling fish when stream temperatures exceed 68°F may result in unacceptable mortality rates. *See* NMFS DEIS comments at 63. However, this statement contradicts the use of trap-and-haul in NMFS's proposed prescriptions. The proposed prescriptions require trap-and-haul of both juveniles and adults arriving at Link and Keno Dam from late June through early October when stream temperatures exceed this threshold temperature value.

The Services do not agree with these statements. In general, the Services prescribe volitional passage as the most effective method for re-establishing fish passage across dams in the Project. However, there are instances where trap-and-haul may be the only viable option for a particular site, as specifically noted in NMFS' Anadromous Salmonid Passage Facility Guidelines and Criteria (NMFS 2004). In their Preliminary and Modified Prescriptions, the Services include an interim, seasonal trap-and-haul operation between Keno and Link dams to address an isolated, seasonal, possibly temporary water quality condition that occurs only in some water year types and impacts only certain species. Flow rate changes and restoration programs in the Klamath River are expected to improve water quality conditions in this reach in the future and render the interim measure unnecessary.

The Services' rationale for this measure states at A-66, C-61:

> During most years, the Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) has dissolved oxygen concentrations greater than 6 mg/L and

> temperatures less than 20°C from mid-November through mid-June (Jason Cameron, BOR, pers. comm.). These conditions are within the criteria for migrating adult anadromous salmonids for these months (U.S. Environmental Protection Agency 2003). However, interim, seasonal, upstream trap and haul for adult Chinook salmon around Keno Reservoir and Lake Ewauna would be necessary during summer months when DO and temperature are out of criteria for this life stage of this species (USEPA 2003) and water quality conditions may not be suitable for migration. The Services expect that the major runs of these fish would occur from March to June for spring-run adult Chinook and October through December for fall-run adults. The Services expect trap and haul to be an effective interim, seasonal fish passage method for adult Chinook salmon under these summer conditions because only this species would be transported and only for a short distance. Other species need volitional fishways to access habitat in Keno Reservoir and Link River year round. Conditions in this reach are expected to improve over time to a point when volitional passage will be effective year-round for all target species. Water quality is expected to improve over the term of a new Project license through the implementation of the Total Maximum Daily Load (TMDL) process, imposition of state water quality certification conditions, and provisions of a new license including terms and conditions added by the Commission as well as the inclusion of recommendations pursuant to FPA section 10(j).

Although not specified, the Applicant apparently refers to fall-run Chinook salmon which may be up-migrating during October, when water quality may be sub-optimal (on a temporary basis until water quality can be improved). It is to their advantage for fall-run fish to enter the system and proceed as far upstream as possible, and it is well-known that these fish will hold in the lower parts of California river systems until conditions improve. The intent of the prescription is to provide passage past Keno Reservoir and Lake Ewauna as soon as fish are present below Keno Dam. The Services consider that this seasonal trap and haul would occur during those instances when water quality is marginally tolerable for Chinook salmon below Keno Dam, but water quality is less tolerable in Keno Reservoir and Lake Ewauna. For example, Keno Dam may add enough oxygen to the tailwater so that concentrations become tolerable. In this manner, the prescription provides for the opportunity for the fish to "decide" when they prefer to up-migrate. This limited trap-and-haul approach conserves the expression of the early-run phenotype, which may be important to the health of the genome.

PacifiCorp is unclear regarding which juveniles may be affected; however, its Alternative states that juvenile salmon would not be present above J.C. Boyle during the referenced time period (PacifiCorp 2006):

> At J.C. Boyle Dam, water temperatures during March and April, when juvenile salmon would be expected to arrive at the dam, would be suitable (42°C) for sorting and tagging.

Apparently PacifiCorp has confused anadromous salmonid temperature tolerances with other species which can tolerate higher temperatures. As the above quotes provide, the year-round operation of volitional fishways provides for passage of resident salmonids, suckers, and other species which may have broader temperature tolerances than adult Chinook.

Trap-and-haul at all dams would expose fish to higher levels of handling stress and mortality during these marginal periods, as well as during better water quality conditions. While the Services generally require volitional passage, this interim measure to handle this specific, limited situation is a reasonable approach given the specific conditions.

On pages 7 and 8, PacifiCorp refers to KlamRAS results in an effort to establish that the Services' comments regarding fish passage are not supported by existing scientific studies. PacifiCorp cites "KlamRAS Methods for Fish Passage Simulations on the Klamath River" as containing KlamRAS results. These results are not found in the cited document, but in a different document entitled "KlamRAS Results for Fish Passage Simulations on the Klamath River." PacifiCorp's discussion of KlamRAS results is highly selective: PacifiCorp does not report KlamRAS results that favor volitional passage over trap-and-haul methods. With respect to the results PacifiCorp does cite, it is doubtful 8 and 2 percentage point differences are large enough to be meaningful.

KlamRAS is not a scientific study. It is a numerical model that has not been calibrated against actual field results. It applies to one species only and results are not valid for spring run Chinook, steelhead, or lamprey. It does not account for a myriad of biological parameters important to fish passage, such as benefits to population viability for ESA listed species.

PacifiCorp's December 29, 2006, Response to NEPA Comments has been fully considered in the Services' analysis and development of the Modified Prescriptions.

Comments by Stakeholders other than PacifiCorp that concern the Preliminary Fishway Prescriptions.

The Services considered several types of documents falling within this category, to include comments filed directly with the Commission that relate to the Preliminary Fishway Prescriptions or PacifiCorp's Alternative; comments filed with FERC responding to the DEIS that relate to the Preliminary Fishway Prescriptions or PacifiCorp's Alternative (PacifiCorp dated its Addendum the same day as the close of the comment period on the DEIS); and comments filed directly with the Services that relate to the Preliminary Fishway Prescriptions, PacifiCorp's Alternative and/or PacifiCorp's Addendum.

The Services reviewed documents filed with FERC, as listed on the FERC Online eLibrary for the Klamath Project, for the period between the filing of the Preliminary Prescriptions in March 2006 and December 1, 2006, the close of the comment period on

the DEIS. A keyword search was conducted on the filings submitted during this period, and most were determined not to relate to the Preliminary Fishway Prescriptions or PacifiCorp's Alternative and thus were not further considered.[18] Eleven comments (excluding those filed by PacifiCorp which are discussed separately, above) reviewed were found to contain comments inconsistent with the Preliminary Prescriptions, but only one was determined to raise substantive issues. This comment, a DEIS comment from the City of Yreka, is discussed below. Comments filed directly with the Commission that were consistent with the Preliminary Prescriptions were reviewed but are not discussed further here. Below, we address the City of Yreka's comments to the Commission on the DEIS and comments filed specifically with the Services that address the Preliminary Fishway Prescriptions, the Alternative and/or the Addendum.

City of Yreka

In comments submitted November 29, 2006, to the Commission in response to the DEIS for the Klamath Project, the City of Yreka concurs with the FERC staff analysis regarding the installation of fish ladders at the Fall Creek Diversion Dam (citing to pages 2-18 and 3-276 of the DEIS). The City states that the fishway prescription seems inappropriate and of very limited value to the fishery since it serves only a limited stream reach accessible to resident fish and makes negligible contribution to improving either water quality or fishery habitat. This information was fully considered by the Services in the analysis and development of the Modified Prescriptions.

Comments of the Hoopa Valley Tribe

By letter dated November 29, 2006, the Hoopa Valley Tribe submitted Comments on PacifiCorp's Proposed Alternative to NMFS and the Service, which request that the Services reject PacifiCorp's less protective alternative and adopt the volitional fishway prescriptions as the final prescriptions. The Tribe notes that PacifiCorp raised many of the arguments supporting its Alternative in the ALJ hearing, but failed to prove its case on each issue, including stock suitability, water temperature, habitat needs, juvenile migration survival, disease introduction, and impacts on coho. The Tribe asserts that PacifiCorp's alternative relies on flawed data, science, and analysis. The Tribe further comments that trap-and-haul is not as protective as volitional passage, citing NMFS policy disfavoring the use of trap-and-haul due to concerns with trap rejection; ineffective diversion of fish into traps; intensive operation and maintenance costs; extensive fish handling, resulting in significant fish stress, injury and mortality; poor downstream passage; and evidence from other river systems that shows significant limitations of trap-and-haul as a means to pass fish. The Tribe further faults PacifiCorp's proposal for

[18] Documentation of the FERC eLibrary listing of filings during the relevant time period, a memorandum explaining the search action conducted by the Services, and a spreadsheet detailing the results of the keyword search are included in the Services' Supplemental Administrative Record, under the following headings: FERC eLibrary Listing of Filings in the Klamath Project proceeding; Theiss, Eric. Memorandum Synthesis of Comments Pertaining to Klamath River Hydroelectric Project Section 18 Fishways Prescription Alternatives Analysis; and Table: Alternatives Analysis: Comment Synthesis Details.

failing to recognize the varying needs and life histories of the different species targeted for reintroduction, including Pacific lamprey and steelhead, and for bypassing suitable habitat within the Project area. Noting that the alternative does not address the water quality concerns in Lake Ewauna, the Tribe asserts that this failure is another aspect in which the Alternative is less protective than the fishway prescriptions. The Tribe further faults PacifiCorp for selective reliance on EDT and KLAMRAS modeling data. This information was fully considered by the Services in the analysis and development of the Modified Prescriptions.

On December 12, 2006, the Hoopa Valley Tribe submitted additional Comments to NMFS and the Service, on PacifiCorp's December 1, 2006, Addendum, urging the Services not to consider the Addendum as an alternative, as it was not timely submitted, but instead to consider it as "evidence and supporting material" in accordance with the Services' regulations. The Tribe faults PacifiCorp's proposal in several ways, including its failure to provide for restoration of fish to the Upper Klamath Basin; its inappropriate reliance on passage survival rates to compare trap-and-haul with volitional passage, which ignores delayed mortality resulting from trap-and-haul; and its failure to indicate how it would return fish to the correct spawning grounds. This information was fully considered by the Services in the analysis and development of the Modified Prescriptions.

Comments of Oregon Department of Fish and Wildlife

By letter dated December 1, 2006, the Oregon Department of Fish and Wildlife (ODFW) provided comments to NMFS and the Service on PacifiCorp's Fish Passage Alternative. ODFW expresses the view that PacifiCorp failed to explain why its trap-and-haul proposal was favorable to the Preliminary Fishway Prescriptions. ODFW further expresses its support for the Services' volitional prescriptions, based in large part on Oregon statutory and management direction to restore passage and natural flow conditions, to provide upstream and downstream passage for native migratory fish (including anadromous and resident fish species), and to install screening or bypass devices. ODFW faults PacifiCorp's Alternative, finding it unclear on the methods for proposed introduction, lacking support or description of the passage conditions, lacking connectivity between Project reaches needed by both anadromous and resident species, lacking direct mitigation for Project impacts, and states that PacifiCorp's studies are lacking in credibility. The Alternative would bypass many miles of suitable habitat and tributaries within the Project boundary, and would present risks of handling and transport and other noted problems with trap-and-haul (including trap rejection, extensive fish handling, system disruption, higher risk of disease and crowding, water temperature effects, and delayed adult mortality). This information was fully considered by the Services in the analysis and development of the Modified Prescriptions.

Comments of Conservation and Fisheries Groups

On January 12, 2007, the Conservation and Fisheries Groups (American Rivers, California Trout, Friends of the River, Institute for Fisheries Resources, Klamath Forest Alliance, National Center for Conservation Science and Policy, Northcoast Environmental Center, Oregon Wild, Pacific Coast Federation of Fishermen's Associations, Salmon River Restoration Council, Trout Unlimited, Water Watch of Oregon) submitted comments to NMFS and the Service on PacifiCorp's Alternative and its December 1, 2006, Addendum, urging the Services to reject the alternative and the Addendum as the alternative fails to meet the "no less protective" standard set forth in section 33 of the FPA, and that the Services adopt the Preliminary Prescriptions. The Conservation and Fisheries Group note that many of the most important facts relied on by PacifiCorp to support its alternative conflict with the Findings of Fact from the ALJ Decision and that other assertions are unsupported by the scientific evidence in the record. The Conservation and Fisheries Group attach Comments from Rick Williams, PhD, that fault PacifiCorp's trap-and-haul alternative for its reliance on management actions that are primarily technological in nature, and which ignore issues of natural timing, biological diversity and fish behavior. Such technologically-based actions have often in the past resulted in unanticipated adverse biological effects on the target species. Dr. Williams' comments include an examination of recent efforts on the Columbia River system, and results showing increased survival for wild fish that migrated in-river, as opposed to those transported in a barge system. He states that transported fish showed decreased homing ability, increased rates of straying, increased fallback at dams, and increased unaccounted losses during adult return migration. Dr. Williams states that dam removal is the preferred choice, with volitional passage an acceptable alternative choice; he states that trap-and-haul is the least desirable choice and one likely to result in lowered performance by individual stocks and the possibility of unexpected adverse results. This information was fully considered by the Services in the analysis and development of the Modified Prescriptions.

Comments of the Yurok Tribe

By letter dated January 16, 2007, the Yurok Tribe submitted Comments on PacifiCorp's Addendum and Modifications to PacifiCorp's Proposed Alternative Section 18 Prescriptions and Section 4(e) Conditions for the Klamath Hydroelectric Project to NMFS, the Service and to the Commission. In its comments, the Yurok Tribe urges the Services to reject the modifications submitted in PacifiCorp's Addendum as untimely and in conflict with the regulations guiding the alternative prescriptions process. The Yurok Tribe notes that PacifiCorp's filings conflict with the Findings of the ALJ and with the weight of scientific evidence considered in the ALJ hearing process. The Yurok Tribe faults PacifiCorp for failing to provide scientific evidence supporting its claim that its alternative would be no less protective to fish than the Services' Fishway Prescriptions. The Yurok Tribe further faults PacifiCorp's hatchery production proposal for failing to address mortality of species other than fall Chinook. The Yurok Tribe states trap-and-haul is extremely stressful to adult anadromous fish, causing immediate and delayed mortality as well as sub-lethal effects that will increase mortality. The Yurok Tribe includes with its comments a report by Steward and Associates, entitled "Assessment of

Volitional and Non-Volitional Fish Passage Systems Relative to the Klamath River Hydroelectric Project," which compares and focuses on the ecological impacts of volitional fish passage and trap-and-haul systems. This report examines issues for upstream passage including: collection efficiency, passage success through ladders and reservoirs, selective transport by species and stream of origin, transportation stress for adult fish, and the use of transport in unique circumstances for adult salmonids; an examination of passage options, collection efficiency, and transportation stress for adult anadromous lamprey; and passage efficiency and sorting requirements for resident fish. For downstream passage, the report examines collection efficiency, reservoir impacts, transportation effects on homing, stress effects of collection and transport, transportation effects on survival on juvenile anadromous salmonids; steelhead kelts; juvenile lamprey; and resident fish. This information was fully considered by the Services in the analysis and development of the Modified Prescriptions.

Section 5. Reservation of Authority to Prescribe Fishways

The Services have prepared their Modified Prescriptions for Fishways in response to the proposals under consideration by the Commission in this proceeding, comments received by the Services and by the Commission relating to the Preliminary Fishway Prescriptions, and after full consideration of the Alternative submitted under section 33 of the FPA. If any of the underlying proposals for licensing of the Project are modified prior to licensing, as a result of licensing, or during the term of the new license, then the Services will require adequate opportunity to reconsider each prescription and make modifications deemed appropriate and necessary for submittal to the Commission.

In their Preliminary Prescriptions, the Services submitted for Commission inclusion in any new license issued for the Project, separate conditions reserving their respective section 18 authority. The discussions underlying those reservations of authority are hereby incorporated by reference. At this time and for purposes of the Modified Prescriptions, the Services file this joint Modified Reservation of Authority for the Commission to include in any new license issued for the Project:

> Authority is reserved for the Services to prescribe the construction, operation, and maintenance of additional or modified fishways at the Klamath River Hydroelectric Project, Project No. 2082, as appropriate, including measures to determine, ensure, and improve the effectiveness of such fishways, pursuant to section 18 of the FPA, as amended. This reservation includes, but is not limited to, authority to prescribe fishways for spring and fall-run Chinook salmon, coho salmon, steelhead trout, Pacific lamprey, Lost River and shortnose suckers, resident trout, and any other fish to be managed, enhanced, protected, or restored to the Klamath River Basin during the term of the license. Authority is reserved to the Services to prescribe an upstream fishway to sucker criteria at Keno Dam pending the evaluation of the need for such a fishway. The Services are prescribing the design and construction standards for fishways herein. As an

alternative, if necessary, authority is reserved to prescribe performance standards to ensure safe, timely, and effective movement.

The preamble to the Joint Regulations implementing the EPAct states that "license parties cannot request a hearing regarding the reservation of authority itself, or submit alternatives to such reservation." 70 Fed. Reg. 69804, 69808 (November 17, 2005). In its Alternative submittal to the Services, PacifiCorp did not submit an alternative to the reservation of section 18 authority but did raise legal arguments relating to the Services' reservations of authority. PacifiCorp asserts that the Services' "broad reservation of authority would vitiate the due process rights conferred by Congress and contravene the plain language of the ...." EPAct. (PacifiCorp 2006 at 11). As noted in the preliminary prescription filing, the Services' reservation of authority has been accepted by the Commission and judicially affirmed. *Wisconsin Public Service Corp.,* 62 FERC ¶61,905 (1993), *aff'd, Wisconsin Public Service Corporation v. FERC*, 32 F.3d 1165 (7th Cir. 1994). As recognized recently by the Commission with respect to a reservation of the Department's section 4(e) authority, "[a] reservation of authority is a well-recognized means of obtaining the licensee's consent to modifications that may be necessary during the term of the license." *Public Utility District No. 1 of Pend Oreille County, Washington,* 117 FERC ¶ 61,205 (2006) p. 32, para. 88. Both the Court of Appeals and FERC recognize that future exercise of the reserved authority would require notice and an opportunity for hearing. *Id., Wisconsin Public Service, 32 F.3d at 1170.* Moreover, the joint regulations implementing the EPAct further recognize that the hearing and alternatives process will be available if and when the Services exercise this reserved authority. 43 C.F.R. § 45.1(c); 50 C.F.R. § 221.1(c).

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ATTACHMENT 1

SECTION C

U.S. DEPARTMENT OF THE INTERIOR AND NATIONAL MARINE FISHERIES SERVICE MODIFIED PRESCRIPTIONS FOR FISHWAYS FOR THE KLAMATH HYDROELECTRIC PROJECT

These prescriptions for the Klamath Hydroelectric Project (FERC Project No. 2082; hereafter Project) include design specifications and implementation schedules, operating requirements and procedures, and specifications for post-installation implementation, evaluation, and maintenance. The U.S. Fish and Wildlife Service (Service) and National Marine Fisheries Service (NMFS) (collectively the Services) have carefully reviewed these modified prescriptions and consider them to fall fully within the scope of their section 18 authority. In general, the Licensee shall develop all elements of the prescriptions in consultation with appropriate technical specialists of the Services, along with the California Department of Fish and Game (CDFG), the Oregon Department of Fish and Wildlife (ODFW), and affected Tribes where appropriate.

Design, construction, evaluation, monitoring, and modifications of developments shall be conducted according to NMFS guidelines (National Marine Fisheries Service 2004). The Services expect that the Licensee shall employ all measures necessary and appropriate to maximize upstream and downstream fish passage effectiveness for resident and anadromous species over the full range of river flows for which the Project maintains operational control. The Licensee shall manage Project reservoirs and forebays to ensure that all upstream and downstream fish passage facilities are fully operational at all times and at all reservoir elevations and inflows. Other modified general prescriptions for fishways are specified to provide for the modification, inspection, and maintenance of upstream and downstream fishways during the term of the license.

Throughout the document, each Modified Prescription is preceded by its supporting rationale. This convention and the numbering system are consistent with the organization of the Preliminary Prescriptions and are provided for ease in comparing the two documents.

The Services' Modified Prescriptions are based upon consideration of the available evidence, including comments received on the preliminary prescriptions and in response to the Commission's draft NEPA analysis, the ALJ's decision and supporting record in the Klamath Project trial-type hearing under Section 18 of the Federal Power Act, as amended by the Energy Policy Act of 2005, and the Applicant's proposed alternative submitted pursuant to section 33 of the Federal Power Act. As explained more fully in the main document, the Services also considered as new information, to the extent it presented "evidence and supporting material" as

provided in the Departments' joint regulations,[1] the December 1, 2006 Addendum submitted by the Applicant. The Addendum was not considered as a new alternative under FPA Section 33, because it was submitted beyond the applicable regulatory deadline. *See* 43 C.F.R. § 45.71(a)(2); 50 C.F.R. § 221.71(a)(2).

Rationale for Modified General Prescriptions*:*

Agency Review and Approval: Because the Services, along with other Federal, State, and Tribal partners, have considerable expertise, experience, and responsibilities in fishway system design and operations, it is standard procedure for the type of design review procedure required by this prescription to be instituted for any fishway plans proposed by the Licensee. This is particularly true where Federal and State oversight is provided by law, either explicitly or implicitly, as is the case here. The Services possess multi-disciplinary technical review capabilities to assist the Licensee in developing effective functional fishway system designs. A Fisheries Technical Subcommittee (FTS), to be established by the Services and comprised of engineers, biologists, and other fish passage specialists, will help ensure quality and performance of complex hydraulic and biological systems.

Sequencing of Construction and Operations: As explained in greater detail below in the rationale for modified specific prescriptions, adult and juvenile fish may migrate into Project facilities that may cause injury or mortality if measures are not in place to ensure their passage. For example, adult fish migrating upstream via a fish ladder may become susceptible to entrainment in hydro-turbines unless the downstream screening facilities are also in place. Large numbers of juvenile fish (downstream migrants) will be particularly susceptible to entrainment into hydro-turbines if screen and bypass systems are not in place and functioning for their protection. The Services intend to work with the Licensee to design the best sequence for the construction and operation of fishway facilities when more specific design information is known.

Design and Construction: The Services prescribe the development of design and construction plans to ensure that the developed fishways are approved by the Services to meet the requirements of providing safe, timely, and effective passage. Review by the FTS will ensure that the most effective designs are adopted and implemented. The phased schedule ensures that fishways are installed to meet the needs of the fish and avoid injury or mortality to fallback fish.

Access to Developments and Records: Reasonable access to developments and Project records is necessary so that Agency personnel will be able to evaluate fishway performance, inspect fishway facilities, and help to optimize facility performance.

Post-Construction Evaluation: The Licensee must complete a Post-Construction Evaluation Plan for review and approval by the Services because it will be necessary to determine fishway system effectiveness and to identify and correct any fish delay, loss, injury, or hydraulic problems that may be present. Adjustments are often required to achieve optimal fish passage

[1] See 43 C.F.R. § 45.73(a) (DOI); 50 C.F.R. § 221.73(a) (DOC).

conditions within the fishway, in front of screens, and within bypass systems; or to achieve effective attraction flows in front of fishway entrances. After the initial adjustments have been made, wear and tear, accumulation of sediment and other debris, and various other factors can, over a period of time, alter hydraulic conditions and decrease the effectiveness of fishways (National Marine Fisheries Service 2004). Therefore, periodic evaluations of fishway effectiveness are necessary to assure continuing compliance and the safe, timely, and effective passage of fish.

Maintenance Requirement: It is essential that the Licensee observe proper maintenance practices for the correct, long term operation of each facility. Large scale fishways and fish passage systems are subject to continuous operations and harsh riverine and climatic conditions. Because vital fish migrations occur at each site on a regular basis, the Services must be notified whenever system maintenance is required that may cause excessive delay, injury, or mortality to migrating fish, or other species. An explicit element of fishway maintenance is the design of facilities that can withstand the elements and perform in continuous duty. Proper maintenance is necessary to ensure the temporal movement of fish in completing their biological requirements, including spawning, smolting, and outmigration (National Marine Fisheries Service 2004).

Operation, Inspection, and Maintenance Plans: Effective operation and performance of the fishways, including fish screens, conveyance, and bypass facilities, are also dependent on regular inspection and maintenance to assure proper operating conditions within the fishway. Wear and tear, corrosion, accumulation of sediment and debris, and various other factors decrease the effectiveness of the fishway's physical features such as screens and seals. If left untreated, this would increase fish losses. Annual inspections of the physical features prior to each migratory period are necessary to assure that all elements of the fishways are in good condition and will operate effectively (National Marine Fisheries Service 2004). Maintenance procedures during shutdown periods need to include provisions for timing fishway maintenance to avoid peak migration periods and safely removing fish from the fishways and returning them to the river. All fishway elements need to be made available to fishery agencies (the Services, CDFG, ODFW, and affected Tribes) for immediate inspection to ensure proper implementation of and compliance with fishway operation and maintenance conditions. The required plan will include these necessary elements to ensure that operation, inspection, and maintenance are planned and approved by the Services.

Fishway Evaluation and Modification Plans: It is important that the Licensee complete Fishway Evaluation and Modification Plans (FEMPs) for the optimal operation of each fishway for the safe, effective, and timely passage of each species. These plans need to include measures to remedy problems with fish passage observed through operations and maintenance and fishway evaluations. FEMPs are necessary to achieve program goals, objectives, and strategies. To assess progress towards these goals and objectives, and minimize fish losses, the Service and NMFS-Engineering must approve these plans.

Annual Work Plan: The FEMPs will include an Annual Work Plan describing prospective actions the Licensee will take to implement and monitor fish passage. The Work Plan will

ensure adequate and timely coordination between the Licensee and the Services, allowing the Services to determine whether program goals are being achieved and whether the Licensee is utilizing appropriate methodologies.

Attraction Flow: Minimizing excessive migration delays during spawning runs is an important objective in the design of upstream fishways for anadromous fish. Should excessive delays occur in their journey to find suitable spawning habitats, reproductive failures may result. This is because anadromous fish have evolved with finite energy reserves during spawning migrations to complete their reproductive cycle. Upstream fishways and their bypass reaches must be designed and operated so as to facilitate safe, timely, and effective fish passage, including the minimization of excessive migration delays. The concept of attraction flow for fishway designs is central to this theme, and is further explained below.

The definition of a "fishway" includes "*…project operations and measures related to [and]…necessary to ensure the effectiveness of [the]…structures, facilities or devices..."* that constitute the fishway.[2] The Services interpret this definitional phrase to include sufficient flow regimes that will consistently attract migrating fish into the fishway entrances <u>and</u> bypass reaches without excessive delay. In other words, these flows are related to and necessary to ensure the effectiveness of the structures, facilities, or devices for fish. Such flows, in fish passage terms, are here generically referred to as "attraction flows."

Failure to provide the necessary attraction flows at key locations could result in significant migration delay, or failure of fish to find the fishway entrances. Thus, these attraction flows are "*…project operations and measures related to [and]…necessary to ensure the effectiveness of [the]…structures, facilities or devices..."* that constitute the fishway.

<u>Attraction Flow for Bypass Reaches</u>

When adult anadromous fish approach the confluence of an extended fish passage bypass reach with a powerhouse discharge, they will frequently explore the powerhouse outflow because it is usually flowing with greater water volume. However, fish will choose to swim up the bypass reach if they can sense a jet of higher velocity flow originating from the adjacent stream. The hydraulic conditions of this high velocity jet are critical cues to migrating fish looking for a path upstream (Ferguson et al. 2005). Therefore, where Project facilities include extended bypass reaches, fishway engineers must not only create the hydraulic conditions needed to attract fish into the fishway entrance pools; but they must also ensure that flows and hydraulic conditions are sufficient to attract fish at the point of confluence between the bypass reaches and downstream powerhouse discharges.

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[2] National Energy Policy Act of 1992, P.L. No. 102-486, section 1701(b) "...the items which may constitute a "fishway" under section 18 for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish, and project operations and measures related to such structures, facilities, or devices which are necessary to ensure the effectiveness of such structures, facilities, or devices for such fish."

Attraction Flow at Fishway Entrances

Once at a dam, adult anadromous fish search across the downstream face looking for passage routes. Entrance preferences are for deep/wide openings with significant attraction flow. Fish may be particularly attracted to the large volumes of flow and high velocities associated with tailrace discharges and spillways, typically causing false attraction and migration delay. To counter this tendency for false attraction, a correctly designed fishway entrance must produce a significant percentage of total stream flow combined with the correct hydraulic characteristics; such that it is capable of attracting fish into the relatively lesser flow emanating from a fishway entrance (Ferguson et al. 2005).

Experience with other fish facilities often shows that lack of adequate attraction flow can limit fish passage effectiveness because migrating fish have difficulty detecting the correct route to swim upstream. Providing enough attraction flow and correct hydraulic conditions at key attraction points is critical to the success of any fishway system design (National Marine Fisheries Service 2004). However, water allocated for attraction flow is typically unavailable for electricity generation.

The Services recognize the competing interests for available flows at each of the Licensee's Klamath hydropower developments. The Services further recognize the need to achieve an optimal flow allocation such that safe, timely, and effective fish passage is consistently achieved, while at the same time preserving as much flow as possible for hydropower generation. While the Services provide some guidelines for fishway design in corresponding project-specific sections below, flow optimization functions can only be derived from a detailed analysis during the design process and through post-construction facility evaluations. Therefore, all fishways must have the capacity to deliver ample water to consistently provide safe, timely, and effective fish passage. The licensee may commission further scientific studies to demonstrate optimal allocations of flows for specific fishways during fish migrations, specifically including flows at the confluences of bypass reaches and hydro-turbine discharges. Optimization means scientifically determining a combination of attraction flows through the fishways and bypass reaches that consistently produce fish passage efficiencies equivalent to full attraction flow releases, according to the design guidelines given for each individual project. All post-construction flow optimization studies for fishway and bypass attraction flow performance shall be conducted consistent with the Modified General Prescriptions below.

High and Low Passage Design Flow Rationale: The design streamflow range for fish passage, bracketed by the designated fish passage design high and low flows, constitutes the bounds of the fish passage facility design where fish passage facilities must operate within the specified design criteria. Within this range of streamflow, migrants must be able to pass in a safe, timely, and effective manner.

The low passage design flow is the lowest stream discharge for which migrants are expected to be present, migrating, and dependent on the proposed facility for safe passage. The high fish passage design flow is the highest stream discharge for which migrants are expected to be

present, migrating, and dependent on the proposed facility for safe passage. Within this range of streamflow, migrants should be able to pass in a safe, timely, and effective fashion. Outside of this flow range, fish are expected to be either not present or not be actively migrating, or shall be able to pass safely without need of a fish passage facility. Site-specific information is critical to determine the design time period and river flows for the passage facility. Local hydrology and site conditions may require that these design streamflows be modified for a particular site (National Marine Fisheries Service 2004).

Modified General Prescriptions:

The following modified general prescriptions for fishways apply to each of the Services' specific prescriptions for the construction, operation, and maintenance of upstream and downstream fishways at the Project. These modified prescriptions are intended to ensure the effectiveness of the fishways pursuant to section 1701(b) of the 1992 National Energy Policy Act (P.L. 102-486, Title XVII, 106 Stat. 3008).

1.1.1. *Design and Construction Plans*: For each facility, the Licensee shall develop detailed design, construction, evaluation, and monitoring plans for review and approval by the Services prior to construction. All original plans, and subsequent modifications of facilities, shall be conducted according to NMFS guidelines for the design of fish screens, fishways, and other fish passage structures (National Marine Fisheries Service 1997, 2004). The Licensee, or their authorized and qualified agent(s),[3] shall have all designs reviewed by the Fisheries Technical Subcommittee (FTS) (which is to be established by the Services and comprised of engineers, biologists, and other fish passage specialists). The Licensee and its agents must establish close consultation with the Services' fisheries engineering and fish passage specialists at the outset of design and throughout the entire process. The initial design meetings shall commence at the pre-design, or conceptual-level design phase. Prior to advancing to feasibility-level of design, the Licensee must obtain concurrence from the Services with all preferred alternatives for each independent facility, or any major feature of a facility. The Licensee shall then proceed with the feasibility and final design phases providing detailed design, specification, and construction plans at the 50, 90, and 100 percent stage of completion. The Licensee shall schedule and provide a minimum of 90 days for the Services to review and approve comprehensive plans. Shorter review periods may be possible, depending on the nature of the subject, as approved by the Services. The Licensee shall implement any design modifications as required by the Services as necessary to fulfill the objective of safe, timely, and effective passage for all species considered.

[3] "Authorized agents" will typically be qualified engineering and/or biological consulting firms who specialize in this area of work.

1.1.2. *Access to Developments and Records*: The Licensee shall provide timely site access to the Services, CDFG, ODFW, and affected Tribes at all Klamath River Hydroelectric Project developments, as well as pertinent Project records for the purpose of inspecting fishways to determine compliance with this fishway prescription.

1.1.3. *Maintenance Requirement:* The Licensee shall keep all fishways in proper order, and shall keep all fishway areas clear of trash, sediment, logs, debris, and other material that would hinder fish passage, or create a personnel safety hazard. The Licensee shall perform anticipated maintenance well in advance of any critical migratory periods so that fishways can be tested, inspected, and be operating effectively during fish migration. If any fishway system becomes seriously damaged or inoperable, the Licensee shall notify NMFS-Engineering and the Service within 48 hours. The Licensee shall take remedial action in a timely manner and in a manner satisfactory to NMFS-Engineering and the Service. Fish passage facilities shall be completed, and brought on line, in a phased schedule. This will allow appropriate time and sequencing for design, contracting, construction, and in some cases, studies of the optimal design for tailrace barriers, or other facility enhancements not immediately apparent. Unless otherwise approved, downstream fishways (screens, bypasses, and spillway modifications) at each development must be complete prior to the completion of the upstream fishway at any given development. The designs approved by the Services shall be filed with the Commission.

1.1.4. *Fishway Operation, Inspection, and Maintenance Plans*: The Licensee shall, in consultation with the Services, affected Tribes, CDFG, and ODFW, develop fishway operation, inspection, and maintenance plans describing anticipated operation, inspections, maintenance, schedules, inspections, and contingencies for each fish passage facility. The operation, inspection, and maintenance plans shall be submitted to the Service and NMFS-Engineering for final review at the same time as final designs for fishway construction. To minimize fish losses, the Licensee must complete these plans and ensure adequate time for review and approval by the Service and NMFS-Engineering prior to the completion of construction and operation of each upstream and downstream fish passage facility. After approval by the Services, the Licensee shall file these plans with the Commission.

1.1.5. *Post Construction Fishway Evaluation Plans:* Prior to the completion of construction of the new fishways, the Licensee shall, in consultation with the Services, ODFW, CDFG, and affected Tribes, develop post-construction monitoring and evaluation plans to assess the effectiveness of each fishway, spillway, and tailrace barrier prescribed below. The plans shall include hydraulic, water quality, and biological evaluations using Passive Integrated Transponder (PIT) or similar technology to detect and record fish passage and assess the performance of the fishway, including measures for follow-up evaluations of effectiveness and fish survival through fishways. The

Licensee shall provide a report to the Services on the monitoring and evaluation of the developments annually for the term of the new license. Specifically, the plans shall include measures to estimate numbers of fish passed by species on a daily basis (including but not limited to spring-run and fall-run Chinook salmon, coho salmon, steelhead, Pacific lamprey, Lost River and shortnose suckers, and redband/rainbow trout), sampling of fish size, and the sampling of age class of fish passed at each development on a daily basis; a record of the daily observations by a qualified fisheries biologist on the physical condition of the fish using the fishways; and a continuous record of DO (dissolved oxygen) and water temperature at locations in the fishway as determined by the Services, and in front of and adjacent to the entrance(s) and exit(s) of the fishways; and an implementation schedule. The evaluation plans shall be submitted to the Services for final review and approval within six months of the date when final designs for fishway construction are approved by the Services. At least 60 days shall be provided for the Services to review the evaluation plans. The Licensee shall fund and implement the approved plans and any plan modifications, and operational or physical changes necessary for the safe, effective, and timely passage of fish as may be required by the Services. After approval by the Services, the Licensee shall file these plans with the Commission.

1.1.6 *Fishway Evaluation and Modification Plans:* The Licensee shall, in consultation with the FTS, prepare a Fishway Evaluation and Modification Plan (FEMP) for each fishway, spillway, and tailrace barrier prescribed to achieve the Services' fish passage goals and objectives. The Licensee shall provide an outline of the FEMPs to the Services no later than one year after license issuance. Consultation with the Services, CDFG, ODFW, and affected Tribes shall begin as soon as fishways are operational. The Licensee shall document all consultation, including the agencies' responses to requests for consultation, and include this documentation in the FEMPs. The complete FEMPs shall be submitted to the Services for review and approval no later than eighteen months from the date of license issuance. At least 60 days shall be provided for review. After receiving the Services' approval, the Licensee shall file the FEMPs with the Commission.

A. Each FEMP shall include:

1. A specifically quantified program to meet the Services' fish passage goals, objectives, and strategies;
2. The Services' criteria by which to measure progress towards fisheries management goals;
3. Procedures for redirecting effort, including funding, as necessary under adaptive fishway management to achieve the Services' goals and objectives;

4. A schedule for implementation of activities to achieve the Services' goals and objectives;
5. A monitoring plan to evaluate progress towards, and achievement of, the Services' goals and objectives; and
6. A format for the Annual Report and Annual Work Plan, which are described below.

B. The Services, in consultation with the ODFW, CDFG, and affected Tribes, will review the FEMPs and reserve the right to accept, reject, or modify the FEMPs, in whole or in part, to ensure the safe, timely, and effective passage of resident and anadromous fish. Any reviews or amendments to the FEMPs, over the term of the license, shall be subject to the same level of the Services' review and approval as the original FEMPs. After receiving the Services' approval, the Licensee shall file with the Commission FEMPs and any amendments therein.

C. By February 1 of every year, for the term of the License and all annual licenses, the Licensee shall submit to the Services for approval an Annual Report detailing the work accomplished under the FEMPs during the previous calendar year, progress made toward program goals and objectives, plans or suggestions to redirect effort per adaptive fishway management with a detailed justification of why this is warranted, and documentation of consultation with the Services and their responses. After receiving the Services' approval, the Licensee shall submit each Annual Report to the Commission.

D. By December 1 of every year, for the term of the License and all annual licenses, the Licensee shall submit to the Services for approval an Annual Work Plan detailing the Licensee's proposed activities for the next calendar year as necessary to implement the FEMPs. The work plan must provide sufficient detail for the Services to determine whether the Plan continues to provide for the safe, effective, and timely passage of resident and anadromous fish. The Annual Work Plan shall include, but not be limited to, detailed information on methods to be employed; schedule of activities; and explanations of how planned activities will help attain program goals. After receiving the Services' approval, the Licensee shall submit each Annual Work Plan to the Commission.

1.1.7. *Upstream Fishway Attraction Flows and Range of Design Flow*: The following general prescriptions for design flow ranges and attraction flows for fishways apply to each of the specific prescriptions below for the construction, operation, and maintenance of upstream fishways at the Project. These prescriptions are included to ensure the effectiveness of the fishways. If other mandatory license conditions or regulatory conditions

require greater flows, the Licensee shall provide attraction flows and design flows consistent with those greater flows.

A. Design Streamflow Range
In consultation with the FTS and the Services and according to the terms of Modified General Prescriptions applicable to facility designs, the Licensee shall design each upstream fish passage facility to pass migrants throughout a design streamflow range, bracketed by a designated High and Low Fish Passage Design Flow, in accordance with NMFS guidelines and criteria (National Marine Fisheries Service 2004), unless site-specific analysis conducted in consultation with the Services and results approved by the Services demonstrate a more suitable flow that meets the objectives of safe, timely, and effective fish passage.

B. Project-Specific Fishway Attraction Flows
Fishway attraction flow is the total amount of flow discharged from the fishway entrance pool at any given time. The Licensee shall design, construct, operate, maintain, and evaluate physical facilities for each upstream passage facility to produce attraction flow equal to at least 10 percent of High Fish Passage Design Flow determined in accordance with NMFS guidelines and criteria (National Marine Fisheries Service 2004), as measured at a point upstream of the hydropower diversion, unless site-specific analysis conducted in consultation with the Services and the results approved by the Services, demonstrate a more suitable flow that meets the objectives of safe, timely, and effective fish passage. After approval by the Services, the Licensee shall file with the Commission the results of any such site-specific analyses that demonstrate a more suitable flow that meets the objectives of safe, timely, and effective fish passage. During facility evaluations, the Licensee may alter or balance attraction flows for testing purposes between the range of 5 percent and 10 percent, in order to determine whether fish passage efficiency can be maintained at a lower attraction flow.

C. Bypass Channel Attraction Flows and Conditions
For the Copco II and J.C. Boyle bypass channels, the Licensee shall, in consultation with the Services, design, construct, operate, maintain, and evaluate physical structures, facilities, devices or channel modifications necessary to ensure that migrating anadromous fish are consistently attracted into the bypass reach without excessive delays, unless the Services determine based on site-specific evaluations that such physical facilities or channel modifications are unnecessary. The Licensee shall conduct engineering and biological analysis in consultation with the FTS and the Services during the facility design phase for Copco II and J.C. Boyle facilities, to determine the attraction flow and hydraulic conditions

at the point of confluence between the fishway bypass reach and the hydropower discharge. Based on these analyses, or other analyses of fishway effectiveness conducted under applicable prescriptions, the Licensee shall determine, in consultation with the Services, any physical facilities or channel modifications necessary to ensure that migrating anadromous fish are consistently attracted into the bypass reach without excessive delays.

Modified Specific Fishway Prescriptions for Klamath Hydroelectric Project Fishways

All modified general prescriptions above shall apply to the specific prescriptions below. The modified prescriptions for developments in the Project are summarized in Table 4.

In the Preliminary Prescriptions, the Services provided the rationale and scientific evidence providing the basis for the prescriptions. The Applicant subsequently submitted a request for hearing on disputed issues of material fact related to the preliminary prescriptions pursuant to the Federal Power Act as amended by the Energy Policy Act of 2005 (see 43 C.F.R. Part 41 and 50 C.F.R. Part 221), in which the Applicant disputed facts supporting the Services' prescriptions. After an evidentiary hearing that included direct written testimony, live cross-examination, some re-direct examination, and submission of thousands of pages of scientific studies and other evidence, the Administrative Law Judge (ALJ) in his decision made Preliminary and Ultimate Findings of Fact and Conclusions of Law, citing to the evidence submitted in the trial-type hearing process. The Modified Prescriptions incorporate by reference all of the scientific evidence cited by the Services in their preliminary prescriptions; in addition, the Services provide additional or revised discussions below in the Modified Specific Prescriptions that are based on relevant ALJ Findings, including short form citation to the relevant Findings. Where the Modified Specific Prescriptions reference the ALJ's Findings, the underlying citations to those Findings incorporate by reference supporting evidence and testimony developed in the hearing process. These citations offer further scientific support to the Services' prescriptions.

These prescriptions also conform to a stipulation reached in the trial-type hearing regarding spillway modifications and tailrace barriers.

1. Iron Gate Dam

Upstream Prescription Rationale: Historically coho salmon, steelhead, and spring-run and fall-run Chinook salmon (Hamilton et al. 2005; ALJ Decision at 12, FOF 2A-3 through 2A-6) and resident trout migrated above the site of Iron Gate Dam to reach holding, spawning, incubation, and rearing habitat. Iron Gate Dam is a barrier to this passage and thus to suitable habitat in perennial streams such as Fall and Jenny Creeks (ALJ Decision at 34, FOF 6-11; ALJ Decision at 35, FOF 7-9), intermittent streams such as Camp and Scotch Creeks (ALJ Decision at 12, FOF 2A-5; ALJ Decision at 34, FOF 6-14; ALJ Decision at 35, FOF 7-9), and the main stem (ALJ Decision at 33, FOF 6-10; ALJ Decision at 35, FOF 7-9). The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore anadromous salmonids to

their historical range and suitable habitat. A goal of the Service is to successfully restore resident fish to their historical range and suitable habitat as well. The means of reaching these goals is restoration of safe, timely, and effective fish movement. Volitional fish passage at Iron Gate Dam would be consistent with the goals and objectives of the Services and the Klamath River Basin Fisheries Task Force for resource management. These goals will be met with the provision of effective facilities, which will mitigate for the impacts of the dam. A holding, sorting, and counting facility is necessary to segregate and mark fish for management purposes. The 5 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Table 4. Summary of Modified Fishway Prescriptions and Timetable for the Klamath Hydroelectric Project (Commission Project #2082)

Developmen t	**Target Species**	**Fish Ladder and Passage Impediment Modification (in Chronological Order)**	**Tailrace Barrier[1]**	**Screens and Bypass**	**Spillway Modifica -tions[1]**	**Interim, Seasonal Trap and Haul**
Copco 2 Bedrock Sill	Salmonids (includes Resident trout), lamprey	2 yrs (Bypass Barrier/Impediment Elimination)	Not Applicable (NA)	NA	NA	NA
J.C. Boyle (Bypass)	Salmonids, lamprey	2 yrs (Bypass Barrier/Impediment Elimination)	NA	NA	NA	NA
Eastside	Salmonids, lamprey, suckers	BOR current facility	3 yrs[2]	3 yrs[3] (to sucker criteria)	NA	Seasonal downstream trapping and hauling for Chinook
Westside	Salmonids, lamprey, suckers	BOR current facility	3 yrs[2]	3 yrs[3] (to sucker criteria)	NA	Seasonal downstream trapping and hauling for Chinook
Fall Creek	Resident trout	3 yrs (0.5 ft/drop and ≤ 10%)	5 yrs[4]	3 yrs	NA	NA
Spring Creek	Resident trout	3 yrs (0.5 ft/drop and ≤ 10% slope)	NA	3 yrs	NA	NA
Keno	Salmonids, lamprey	3 yrs (0.5 ft/drop and ≤ 10% slope)	NA	NA	3 yrs	Seasonal upstream trapping and hauling for Chinook
J.C. Boyle	Salmonids, lamprey	4 yrs (0.5 ft/drop and ≤ 10% slope)	4 yrs	4 yrs	4 yrs	NA
Iron Gate	Salmonids, lamprey	5 yrs (0.5 ft/drop and ≤ 10% slope)	NA	5 yrs	5 yrs	Modify existing trapping facility
Copco 2	Salmonids, lamprey	6 yrs (0.5 ft/drop and ≤ 10% slope)	8 yrs[4]	6 yrs	6 yrs	NA
Copco 1	Salmonids, lamprey	6 yrs (0.5 ft/drop and ≤ 10% slope)	8 yrs[4] (if adults in C2 pool)	6 yrs	6 yrs	NA

[1] As described in detail below, in accordance with a stipulation with the Applicant, the Services have revised the prescriptions for spillway modifications and tailrace barriers in the Modified Prescriptions to allow the Applicant to conduct site-specific studies on the need for and design of spillway modifications

[2]Study of impacts to and the potential design and construction of tailrace barrier is given priority due to the presence of federally listed suckers

[3] Screen and bypass system given priority due to the presence of federally listed suckers

[4]Timing of Tailrace Barrier design and construction deferred for study to determine optimal design

Benefits: Specific benefits of fishways at Iron Gate Dam include:

- Resident Trout: For the resident redband trout currently present both above and below Iron Gate Dam, fishways would restore historical seasonal movement for immature fish, restore population connectivity and genetic diversity, and allow greater utilization of existing habitat and refugial areas. Fish passage at Iron Gate Dam alone would restore the connectivity of resident redband populations in the mainstem Klamath River with those in the Copco 2 bypassed channel and Slide, Scotch, Camp, Jenny, Salt, and Fall Creeks. These tributaries also provide important habitat elements, such as spawning and temperature related refugial areas. In particular, Fall Creek provides a steady volume of high quality water and historically provided good habitat for resident fish, including rainbow/redband trout, Klamath small-scaled suckers (*Catastomus rimiculus*), and Klamath sculpin (*Cottus klamathensis*) (Coots 1957). With fish passage, seasonal migration of trout and access to refugial areas would be restored.
- Coho: Coho salmon are present in the Klamath River below Iron Gate Dam and were present historically above the dam. Iron Gate Dam blocks these fish species from reaching elements of their historical habitat. Between Iron Gate Dam and the next barrier upstream (Copco 2 Dam), access to habitat would benefit coho salmon by: a) extending the range and distribution of the species, thereby increasing the reproductive potential; b) increasing genetic diversity in the coho stocks; c) reducing the species vulnerability to the impacts of degradation; and d) increasing the abundance of the coho population (ALJ Decision at 86, Ultimate Finding of Fact 9; ALJ Decision at 36, FOF 7-16). National Research Council (National Research Council 2003) considered the amount of tributary habitat between Iron Gate Dam and the next barrier upstream to be substantial. Coho salmon were reported in Scotch Creek in 1950 (California Department of Fish and Game 2006) and are known to have spawned in Fall Creek (California Department of Water Resources 1964; Coots 1954; Coots 1957; Coots 1962). In both 1951 and 1952, at least 10 adult coho spawned in Fall Creek and greater than 29,600 young of the year and juvenile coho salmon outmigrated in 1954 (Coots 1954). Little documentation is available for Slide, Camp, and Jenny Creeks, but the lower reaches of these streams are relatively low gradient and appear to be suitable coho habitat. With fish passage, coho will likely have access to this habitat and access to refugial areas would be restored.
- Fall-run Chinook: With fish passage at Iron Gate Dam, fall-run Chinook salmon access would be restored to 11.1 miles of habitat, including Scotch, Camp, Jenny, and Fall Creeks (Table 3 of the Preliminary Prescription, hereafter referred to as Table 3) between Iron Gate Dam and the next barrier upstream (Copco 2 Dam). Prior to the construction of Iron Gate Dam, escapement of Chinook salmon to Jenny and Fall Creeks averaged 215 and 1,384 adults, respectively, from 1950 to 1960 (Coots 1957; Coots 1962; Coots and Wales 1952; Wales and Coots 1954). With fish passage, fall-run Chinook will again have access to this habitat. Seasonal migration of fall-run Chinook and access to refugial areas would be restored.
- Spring-run Chinook: With fish passage at Iron Gate Dam, spring-run Chinook salmon would regain access to cool water refugial areas necessary for this run of fish

(McCullough 1999) such as Fall Creek. Spring-run Chinook would also regain access to upstream migration corridors necessary to reach historical spawning areas in the Upper Klamath Basin (California Department of Fish and Game 1990).

- Pacific Lamprey: With fish passage at Iron Gate Dam, Pacific lamprey would gain access to habitat, including tributaries and the Copco 2 bypass reach (Table 3) between Iron Gate Dam and the next barrier upstream (Copco 2 Dam). Although the historical upstream distribution of Pacific lamprey is unknown, suitable habitat for spawning and juvenile rearing is available within tributaries and stream reaches in the Project area (ALJ Decision at 37, FOF 8-3). Access to habitat would benefit Pacific lamprey by increasing their viability through: a) extending the range and distribution of the species; b) providing additional spawning and rearing habitat; c) increasing the genetic diversity of the species; and d) increasing the abundance of the Pacific lamprey population (ALJ Decision at 38, FOF 8-9).
- Steelhead: With fish passage at Iron Gate Dam, steelhead would regain access to 13.7 miles of habitat, including tributaries and the Copco 2 bypass reach (Table 3), between Iron Gate Dam and the next barrier upstream (Copco 2 Dam). Adult steelhead have been documented in Fall Creek (Coots 1957, 1962). During 1951–1952, 471 steelhead spawners were counted in Fall Creek and between January and April 1954, more than 6,500 fry and 1,200 yearling steelhead emigrated from Fall Creek (Coots 1954). Steelhead have also been reported in Scotch and Camp creeks (California Department of Fish and Game 2006). Steelhead are generally tributary spawners and able to access reaches of tributaries upstream from areas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would have access to habitat in its entirety in tributaries above Iron Gate Dam. Steelhead would have access to 13.7 miles of habitat including Scotch, Camp, and Fall Creeks (ALJ Decision at 12, FOF 2A-5) as well as Slide and Jenny creeks. Seasonal migration of steelhead and access to refugial areas would be restored.

Downstream Prescription Rationale: Downstream fishways as modified herein are prescribed for Iron Gate Dam. Redband/rainbow trout and other resident fish (including federally listed suckers) are currently present in Iron Gate Reservoir. The Services conclude that trout (in particular fry and juveniles) move downstream (Hemmingsen 1997), a significant portion move through the powerhouse, and turbine entrainment at Iron Gate Dam causes significant mortality to downstream migrating redband trout (see discussion of turbine-caused mortality later in this paragraph). In addition, with the construction of a functional adult fish ladder at Iron Gate Dam, salmon and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005, ALJ Decision at 12, FOF 2A-3 through 2A-6; ALJ Decision at 14, FOF 2A-12). However, the progeny of these fish must negotiate not only the reservoir but the dam, powerhouse, and spillway during their outmigration. Migration is one of several defining life history characteristics of resident trout and anadromous fish, especially salmonids (ALJ Decision at 27, FOF 3-7; ALJ Decision at 13, FOF 2A-10). To ensure that the fish can outmigrate, downstream passage through the dam, powerhouse, and spillway is necessary. Unless protected by fish screening and bypass systems, fish migrating downstream can suffer injury or death by passing through turbines at hydroelectric plants (Electric Power Research

Institute 1987). Turbine caused mortality can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001), turbine mortality being caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (Electric Power Research Institute 1987) reported that Francis turbines, which are used at Iron Gate Dam, had average mortality to downstream moving fish of about 24 percent. In light of the foregoing evidence, the Services conclude that turbine entrainment at Iron Gate Dam presently causes a degree of mortality to downstream migrating resident fish comparable to that cited in the studies above and would cause comparable losses of reintroduced anadromous fish populations in the future, absent effective fish screening systems. The Applicant has acknowledged, based on their initial review of other studies, that tens of thousands of resident fish are likely entrained annually at each of the unscreened mainstem Klamath River developments and estimated that between 7 to 21 percent of those fish are killed passing through the Iron Gate Powerhouse ((PacifiCorp 2004a), Exhibit E 4-113). It is estimated that "several tens of thousands of resident fish" are annually entrained at "each of the Projects" facilities (ALJ Decision at 28, FOF 4-2). It is anticipated that annual entrainment of anadromous fish would be on the same order of magnitude, if not greater. Once entrained, the fish face a high risk of mortality. For juvenile fish, the risk is between 10 to 30 percent (ALJ Decision at 29, FOF 4-5). Volitional fish passage would be consistent with fish movement through Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat, as well as ensuring that the goals and objectives of the Klamath River Basin Fishery Task Force and the Services for resource management are met. The 5 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Spillway Prescription Rationale: Spill survival estimates for salmonids are numerous and range from 76 percent to 100 percent, depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (National Marine Fisheries Service 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Turbulent mixing of spilled water with receiving waters may result in gas supersaturation and resultant gas bubble disease in fish. Dissolved nitrogen concentrations of more than 130 percent of normal equilibrium levels have been measured in tailwaters on the Columbia River (Ebel and Raymond 1976). The threshold value for significant mortality among juvenile Chinook salmon and steelhead trout occurs when nitrogen gas levels are about 115 percent of normal. Along the Columbia River, where many spillways discharge from a given dam and there are many consecutive dams along the stream course, supersaturation increases cumulatively from one dam to the next. Losses of salmon and steelhead trout in this river due to supersaturation have been severe in years of high spillage (Ebel and Raymond 1976). Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g., baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water. Given the steepness and configuration of the Iron Gate Dam spillway, the Services conclude that spillway mortality will likely occur at levels near the high end of the range found in the studies above.

Therefore, a 5 year timeline is necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific spillway prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the spillway prescriptions. The Applicant subsequently withdrew its request for hearing regarding spillway prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the spillway prescriptions in the Modified Prescriptions below to allow the Applicant to study the need for and design of spillway modifications for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the spillway modifications in order to inform the need for and design of spillway modifications. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that spillway modifications are necessary for the safe, timely, and effective fish passage where prescribed.

Tailrace Barrier: The Services have not prescribed the construction of tailrace barriers at Iron Gate Dam because anadromous and resident fish are currently present below the dam and the Services are aware of no reported problems with fish injury or delay during upstream migration to the hatchery.

Iron Gate Dam Upstream Fishway

1.1 Iron Gate Dam Upstream Fishway

1.1.1 Fishway Design Features and Performance Standards: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at Iron Gate Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria for anadromous fish (National Marine Fisheries Service 2004) or alternative criteria for other species approved by the Services. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools. An auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay, or a suitable alternative source. The AWS shall be screened in accordance with NMFS juvenile fish screen and bypass criteria (National Marine Fisheries Service 1997) or such alternative criteria as may be determined acceptable to the Services. The AWS shall be designed to

provide the suitable water quality and quantity to effectively attract fish. The fish ladder and AWS together must be designed to supply attraction flows according to the terms of Modified General Prescriptions 1.1.7. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1 in Preliminary Prescription herein referred to as Table 1). The ladder shall include features to detect and record data for PIT-tagged (or fish identified using similar technology) upstream migrating fish. The construction shall include features to modify the existing development to hold, count, and mark fish and to sort fish by age, species, and origin for the purposes of fish population restoration and management. The upstream fishway shall be constructed to current criteria for passage of Pacific lamprey and the existing ladder to the CDFG trap and holding tanks shall be modified to current criteria (Table 1) for lamprey passage and resident trout passage. The Licensee shall complete construction and begin operation of the fishway within 5 years of the issuance of the new license.

1.1.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged upstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of Modified General Prescriptions 1.1.1 above within 2 years of the issuance of a new license for review and approval by the Services prior to construction. The design shall include features to modify the existing development to hold, count, and mark fish; and to sort fish by age, species, and origin for the purposes of fish population restoration and management.

1.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

1.2 Iron Gate Dam Downstream Fishway

1.2.1 Intake Fish Screens and Bypass Facilities: The Licensee shall, to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout, construct, operate, maintain, and evaluate a fish screen and bypass facility for volitional fish passage at Iron Gate Dam. The screens and bypass shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service and NMFS-Engineering. The screens and bypass shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The bypass facility shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish

identified using similar technology). The Licensee shall complete construction and begin operation of the fishway within 5 years of the issuance of the new license.

1.2.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

1.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

1.3 Iron Gate Spillway

1.3.1 Spillway Modification: Unless the Services determine based on site-specific studies that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 1.3.2 and 1.3.3, the Licensee shall modify, maintain, and evaluate hydraulically-engineered spillway modifications to improve volitional downstream fish passage at Iron Gate Dam for Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The purpose of all spillway modifications is to improve hydraulic conditions and overall fish passage conditions on the downstream side of the dam, to prevent false attraction to non-passable areas, and to make the entrance of the fishway more accessible. The spillway modifications shall be constructed and operational within 5 years of the issuance of the new license.

1.3.2 Spillway Modification Studies: The Licensee may, in consultation with the Services, study the need for and design of hydraulically-engineered spillway modifications to improve volitional downstream fish passage at Iron Gate Dam for Chinook and coho salmon, steelhead trout, Pacific Lamprey, and redband trout. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of spillway modifications for review and approval by the Services consistent with the provisions for timing of the spillway design consultation under Modified Specific Prescriptions 1.3.3.

1.3.3 Spillway Design Consultation: Unless the Services determine based on site-specific studies that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 1.3.2, within 3 years of the issuance of the new license, the Licensee shall develop design and construction plans according to the terms of the Modified General

Prescriptions 1.1.1 above for review and approval by the Service and NMFS-Engineering.

1.3.4 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

2. Fall Creek Diversion Dam

The prescriptions for fishways at the Fall Creek Diversion Dam are made solely by the Service. The prescription for the Fall Creek Powerhouse Tailrace Barrier is made jointly by NMFS and the Service.

Upstream Prescription Rationale: There are currently no upstream fish passage facilities at the Fall Creek Diversion Dam for any species ((PacifiCorp 2004b) Fish Resources FTR). This dam is a seasonal or low flow barrier to the upstream movement of fish (Scott Snedaker, BLM pers. comm.). The Applicant has proposed an upstream fishway at this development. The Service's prescription is consistent with this proposal. Redband/rainbow trout are present in Fall Creek below the dam and above the dam. The fish need to be able to move between the two areas to make seasonal use of habitat. Volitional upstream passage would be consistent with the Service goal to successfully restore resident fish to their historical range. One objective of reaching this goal is the restoration of safe, timely, and effective fish movement, and to ensure the Project does not impair future restoration of fish populations in the upper Fall Creek and Klamath River systems. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Downstream Prescription Rationale: There are currently no downstream fish passage facilities at the Fall Creek Diversion Dam for any species ((PacifiCorp 2004b) Fish Resources FTR, Exhibit E). The Applicant has proposed a downstream fish screen (but no bypass) at this development. We agree with the Applicant's proposal to screen downstream migrating fish. In addition, a bypass system is needed to guide the movement of redband/rainbow trout and restore historical fish populations in Fall Creek. Redband trout are present above the diversion. The Services conclude that trout (in particular fry and juveniles) move downstream here as they do in the Klamath River system elsewhere (Hemmingsen 1997), a significant portion move through the diversion canal, and that turbine entrainment at the Fall Creek Powerhouse causes significant mortality to downstream migrating redband trout (see the discussion for the Downstream Prescription Rationale for the Iron Gate Dam development). With the 5 cfs proposed for instream flows by the Applicant and the construction of a functional fish ladder at the Fall Creek Diversion Dam, biological connectivity for rainbow trout would be restored to some degree in upper Fall Creek. However, the progeny of these fish must be excluded from the power canal and turbines. Adequate passage conditions would be consistent with the Service's goal of restored fish populations in the Fall Creek system. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Fall Creek Powerhouse Tailrace Prescription Rationale: With an upstream fishway at Iron Gate Dam, anadromous fish would migrate to Fall Creek to the powerhouse. Coots (1954; 1957; 1962) reported steelhead, coho, and Chinook salmon in Fall Creek downstream from the powerhouse. Depending on powerhouse operations, draft tube discharge velocities at Project facilities are between 3.4 and 10.4 feet per second (fps) (CH2MHill 2006); these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985). To prevent injury or mortality to salmonids caused by attempts to swim upstream into the tailrace, a barrier is required to prevent fish from entering this area (National Marine Fisheries Service 2004). The 5 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific tailrace barrier prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the tailrace barrier prescriptions. The Applicant subsequently withdrew its request for hearing regarding tailrace barrier prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the tailrace barrier prescriptions in the Modified Prescriptions below to allow time for the Applicant to study the need for and design of tailrace barriers for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the tailrace barriers in order to inform the need for and design of tailrace barriers. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that tailrace barriers are necessary for the safe, timely and effective upstream passage of fish at Fall Creek Diversion Dam.

2.1 Fall Creek Diversion Dam Upstream Fishway

2.1.1 Fall Creek Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional upstream fishway at the Fall Creek Diversion Dam to provide for the safe, timely, and effective upstream passage of rainbow/redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria (National Marine Fisheries Service 2004) or alternative criteria as determined by the Service. The ladder shall provide for the uninterrupted passage of fish over the full range of Fall Creek flows. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1).

The fishway shall be constructed and operational within 3 years of the issuance of the new license.

2.1.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 1 year of license issuance for review and approval by the Service prior to construction.

2.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

2.2 Fall Creek Diversion Dam Downstream Fishway

2.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility at the Fall Creek Diversion Dam to provide for the safe, timely, and effective downstream passage of rainbow/redband trout. The screens and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service. The screens and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows. The downstream fishway shall be constructed and operational within 3 years of the issuance of the new license.

2.2.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above, within 1 year of the issuance of the new license, for review and approval by the Service prior to construction.

2.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

2.3 Fall Creek Powerhouse Tailrace Barrier

2.3.1 Tailrace Barrier Construction: Unless the Services determine, based on site-specific studies, that a tailrace barrier is unnecessary in accordance with Modified Specific Prescriptions 2.3.2 and 2.3.3, the Licensee shall construct a tailrace barrier and guidance system at Fall Creek Powerhouse to provide for the safe and effective protection and guidance of Chinook salmon, coho salmon, steelhead, and redband trout away from the powerhouse. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 5 years of the issuance of the new license.

2.3.2 Tailrace Barrier Studies: The Licensee may, in consultation with the Services, study the need for and design of tailrace barriers to protect

upstream migrating Chinook salmon, coho salmon, steelhead, and redband trout at the Fall Creek Powerhouse. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of tailrace barriers for review and approval by the Services consistent with the provisions for timing of the tailrace barrier design under Modified Specific Prescriptions 2.3.3

2.3.3 Tailrace Barrier Design: Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 2.3.2, the Licensee shall, within 3 years of the issuance of the new license, develop detailed design and construction plans for Service and NMFS-Engineering approval for a tailrace barrier and guidance system to protect adult fish according to the terms of the Modified General Prescriptions 1.1.1 above.

2.3.4 Tailrace Barrier Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

3. Spring Creek Diversion Dam

The prescriptions for fishways at the Spring Creek Diversion Dam are made solely by the Service.

Upstream Prescription Rationale: There are currently no upstream fish passage facilities at the Spring Creek Diversion Dam for any species ((PacifiCorp 2004b)Fish Resources FTR). The Applicant has proposed an upstream fishway at this development. We agree with this action and our prescription is consistent with the Applicant's proposal. Redband/rainbow trout are present in Spring Creek below the dam and above the dam. The fish need to be able to move between the two areas to make seasonal use of habitat. Volitional upstream passage would be consistent with the Service goal to successfully restore resident fish to their historical range. The objective in reaching these goals is the restoration of safe, timely, and effective fish movement, and to ensure the Project does not impair future restoration of fish populations in the upper Spring Creek, Jenny Creek, and Klamath River systems. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Downstream Prescription Rationale: There are currently no downstream fish passage facilities at the Spring Creek Diversion Dam for any species ((PacifiCorp 2004b)Fish Resources FTR). The Applicant has proposed a downstream fish screen at this development. We agree with the Applicant's proposal to screen downstream migrating fish. In addition, a bypass system is needed to guide the movement of redband/rainbow trout and restore historical fish populations in Spring Creek. The Service concludes that trout (in particular fry and juveniles) move downstream here as they do in the Klamath River elsewhere (Hemmingsen 1997), a significant portion move through the Spring Creek diversion canal to

Fall Creek, and turbine entrainment at the Fall Creek Powerhouse causes significant mortality to redband/rainbow trout that have originated in Spring Creek (see the discussion for the Downstream Prescription Rationale for the Iron Gate Dam development). Volitional fish passage to a bypass around the Spring Creek Diversion Dam is consistent with the Service goals and objectives for resource management. With minimum flows and the construction of a functional fish ladder at the Spring Creek Diversion Dam, biological connectivity for rainbow trout would be restored to some degree in Spring Creek. However, these fish must be excluded from the power canal and turbines. Adequate passage conditions would be consistent with the Service's goal of restored fish populations in the Spring Creek system. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

3.1 Spring Creek Diversion Dam Upstream Fishway

3.1.1 Spring Creek Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at Spring Creek Diversion Dam to provide for the safe, timely, and effective upstream passage of rainbow/redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria (National Marine Fisheries Service 2004) or alternative criteria as determined by the Service. The ladder shall provide for the uninterrupted passage of fish over the full range of Spring Creek flows. The ladder shall have a maximum drop between pools of 0.5 ft (Table 1) and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The fishway shall be constructed and operational within 3 years of the issuance of the new license.

3.1.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service prior to construction.

3.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

3.2 Spring Creek Diversion Dam Downstream Fishway

3.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility at the Spring Creek Diversion Dam to provide for the safe, timely, and effective downstream passage of rainbow/redband trout. The screen and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service. The screens and bypass facility shall provide for the

uninterrupted passage of fish over the full range of river flows. The downstream fishway shall be constructed and operational within 3 years of the issuance of the new license.

3.2.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service prior to construction.

3.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

4. Copco 2 and Copco 1 Dams

Copco 2 and Copco 1 Upstream Prescription Rationale: Historically coho salmon, steelhead, and spring-run and fall-run Chinook salmon (Hamilton et al. 2005; ALJ Decision at 12, FOF 2A-3 through 2A-6) and resident trout migrated above the site of Copco 2 and Copco 1 dams to reach holding, spawning, incubation, and rearing habitat. Copco Dams are a barrier to this passage and thus to suitable habitat in Shovel Creek, a perennial stream (ALJ Decision at 34, FOF 6-11; ALJ Decision at 35, FOF 7-9), intermittent streams such as Beaver and Deer Creeks (ALJ Decision at 34, FOF 6-14; ALJ Decision at 35, FOF 7-9), habitat areas cooled by springs (thermal refugia) in the J.C. Boyle bypass (ALJ Decision at 33, FOF 6-10), and the main stem (ALJ Decision at 33, FOF 6-10; ALJ Decision at 35, FOF 7-9).

The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore corresponding life history phases of anadromous salmonids to their historical range and to this suitable habitat. The Service goal is to successfully restore resident fish to their historical range and suitable habitat as well. The objective in reaching these goals is restoration of safe, timely, and effective fish movement through volitional fish passage. Providing volitional fish passage at Copco 2 and Copco 1 Dams is consistent with goals and objectives for resource management of the Services and the Klamath River Basin Fisheries Task Force. The 6–8 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Benefits – The Copco Dams are less than one half mile apart. Specific benefits of fishways at Copco 2 and Copco 1 Dams include:

- Resident Trout: For the resident redband/rainbow trout currently present both above and below Copco 2 and 1 Dams, fishways would restore historical seasonal migration patterns for immature fish, restore population connectivity and genetic diversity, and allow greater utilization of existing habitat and refugial areas. For resident rainbow/redband populations, fish passage at the Copco Dams alone would result in restoring the connectivity of fish populations in the mainstem Klamath River below the Copco Dams with those in tributaries above the dams and the Klamath River reach designated as Wild Trout water by the CDFG (California Department of Fish and Game 2005). The lower 2.7 miles of Shovel Creek are accessible and provide important habitat

elements for rainbow/redband trout, including spawning and temperature related refugial areas. With fish passage, Shovel Creek would again become accessible to resident trout from below the Copco Dams and seasonal migration and habitat use would be restored.

- Coho: Coho salmon are present in the Klamath River below Iron Gate Dam and were present historically below and above Copco 2 and Copco 1 Dams. Copco 2 and Copco 1 Dams block these fish from reaching elements of their historical habitat. Access to habitat within the Project would benefit coho salmon by: a) extending the range and distribution of the species thereby increasing the reproductive potential; b) increasing genetic diversity in the coho stocks; c) reducing the species vulnerability to the impacts of degradation; and d) increasing the abundance (ALJ Decision at 86, Ultimate Finding of Fact 9; ALJ Decision at 36, FOF 7-16). Between Copco 1 and Copco 2 Dams and the next barrier upstream (J.C. Boyle Dam), coho salmon would have access to suitable habitat, including the J.C Boyle peaking and bypass reaches of the Klamath River mainstem (Table 3; ALJ Decision at 35, FOF 7-9). With fish passage, coho would have access to this habitat again and connectivity to refugial areas would be restored.
- Spring-run Chinook: With passage, spring-run Chinook salmon access to cool water refugial areas such as the 220 cfs of spring water in the J.C. Boyle bypassed reach would be restored. During summer months, this would provide key holding, coolwater refugial habitat necessary for this run of fish (McCullough 1999). Juvenile spring-run Chinook would be able to rear in the cool water habitat adjacent to the springs in the J.C. Boyle bypass reach. These springs also provide warmer, ice-free habitat during winter months (Hanel and Gerlach 1964). The temperature of incoming spring water does not vary substantially from 50 to 55°F throughout the year (USDI Bureau of Land Management 2003) and would be optimal for juvenile Chinook growth (McCullough 1999). Spring-run Chinook adults would also have access to the main channel as an upstream migration corridor necessary to reach historical spawning areas in the Upper Klamath Basin (California Department of Fish and Game 1990).
- Fall-run Chinook: Between Copco 2 and Copco 1 Dams and the next barrier upstream (J.C. Boyle Dam), passage for fall-run Chinook salmon would restore access to 25.8 miles of habitat, including the J.C Boyle peaking and bypass reaches of the Klamath River mainstem (Table 3; ALJ Decision at 33, FOF 6-10; ALJ Decision at 34, FOF 6-11; ALJ Decision at 34, FOF 6-14 and ALJ Decision at 86, Ultimate Finding of Fact 8). Snyder (Snyder 1931) reported large numbers of salmon annually passed the point where the Copco Dams are now located. The lower 2.7 miles of Shovel Creek continue to provide good salmonid habitat. The reach of the Klamath River between Copco 1 Reservoir and the Oregon/California State line is designated Wild Trout water and is currently managed under the Wild Trout Program by the CDFG (California Department of Fish and Game 2005). With fish passage, this area would again become accessible to fall-run Chinook salmon.
- Pacific Lamprey Between Copco 2 and Copco 1 Dams and the next barrier upstream (J.C. Boyle Dam), passage would allow access to habitat, including tributaries and the mainstem Klamath River (Table 3). This access to habitat would benefit Pacific lamprey by increasing their viability through: a) extending the range and distribution of the species; b) providing additional spawning and rearing habitat; c) increasing the genetic

diversity of the species; and d) increasing the abundance of the Pacific lamprey population (ALJ Decision at 38, FOF 8-9).

- Steelhead Between Copco 2 and Copco 1 Dams and the next barrier upstream (J.C. Boyle Dam), passage would allow steelhead to regain access to 27.1 miles of habitat, including the J.C Boyle peaking and bypass reaches of the Klamath River mainstem (Table 3; ALJ Decision at 33, FOF 6-10; ALJ Decision at 34, FOF 6-11; ALJ Decision at 34, FOF 6-14 and ALJ Decision at 86, Ultimate Finding of Fact 8). Steelhead occurred historically above the Copco 2 and Copco 1 Dams (Hamilton et al. 2005). Steelhead are generally tributary spawners and able to access reaches of tributaries upstream from areas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would utilize habitat in its entirety in tributaries above the Copco Dams. This means that steelhead would fully have access to the 27.1 miles of habitat including Shovel Creek (ALJ at Decision 12, FOF 2A-5), Beaver and Deer Creeks (ALJ Decision at FOF 34, 6-14; ALJ Decision at 35, FOF 7-9), as well as Long Prairie, Edge, Frain, Negro, Tom Hayden, and Topsy Creeks (Table 3).

Copco 2 and Copco 1 Downstream Prescription Rationale: Downstream fishways and fishway modifications are prescribed for Copco 2 and Copco 1 Dams. Redband/rainbow trout and other resident fish are currently present in Copco reservoirs. The Services conclude that trout (in particular fry and juveniles) move downstream here as they do in the Klamath River elsewhere (Hemmingsen 1997), a significant portion move through the powerhouses, and turbine entrainment at Copco 2 and Copco 1 Dams causes significant mortality to downstream migrating redband trout (see discussion of turbine-caused mortality later in this paragraph). In addition, with the construction of a functional adult fish ladder at Iron Gate Dam and the Copco Dams, salmon and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005). The progeny of these fish must negotiate not only the reservoirs but the dams, powerhouses, and spillways during their outmigration. Migration is one of several defining life history characteristics of resident trout and anadromous fish, especially salmonids (ALJ Decision at 27, FOF 3-7; ALJ Decision at 13, FOF 2A-10). To ensure these fish can safely outmigrate, downstream passage around the dams, powerhouses, and spillways is necessary. Fish migrating downstream can suffer injury or death by passing through turbines at hydroelectric plants (Electric Power Research Institute 1987). Turbine caused mortality can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001), turbine mortality being caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (Electric Power Research Institute 1987) reported that Francis turbines, which are used at both Copco Dams, had average mortality to downstream moving fish of about 24 percent. In light of the foregoing evidence, the Services conclude that turbine entrainment at each Copco dam presently causes levels of mortality to downstream migrating resident fish comparable to those cited in the studies above and would cause comparable losses of reintroduced anadromous fish populations in the future, absent effective fish screening systems. The Applicant has estimated that approximately 85,848 fish are entrained annually at each mainstem development and has estimated that between 7 to 20 percent of fish passing

through the Copco 2 Powerhouse are killed and that between 6 to 18 percent of the fish passing through the Copco 1 Powerhouse are killed ((PacifiCorp 2004a), Exhibit E 4-113). It is estimated that "several tens of thousands of resident fish" are annually entrained at "each of the Projects" facilities (ALJ Decision at 28, FOF 4-2). It is anticipated that annual entrainment of anadromous fish would be on the same order of magnitude, if not greater. Once entrained, the fish face a high risk of mortality. For juvenile fish, the risk is between 10 to 30 percent (ALJ Decision at 29, FOF 4-5). Volitional fish passage would be consistent with fish movement through the Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat. Volitional fish passage is consistent with the goals and objectives for resource management of the Klamath River Basin Fishery Task Force and the Services. The 6 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Tailrace Prescription Rationale: Water discharging from the Copco 2 and Copco 1 powerhouses can represent the major portion of the total river flow of the Klamath. Under the current license, the powerhouses each can discharge up to ~3000 cubic feet per second (cfs) and the Copco 2 bypass reach contains as little as 5–10 cfs. Even with the Applicant's proposed minimum instream flow, the disparity in flow levels can contribute to false attraction of upstream migrating fish to an area which provides no upstream passage, and delay these fish in their migration. The natural tendency for fish attracted to such an area is to hold and wait for passage conditions to improve, or to attempt to move past the obstacle either by swimming or leaping. Depending on powerhouse operations, draft tube discharge velocities at Project facilities are between 3.4 and 10.4 feet per second (fps) (CH2MHill 2006); these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985).

Adult anadromous fish are attracted into oncoming flows (National Marine Fisheries Service 2004). Migration upstream may be delayed when tailrace flows from the powerhouse exceed river bypass reach flows. A migration delay, or combined delays at several facilities, may prevent fish from reaching suitable spawning habitat when they are ready to spawn or conditions are optimal for survival. Migration delays caused by tailrace effects may have a greater impact on fish populations than injury and mortality from turbine impacts (Federal Energy Regulatory Commission 1994). Migration delays may occur to a greater percentage of migrating adults than the percentage of adults impacted by turbine mortality. Migration delays are well documented for anadromous salmonids in the Pacific Northwest (Haynes and Gray 1980; Rondorf et al. 1983; Schadt et al. 1985; Vogel et al. 1990). For migratory adults, false attraction occurs when upstream migrants are attracted to turbine discharge or spillway flows rather than to fishway flows. False attraction also occurs when upstream migrants detect the scent of their natal stream downstream of its natural outlet (Fretwell 1989). This happens when water from a natal stream is diverted through a canal or pipe to a hydroelectric project. In either instance, without proper project design or operation modifications, there may be migratory delays.

To prevent injury, delay, or mortality to salmonids, caused by attempts to swim upstream into the tailrace, a barrier is required to guide migrating fish away from this area and encourage them to continue their upstream migration (National Marine Fisheries Service 2004). The 8 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific tailrace barrier prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the tailrace barrier prescriptions. The Applicant subsequently withdrew its request for hearing regarding tailrace barrier prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the tailrace barrier prescriptions in the Modified Prescriptions below to allow the Applicant to study the need for and design of tailrace barrier s for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the tailrace barriers in order to inform the need for and design of tailrace barriers. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that tailrace barriers are necessary for the upstream passage of fish at Copco 1 and 2 Dams.

Spillway Prescription Rationale: Spill survival estimates for salmonids are numerous and range from 70 percent to 100 percent, depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (National Marine Fisheries Service 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Turbulent mixing of spilled water with receiving waters may result in gas supersaturation and resultant gas bubble disease in fish. Dissolved nitrogen concentrations of more than 130 percent of normal equilibrium levels have been measured in tailwaters (Ebel and Raymond 1976). The threshold value for significant mortality among juvenile Chinook salmon and steelhead trout occurs when nitrogen gas levels are about 115 percent of normal. Along the Columbia River, where many spillways discharge from a given dam and there are many consecutive dams along the stream course, supersaturation increases cumulatively from one dam to the next. Losses of salmon and steelhead trout in the Columbia River due to supersaturation have been severe in years of high spillage (Ebel and Raymond 1976). Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g., baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water. After examining the height of Copco 1 Dam, the angle of the spillway, and the stair-stepped design of this spillway, the Services conclude that spill entrainment mortality at the Copco 1 development will likely occur at levels near the high end of the range found in the studies above. While Copco 2 Dam is not as high, mortality may occur here as well. Therefore, spillway modifications and a 6 year timeline are necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific spillway prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the spillway prescriptions. The Applicant subsequently withdrew its request for hearing regarding spillway prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the spillway prescriptions in the Modified Prescriptions below to allow the Applicant to study the need for and design of spillway modifications for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the spillway modifications in order to inform the need for and design of spillway modifications. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that spillway modifications are necessary for the safe, timely and effective passage of fish at Copco 1 and 2 Dams.

Transverse Bedrock Sill Fish Barrier Evaluation/Elimination Rationale: A transverse bedrock sill is located about River Mile 197.3 or 0.5 mile above the Copco 2 Powerhouse (1 mile below Copco 2 Dam). Historical fish distribution upstream from this point (Hamilton et al. 2005) indicates this sill was not a fish barrier prior to the Project, but the sill is a depth barrier to salmonids under the current 5–10 cfs release during normal operation, except during periods of spill, and may continue to be a depth barrier under the flows specified in the new license. This impediment to fish was observed during the summer of 2005 (David K. White, NMFS, pers. comm.). Physical structures, facilities, or devices or sill modification are necessary to eliminate the barrier. The 2 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

4.1 Copco 2 Upstream Fishway

4.1.1 Copco 2 Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at Copco 2 Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria (National Marine Fisheries Service 2004) or alternative criteria approved by the Services. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools and the auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or such alternative criteria as may be determined acceptable to NMFS Engineering and the Service. The AWS shall be designed to provide the correct water

temperature and water quality to attract fish. The fish ladder and AWS together must be designed to supply attraction flows according to the terms of Modified General Prescriptions 1.1.7 The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway must be constructed to current criteria for passage of Pacific lamprey (Table 1). The fishway shall be constructed and operational within 6 years of the issuance of the new license.

4.1.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

4.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

4.2 Copco 2 Downstream Fishway

4.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility for volitional fish passage at Copco 2 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The screens and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service and NMFS-Engineering. The screens and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The bypass facility shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The downstream fishway shall be constructed and operational within 6 years of the issuance of the new license.

4.2.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 3 years of the issuance of the new license

for review and approval by the Service and NMFS-Engineering prior to construction.

4.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

4.3 Copco 2 Spillway

4.3.1 Spillway Modification: Unless the Services determine based on site-specific studies that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 4.3.2 and 4.3.3, the Licensee shall modify, maintain, and evaluate a spillway for the volitional passage at Copco 2 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The spillway modifications shall be constructed and operational within 6 years of the issuance of the new license.

4.3.2 Spillway Modification Studies: The Licensee may, in consultation with the Services, study the need for and design of hydraulically-engineered spillway modifications to improve volitional downstream fish passage at Copco 2 Dam for coho salmon, steelhead trout, Pacific lamprey, and redband trout. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of spillway modifications for review and approval by the Services consistent with the provisions for timing of the spillway design under Modified Specific Prescriptions 4.3.3.

4.3.3 Spillway Design: Unless the Services determine based on site-specific studies that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 4.3.2, the Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 4 years of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction.

4.3.4 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

4.4 Copco 2 Tailrace Barrier

4.4.1 Tailrace Barrier Construction: Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 4.4.2 and 4.4.3, the Licensee shall construct a tailrace barrier and guidance system at Copco 2 Dam to

provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 8 years of the issuance of the new license.

4.4.2 Tailrace Barrier Studies: The Licensee may, in consultation with the Services, study the need for and design of a tailrace barrier and guidance system at Copco 2 Dam. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of tailrace barriers for review and approval by the Services consistent with the provisions for timing of the tailrace barrier design under Modified Specific Prescriptions 4.4.3.

4.4.3 Tailrace Barrier Design: Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 4.4.2, the Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 5 years of the issuance of the new license, for review and approval by the Service and NMFS-Engineering prior to construction.

4.4.4 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

4.5 Copco 2 Bypass Channel Barrier/Impediment Elimination

4.5.1 Barrier Modification: The Licensee shall construct physical structures, facilities, or devices or modify the sill (as provided in 4.5.2 below), unless the Licensee demonstrates through an evaluation (conducted in consultation with the Services and CDFG and in a manner approved by the Services) using accepted fish barrier evaluation methodology (Powers and Orsborn 1985) that the transverse bedrock sill approximately 0.5 miles above the Copco 2 Powerhouse in the Copco 2 bypassed reach is not a barrier to fish passage under normal operating flows specified for the Copco 2 bypassed reach in the new license. The evaluation shall be completed within six months of the issuance of the new license and its conclusions must be approved by the Services.

4.5.2 Design and Construction: The Licensee shall develop design and construction plans for the physical structures, facilities, devices or barrier modification according to the terms of the Modified General Prescriptions article 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS-Engineering prior to construction. The physical structures, facilities, devices or barrier

modification shall be constructed within 2 years of license issuance, in accordance with specified guidelines and criteria for fish passage (National Marine Fisheries Service 2004), including, if the sill is not bypassed, providing at least 1.0 foot of swimming depth across the sill and with adequate attraction, velocity, capacity, and vertical jump characteristics.

4.5.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

5. Copco 1 Dam

5.1 Copco 1 Dam Upstream Fishway

5.1.1 Copco 1 Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional upstream fishway at Copco 1 Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria (National Marine Fisheries Service 2004) or alternative criteria approved by the Services. The ladder shall provide for the uninterrupted passage of fish over the full river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools and the auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or such alternative criteria as may be determined acceptable to NMFS-Engineering and the Service. The AWS shall be designed to provide the correct water temperature and water quality as to attract fish. The fish ladder and AWS together must be designed to supply attraction flows according to the terms of Modified General Prescriptions 1.1.7 The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall construct the upstream fishway according to current criteria for passage of Pacific lamprey (Table 1). The fishway shall be constructed and operational within 6 years of the issuance of the new license.

5.1.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of the Modified

General Prescriptions 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS-Engineering prior to construction.

5.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

5.2 Copco 1 Downstream Fishway

5.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility for volitional fish passage at Copco 1 Dam to below Copco 1 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The screens and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service and NMFS-Engineering. The screens and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The bypass facility shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The downstream fishway shall be constructed and operational within 6 years of the issuance of the new license.

5.2.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

5.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

5.3 Copco 1 Spillway

5.3.1 Spillway Modification: Unless the Services determine, based on site-specific studies, that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 5.3.2 and 5.3.3, the Licensee shall modify, maintain, and evaluate a spillway for volitional passage at Copco 1 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and

redband trout. The spillway modifications shall be constructed and operational within 6 years of the issuance of the new license.

5.3.2 Spillway Modification Studies: The Licensee may, in consultation with the Services, study the need for and design of hydraulically-engineered spillway modifications to improve volitional downstream fish passage at Copco 1 Dam for Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of spillway modifications for review and approval by the Services consistent with the provisions for timing of the spillway design under Modified Specific Prescriptions 5.3.3.

5.3.3 Spillway Design: Unless the Services determine based on site-specific studies that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 5.3.2, the Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 4 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

5.3.4 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

5.4 Copco 1 Tailrace Barrier

5.4.1 Tailrace Barrier Construction: Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Specific Modified Prescriptions 5.4.2 and 5.4.3, the Licensee shall construct a tailrace barrier and guidance system at Copco 1 Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 8 years of the issuance of the new license.

5.4.2 Tailrace Barrier Studies: The Licensee may, in consultation with the Services, study the need for and design of a tailrace barrier and guidance system at Copco 1 Dam. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of tailrace barriers for review and approval by the Services consistent with the provisions for timing of the tailrace barrier design under Modified Specific Prescriptions 5.4.3.

5.4.3 Tailrace Barrier Design: Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 5.4.2, the Licensee shall, within 5 years of the issuance of the new license, develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 for review and approval by the Service and NMFS-Engineering prior to construction.

5.4.4 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

6. J.C. Boyle Dam

Upstream Prescription Rationale: Historically coho salmon, steelhead, and spring-run and fall-run Chinook salmon (Hamilton et al. 2005; ALJ Decision at 12, FOF 2A-3 through 2A-6) and resident trout (Hanel and Gerlach 1964) migrated above the current site of J.C. Boyle Dam to reach holding, spawning, incubation, and rearing habitat. The upstream fishway at J.C. Boyle Dam is obsolete and does not meet current design criteria. It is a partial barrier to trout passage and, thus, to critical holding, spawning, incubation, and rearing habitat in tributaries (Spencer, Hunters Park, and Miners Creeks) and the Boyle Reservoir to Keno Dam reach (Table 3). Suitable habitat for anadromous fish occurs in Spencer Creek, a perennial stream (ALJ Decision at 34, FOF 6-11; ALJ Decision at 35, FOF 7-9), intermittent streams (ALJ Decision at 34, FOF 6-14; ALJ Decision at 35, FOF 7-9), and the main stem (ALJ Decision at 33, FOF 6-10; ALJ Decision at 35, FOF 7-9).

The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore corresponding life history phases of anadromous salmonids to their historical range and this suitable habitat. The Service goal is to successfully restore resident fish to their historical range and suitable habitat as well. The objective in reaching these goals is the restoration of safe, timely, and effective fish movement. Providing fishways that meet current criteria at J.C. Boyle Dam is consistent with the goals and objectives for resource management of the Services and the Klamath River Basin Fisheries Task Force. The 4 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Benefits: Specific benefits of fishways at J.C. Boyle Dam include:

- Resident Trout: Fish passage at J.C. Boyle Dam alone would restore the unimpaired connectivity of resident redband trout populations in the mainstem Klamath River with those in Spencer Creek. This tributary, in particular, provides important habitat elements, such as spawning and temperature related refugial areas for redband trout. A number of reports document the importance of Spencer Creek habitat to redband trout (Buchanan et al. 1990; Buchanan et al. 1991; Hemmingsen 1997; Hemmingsen et al. 1992; USDI Bureau of Land Management et al. 1995). The Spencer Creek population of Klamath River redband trout is migratory and has connectivity to the population in the mainstem Klamath River and nearby tributary watersheds. This Basin connectivity coupled with

homing behavior (and straying of individuals) allows Spencer Creek redband/rainbow trout to be a source of adaptive variability in Klamath Basin trout populations (USDI Bureau of Land Management et al 1995). This connectivity has been greatly impaired by inadequate passage at J.C. Boyle Dam. The number of redband trout using the J.C. Boyle fish ladder have declined 90 percent or more since shortly after the dam was constructed (Hanel and Gerlach 1964; Hemmingsen et al. 1992; Oregon Department of Fish and Wildlife 2006). An upstream ladder, built to current criteria and with the entrance located to avoid false attraction flows, would provide for the safe, timely and effective passage around J.C. Boyle Dam for redband trout migrating to Spencer Creek and upstream. With fish passage, habitat in Spencer Creek and habitat between J.C. Boyle Dam and Keno Dam would be fully utilized. Seasonal migration of redband trout and access to refugial areas would be restored.

- Coho: Coho salmon are present in the Klamath River below Iron Gate Dam and were present historically below and above the J.C. Boyle Dam to at least Spencer Creek (Hamilton et al. 2005). Access to habitat within the Project would benefit coho salmon by: a) extending the range and distribution of the species thereby increasing the reproductive potential; b) increasing genetic diversity in the coho stocks; c) reducing the species vulnerability to the impacts of degradation; and d) increasing the abundance (ALJ Decision at 86, Ultimate Finding of Fact 9; ALJ Decision at 36, FOF 7-16). With passage at J.C. Boyle Dam, coho salmon would regain access to suitable habitat (Table 3; ALJ Decision at 35, FOF 7-9). With fish passage, access to this habitat would no longer be unutilized. Seasonal migration of coho and access to refugial areas would be restored.
- Spring-run Chinook: With fish passage at J.C. Boyle Dam, spring-run Chinook salmon would regain access to seasonal cool water refugial areas necessary for this run of fish (McCullough 1999) between J.C. Boyle Dam and the next dam upstream (Keno Dam). Spring-run Chinook would also have access to the main channel as an upstream migration corridor necessary to reach historical spawning areas in the Upper Klamath Basin (California Department of Fish and Game 1990).
- Fall Chinook: With fish passage, fall-run Chinook salmon would regain access to 14.3 miles of habitat, including tributaries and the mainstem Klamath River (Table 3) between J.C. Boyle Dam and the next dam upstream (Keno Dam). With fish passage seasonal migration of fall-run Chinook and access to refugial areas would be restored.
- Pacific Lamprey: With fish passage, Pacific lamprey would gain access to habitat, including tributaries and the mainstem Klamath River (Table 3) between J.C. Boyle Dam and the next dam upstream (Keno Dam). This access to habitat would benefit Pacific lamprey by increasing their viability through: a) extending the range and distribution of the species; b) providing additional spawning and rearing habitat; c) increasing the genetic diversity of the species; and d) increasing the abundance of the Pacific lamprey population (ALJ Decision at 38, FOF 8-9).
- Steelhead: With fish passage, steelhead would regain access to 17.1 miles of habitat between J.C. Boyle Dam and the next dam upstream (Keno Dam). Steelhead are generally tributary spawners and able to access reaches of tributaries upstream from areas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would utilize habitat in its entirety in tributaries above J.C. Boyle Dam. This means that

steelhead would fully have access to 17.1 miles of habitat including Spencer Creek (ALJ Decision at 12, FOF 2A-5), Hunters Park and Miners Creeks, as well as the mainstem Klamath River (ALJ Decision at 35, FOF 7-9) below Keno Dam (Table 3; ALJ Decision at 33, FOF 6-10; ALJ Decision at 34, FOF 6-11; ALJ Decision at FOF 34, 6-14 and ALJ Decision at 86, Ultimate Finding of Fact 8). Seasonal migration of steelhead and access to refugial areas would be restored.

Downstream Prescription Rationale: Redband/rainbow trout, federally listed suckers, and other resident fish are currently present in J.C. Boyle Reservoir ((Desjardins and Markle 2000; PacifiCorp 2004b) Fish Resources FTR). The Services conclude that trout (in particular fry and juveniles) move downstream as they do in the Klamath River elsewhere (Hemmingsen 1997) and that the vast majority of these move through the J.C. Boyle Powerhouse because the screens are ineffective and the facility seldom spills. Dam operators at the J.C. Boyle development generally do not spill until Klamath River discharge exceeds 3,000 cfs. Over the past 25 years the Klamath River exceeded this threshold a median of 4.5 days per year and in 12 years it did not exceed 3,000 cfs (Oregon Department of Fish and Wildlife 2006). The Services conclude that turbine entrainment at J.C. Boyle Dam causes significant mortality to downstream migrating redband trout (see discussion of turbine-caused mortality later in this paragraph; ALJ Decision at 86, Ultimate Findings of Fact 6 and 7). With the construction of a functional adult fish ladder at J.C. Boyle Dam, salmon, and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005). However, the progeny of these fish would also move downstream and must negotiate not only the reservoir but the dam, powerhouse, and spillway during their outmigration. Migration is one of several defining life history characteristics of resident trout and anadromous fish, especially salmonids (ALJ Decision at 27, FOF 3-7; ALJ Decision at 13, FOF 2A-10). Turbine caused mortality at dams can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001), turbine mortality being caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (EPRI) (Electric Power Research Institute 1987) reported that the Francis turbines which are used at the J.C. Boyle development have an average mortality of about 24 percent for all subject species. EPRI's studies, and those of Milo Bell (Bell 1986; Bell et al. 1967) measured entrainment for some of the same species and under similar conditions as exist at J.C. Boyle Dam, and thus support the conclusion that entrainment mortality is presently occurring at significant levels for resident fish. The J.C. Boyle development, at 440 feet of head, may have even greater mortality due to turbine entrainment, as pressure gradients will be even greater. For projects with Francis turbines, the EPRI study found a high correlation ($r = 0.77$) between head and fish mortality. Four hydroelectric developments with Francis turbines that had greater than 335 feet of head had mortality ranging from 33 to 48 percent (Electric Power Research Institute 1987); ALJ Decision at 29, FOF 4-10). The facilities in these studies have comparable or less hydraulic head than the J.C. Boyle development and comparable turbine types. Using the above evidence, the Services conclude that entrainment mortality at J.C. Boyle Powerhouse likely falls in this range (ALJ Decision at 30, Decision 4-11) rather than the 12 to 36 percent range estimated by the Applicant (PacifiCorp 2004a), Exhibit E 4-113). It is estimated

that "several tens of thousands of resident fish" are annually entrained at "each of the Projects" facilities (ALJ Decision at 28, Decision 4-2). It is anticipated that annual entrainment of anadromous fish would be on the same order of magnitude, if not greater. Once entrained, the fish face a high risk of mortality. For juvenile fish, the risk is between 10 to 30 percent (ALJ Decision at 29, Decision 4-5). When anadromous fish are restored above J.C. Boyle Dam, out-migrating salmonid smolts, including federally listed coho, would be entrained and a significant portion killed during turbine passage absent downstream fish screens and bypass systems. Volitional fish passage would be consistent with fish movement through Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat. It is also consistent with the goals and resource management objectives of the Klamath River Basin Fishery Task Force and the Services.

PacifiCorp recognizes that entrainment at J.C. Boyle dam is a "problem that needs to be addressed" (ALJ Decision at 30, FOF 4-12). The development of detailed design and construction plans for review and approval by the Service and NMFS-Engineering is critical to ensure that effective passage measures are incorporated into the design. The 4 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Sidecast Rock Barrier Elimination Prescription Rationale: Sidecast rock extends from the J.C. Boyle canal access road into and across the J.C. Boyle bypass channel, blocking or inhibiting fish passage. Presently, all flows in the bypass reach filter through the sidecast rock and there is no unimpeded route for anadromous and resident fish passage at the typical bypass flows observed. The rock has been deposited in this channel recently and is sidecast from Project construction and operation of the J.C. Boyle canal and access road. This impediment to fish was observed during the summer of 2005 (David K. White, NMFS, pers. comm.). Historically, higher flows in the bypassed channel might have been able to disperse this material and restore fish movement. Physical structures, facilities, devices or barrier removal are necessary to achieve the safe, timely, and effective passage through the channel past this obstruction and would be consistent with the goals and objectives for resource management of the Services and the Klamath River Basin Fishery Task Force. The 2 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Tailrace Prescription Rationale: Water discharging from the J.C. Boyle Powerhouse represents a significant portion of the total river flow of the Klamath River. Under the current license the powerhouse can discharge up to 3,000 cubic feet per second (cfs) and the bypass reach contains as little as 320 cfs. Even with the instream flow in the bypassed channel proposed by the Applicant, this disparity in flows contributes to false attraction for upstream migrating fish to an area which provides no upstream passage. The natural tendency for fish attracted to such an area is to hold and wait for passage conditions to improve or to attempt to move past the obstacle either by swimming or leaping. Depending on powerhouse operations, draft tube discharge velocities at Project facilities are between 3.4 and 10.4 feet per second (fps) (CH2MHill 2006); these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in

migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985).

Adult anadromous fish are attracted into oncoming flows (National Marine Fisheries Services 2004) as are resident fish. Migration upstream may be delayed when tailrace flows from the powerhouse exceed river bypass reach flows. A migration delay, or combined delays at several facilities, may prevent fish from reaching suitable spawning habitat when they are ready to spawn or conditions are optimal for survival. Migration delays caused by tailrace effects may have a greater impact on fish populations than injury and mortality from turbine impacts (Federal Energy Regulatory Commission 1994). Migration delays may occur to a greater percentage of migrating fish than the percentage of fish impacted by turbine mortality. Migration delays are well documented for anadromous salmonids in the Pacific Northwest (Haynes and Gray 1980; Rondorf et al. 1983; Schadt et al. 1985; Vogel et al 1990). For migratory fish, false attraction occurs when upstream migrants are attracted to turbine discharge or spillway flows rather than to fishway flows. False attraction also occurs when upstream migrants detect the scent of their natal stream downstream of its natural outlet (Fretwell 1989). This happens when water from a natal stream is diverted through a canal or pipe to a hydroelectric project. In either instance, without proper project design or operation modifications, there may be migratory delays.

In order to prevent injury, delay, or mortality to salmonids, caused by attempts to swim upstream into the tailrace, a barrier is required to guide migrating fish away from this area and encourage them to continue their upstream migration. The 4 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific tailrace barrier prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the tailrace barrier prescriptions. The Applicant subsequently withdrew its request for hearing regarding tailrace barrier prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the tailrace barrier prescriptions in the Modified Prescriptions below to allow the Applicant to study the need for and design of tailrace barriers for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the tailrace barriers in order to inform the need for and design of tailrace barriers. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that tailrace barriers are necessary for the safe, timely and effective upstream passage of fish at J.C. Boyle Dam.

Spillway Prescription Rationale: Spill survival estimates for juvenile salmonids are numerous and range from 76 percent to 100 percent, depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating

survival, and predator conditions (National Marine Fisheries Service 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Turbulent mixing of spilled water with receiving waters may result in gas supersaturation and resultant gas bubble disease in fish. Dissolved nitrogen concentrations of more than 130 percent of normal equilibrium levels have been measured in tailwaters (Ebel and Raymond 1976). The threshold value for significant mortality among juvenile Chinook salmon and steelhead trout occurs when nitrogen gas levels are about 115 percent of normal. Along the Columbia River, where many spillways discharge from a given dam and there are many consecutive dams along the stream course, supersaturation increases cumulatively from one dam to the next. Losses of salmon and steelhead trout in the Columbia River due to supersaturation have been severe in years of high spillage (Ebel and Raymond 1976). Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g. baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water.

The configuration of the J.C. Boyle Dam spillway includes numerous rocks and many such solid objects and it is reasonable to conclude that significant mortality will occur while passing fish through the spillway. Therefore, the following spillway modifications and 4 year timeline are necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific spillway prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the spillway prescriptions. The Applicant subsequently withdrew its request for hearing regarding spillway prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the spillway prescriptions in the Modified Prescriptions below to allow the Applicant to study the need for and design of spillway modifications for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the spillway modifications in order to inform the need for and design of spillway modifications. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that spillway modifications are necessary for the safe, timely, and effective passage of fish at J.C. Boyle Dam.

6.1 J.C. Boyle Bypass Channel

6.1.1 Barrier Elimination: The Licensee shall construct physical structures, facilities, or devices to provide passage around or remove the sidecast rock barrier approximately 2.5 mile above the J.C. Boyle Powerhouse in the J.C. Boyle Bypass reach within 2 years of the issuance of the new license to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout.

6.1.2 Design and Construction: The Licensee shall develop design, construction, and maintenance plans according to the terms of the Modified General Prescriptions 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

6.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

6.2 J.C. Boyle Upstream Fishway

6.2.1 J.C. Boyle Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at J.C. Boyle Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS' criteria (National Marine Fisheries Service 2004) or alternative criteria approved by the Services. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools and the auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The ladder entrance shall be located downstream of the fish screen bypass outfall and existing velocity barrier below the existing ladder. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997), or such alternative criteria as may be determined acceptable by NMFS-Engineering and the Service. The AWS shall be designed to provide the correct water temperature and water quality as to attract fish. The fish ladder and AWS together must be designed to supply attraction flows according to the terms of Modified General Prescriptions 1.1.7. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway shall be constructed to current criteria for passage of Pacific lamprey. The fishway shall be constructed and operational within 4 years of the issuance of the new license.

6.2.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS-Engineering prior to construction.

6.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

6.3 J.C. Boyle Downstream Fishway

6.3.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a new fish screen and a bypass facility at J.C. Boyle Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The screen and bypass shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria acceptable to the Service and NMFS-Engineering. The screen and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The screen shall divert all fish to a bypass facility. The bypass facility shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall complete construction and begin operation within 4 years of the issuance of the new license.

6.3.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS-Engineering prior to construction.

6.3.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

6.4 J.C. Boyle Spillway

6.4.1 Spillway Modification: Unless the Services determine based on site-specific studies that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 6.4.2 and 6.4.3, the Licensee shall modify, maintain, and evaluate a spillway for the volitional passage at J.C. Boyle Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The spillway modifications shall be constructed and operational within 4 years of the issuance of the new license.

6.4.2 Spillway Modification Studies: The Licensee may, in consultation with the Services, study the need for and design of hydraulically-engineered

spillway modifications to improve volitional downstream fish passage at J.C. Boyle Dam for Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of spillway modifications for review and approval by the Services consistent with the provisions for timing of the spillway design under Modified Specific Prescriptions 6.4.3.

6.4.3 Spillway Design: Unless the Services determine based on site-specific studies that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 6.4.2, the Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS-Engineering prior to construction.

6.4.4 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

6.5 J.C. Boyle Tailrace Barrier

6.5.1 Tailrace Barrier Construction: Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 6.5.2 and 6.5.3, the Licensee shall construct a tailrace barrier and guidance system at J.C. Boyle Dam to provide for the safe, timely, and effective passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 4 years of the issuance of the new license

6.5.2 Tailrace Barrier Studies: The Licensee may, in consultation with the Services, study the need for and design of a tailrace barrier and guidance system at the J.C. Boyle Powerhouse. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of tailrace barriers for review and approval by the Services consistent with the provisions for timing of the tailrace barrier design under Specific Modified Prescriptions 6.5.3.

6.5.3 Tailrace Barrier Design – Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 6.5.2, the Licensee shall, within 3 years of the issuance of the new license, develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 for

review and approval by the Service and NMFS-Engineering prior to construction.

6.5.4 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

7. Keno Dam

Upstream Prescription Rationale: Historically steelhead, spring-run and fall-run Chinook salmon (Hamilton et al. 2005; ALJ Decision at 12, FOF 2A-3 through 2A-5), and resident fish migrated through the current site of Keno Dam to reach holding, spawning, incubation, and rearing habitat. Keno Dam is a partial barrier to this passage and, thus, to holding, spawning, incubation, and rearing habitat in the Link River reach. The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore corresponding life history phases of anadromous salmonids to their historical range and suitable habitat. The goal of the Service is to successfully restore resident fish to their historical range and suitable habitat as well. The objective in reaching these goals is restoration of safe, timely, and effective fish movement. Providing fish passage that meets current standards at Keno Dam is consistent with goals and objectives for resource management of the Services and the Klamath River Basin Fisheries Task Force. The provision of effective fish passage facilities will meet these goals and provide mitigation for the impacts of the dam.

Keno Reservoir in its current state would be primarily a migration corridor for anadromous salmonids because the depth and velocity of the impoundment provide little suitable habitat. Link River is the only free flowing reach of the Klamath River between Keno Dam and Link River Dam. Link River provides habitat for Klamath largescale suckers (*Catastomus snyderi*) during all months of the year, and for Lost River and shortnose suckers in summer when water quality is poor in downstream Lake Ewauna (Rich Piaskowski, BOR, pers. comm.) For salmonids, Link River provides habitat most of the year other than summer months. During most years, the Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) has dissolved oxygen concentrations greater than 6 mg/L and temperatures less than 20°C from mid-November through mid-June (Jason Cameron, BOR, pers. comm.). These conditions are within the criteria for migrating adult anadromous salmonids for these months (U. S. Environmental Protection Agency 2003). For steelhead trout, the Services expect that adult returns would occur primarily from October through March. Major runs of spring-run Chinook and fall-run Chinook salmon would occur from March to June and September to December, respectively. Because of their run timing, passage of fall-run Chinook may be affected by conditions in Lake Ewauna. Interim, seasonal, upstream trap and haul for primarily fall-run adult Chinook salmon around Keno Reservoir and Lake Ewauna would be necessary during the period June 15 to November 15 when DO and temperature are out of criteria for this life stage of this species (U.S. Environmental Protection Agency 2003) and water quality conditions may not be suitable for migration. The Services expect trap and haul to be an effective interim, seasonal fish passage method for adult fall-run Chinook salmon during the period June 15 to November 15 because only this species would be transported and only for a short distance. Other species need

volitional fishways to access habitat in Keno Reservoir and Link River year round. Conditions in this reach are expected to improve over time to a point when volitional passage will be effective year-round for all target species. Water quality is expected to improve over the term of a new Project license through the implementation of the Total Maximum Daily Load (TMDL) process, imposition of state water quality certification conditions, and provisions of a new license, including terms and conditions added by the Commission and based on the recommendations of the Agencies pursuant to FPA section 10(j). Upper Klamath Lake above Link River Dam currently provides habitat for salmonids. Water quality problems in the lake during the summer months are relatively short lived and springs in the lake provide thermal refugial areas for redband trout and other species. Redband trout are also well known for migrating upstream into the Wood and Williamson Rivers when Upper Klamath Lake water quality deteriorates. Once fish pass Keno Dam, Keno Reservoir, and Lake Ewauna, the current upstream fishway at Link River Dam would pass anadromous fish species (including Pacific lamprey) on their way to currently available, good quality upstream habitat upstream (Huntington 2006; Oregon Department of Fish and Wildlife 1997). The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Keno Dam may impede native suckers occupying habitat below the dam from reaching elements of their historical habitat including Lake Ewauna, Link River, and Upper Klamath Lake, the core recovery area for this species (USDI Fish and Wildlife Service 1993). The existing fishway at Keno Dam does not meet Service and ODFW criteria for sucker passage (Table 1) because the slope is too steep (USDI Fish and Wildlife Service 2005). However, the potential contribution of the J.C. Boyle Reservoir population occupying habitat below Keno Dam for conservation of the species may be limited. Monitoring of fish passage at Keno Dam has demonstrated small numbers of fish moving upstream through the existing ladder at Keno Dam (PacifiCorp 1997). Until additional information becomes available regarding the populations of federally listed suckers in J.C. Boyle Reservoir and the need for passage of federally listed suckers upstream, the Service reserves its authority to prescribe an upstream fishway to sucker criteria at Keno Dam.

Benefits of fishways at Keno Dam include:

- Resident Trout: Significant recreational fisheries for redband trout currently exist in the Project area, as well as in and upstream of Upper Klamath Lake. Upstream fish passage at Keno Dam would result in restoring the connectivity of resident redband populations in the mainstem Klamath River with those in Keno Reservoir/Lake Ewauna, Link River, and Upper Klamath Lake. In 2005, The Bureau of Reclamation completed a new fishway at Link River Dam designed to pass endangered suckers, trout, lamprey, and other native species. Adequate upstream fish passage at Link River Dam has resulted in restoring the connectivity of resident redband populations in the Link River reach with those in Upper Klamath Lake and its tributaries. These tributaries, including the Wood, Williamson, and Sprague Rivers in particular, provide important habitat elements, such as spawning and temperature related refugial areas for redband trout (Oregon Department of Fish and Wildlife 1997). With fish passage, habitat between Keno and Link River Dam would be

fully utilized. Seasonal migration of trout and access to refugial areas would be improved.

- Spring-run Chinook salmon, fall-run Chinook, and steelhead: All these species occurred historically above the current site of Keno Dam and Upper Klamath Lake (Hamilton et al. 2005; ALJ Decision at 12, FOF 2A-3 through 2A-5). With upstream fishways at downstream dams and the new ladder at Link River Dam, adequate anadromous fish passage facilities at Keno Dam would mean these runs would regain access to 49 significant tributaries in the Upper Klamath Basin, comprising 360 miles of currently productive anadromous fish habitat (if anadromous fish had access to this habitat) and an additional 60 miles of recoverable habitat (Huntington 2006). Large populations of spring-run Chinook were found in several of the tributaries to Upper Klamath Lake, including both the Williamson and Sprague Rivers (California Department of Fish and Game 1990). Historical run sizes in both the Williamson River and the Sprague River were estimated to be at least 5,000 spring-run Chinook salmon (California Department of Fish and Game 1990). Substantial numbers of what were apparently fall-run Chinook were still being harvested in the Sprague River up until about 1910 (Lane and Lane Associates 1981). Steelhead are generally tributary spawners and able to access reaches acifiCorp,</authoas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would have access to tributaries above Keno Dam. Seasonal migration of anadromous salmonids and access to refugial areas would be restored.
- Pacific lamprey: At Keno Dam the existing fishway does not meet current criteria to accomplish lamprey passage because corners and ladder steps are not rounded (USDI Fish and Wildlife 2005). Lampreys occur long distances inland in the Columbia and Yakima river systems (Wydoski and Whitney 2003) and would likely do so in the Klamath River system as well, as habitat conditions are similar. Access to habitat above Keno Dam would likely benefit Pacific lamprey by increasing their viability through: a) extending the range and distribution of the species; b) providing additional spawning and rearing habitat; c) increasing the genetic diversity of the species; and d) increasing the abundance of the Pacific lamprey population (ALJ Decision at 38, FOF 8-9). Resident lamprey would benefit from a fishway that meets current criteria to accomplish lamprey passage.

Spillway Prescription Rationale: Spill survival estimates for salmonids are numerous and range from 76 percent to 100 percent depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (National Marine Fisheries Service 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g., baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water. Water exits Keno spillways via undershot gates with small openings and plunges into a wide, shallow bedrock sill that is an area known for predatory fish (Oregon Department of Fish and Wildlife 1997). It is likely that fish will be injured as water is passed through the gates under pressure and that predation will occur in the receiving waters. Therefore, the spillway

modifications and 3 year timeline are necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific spillway prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the spillway prescriptions. The Applicant subsequently withdrew its request for hearing regarding spillway prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the spillway prescriptions in the Modified Prescriptions below to allow the Applicant to study the need for and design of spillway modifications for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the spillway modifications in order to inform the need for and design of spillway modifications. However, unless and until such site-specific studies are done, the Services must rely on the available information in concluding that spillway modifications are necessary for the safe, timely and effective passage of fish at Keno Dam.

7.1 Upstream Fishway at Keno Dam

7.1.1 Keno Upstream Fishway: To provide for the safe, timely, and effective upstream passage of Chinook salmon, steelhead trout, Pacific lamprey, and redband trout, the Licensee shall modify, operate, and maintain the existing volitional fishway. The Licensee shall also construct, operate, and maintain a holding and sorting facility to accommodate upstream interim, seasonal trap and haul for anadromous salmonids at Keno Dam. In addition, the modification shall include features to trap, hold, and sort anadromous salmonids by age and species, as well as accomplish the transfer of Chinook salmon upstream above Link River Dam between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. If agreed to by the Services, volitional passage shall be employed during this time in periods when dissolved oxygen concentrations are greater than 6 mg/L and temperatures lower than 20°C, as measured at Miller Island using a method that is acceptable to the Services. The upstream fishway shall be operated year-round regardless of trap and haul operations to allow for the passage of steelhead, Chinook salmon, redband trout, lampreys, suckers, and other species. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or alternative criteria approved by the Services. The AWS shall be designed

to provide the correct water temperature and water quality as to attract fish. The fish ladder and AWS together must be designed to supply attraction flows according to the terms of Modified General Prescriptions 1.1.7 The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway shall be modified to current criteria (Table 1) for passage of Pacific lamprey. The fishway shall be modified and operational within 3 years of the issuance of the new license.

7.1.2 Design Consultation: The Licensee shall develop design and modification plans according to the terms of the Modified General Prescriptions 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS-Engineering prior to construction. The design shall include features to hold and sort anadromous salmonids by age and species, as well as accomplish the transfer of Chinook salmon upstream between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. Facilities shall be designed so that fish to be trapped and hauled above Keno are held a maximum of 8 hours before transport. The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway must be modified to current criteria for passage of Pacific lamprey.

7.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

7.2 Keno Spillway

7.2.1 Spillway Modification: Unless the Services determine, based on site-specific studies, that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 7.2.2 and 7.2.3, the Licensee shall modify, maintain, and evaluate the radial gate(s) to provide a spillway at Keno Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, suckers, lamprey, steelhead trout, and redband trout. The spillway modifications shall be constructed and operational within 3 years of the issuance of the new license.

7.2.2 Spillway Modification Studies: The Licensee may, in consultation with the Services, study the need for and design of hydraulically-engineered modifications to the radial gate(s) to provide a spillway (s) at Keno Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, suckers, lamprey, steelhead trout, and redband trout. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and

submit study results and recommendations on the need for and design of spillway modifications for review and approval by the Services consistent with the provisions for timing of the spillway design under Modified Specific Prescriptions 7.2.3.

7.2.3 Spillway Design: Unless the Services determine, based on site-specific studies, that spillway modifications are unnecessary in accordance with Modified Specific Prescriptions 7.2.2, the Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS engineering prior to construction.

7.2.4 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in the Modified General Prescriptions, above.

Eastside and Westside Developments

Eastside and Westside Downstream Prescription Rationale: The Applicant's Eastside and Westside developments divert water at Link River Dam to downstream powerhouses. Migration is one of several defining life history characteristics of resident trout and anadromous fish, especially salmonids (ALJ Decision at 27, FOF 3-7; ALJ Decision at 13, FOF 2A-10). Significant numbers of redband trout and other resident fish are presently moving downstream from Upper Klamath Lake and being entrained by the Applicant's Eastside and Westside developments, including tens of thousands of larvae and juveniles of federally listed suckers annually (Gutermuth et al. 2000). With the adult fish ladder in place at BOR's Link River Dam and construction of functional adult fish ladders at dams downstream of Link River, salmon and steelhead will return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005). However, the progeny of these fish must also negotiate not only the reservoir but the dam, powerhouse, and spillway during their outmigration. Unless protected by fish screens and bypasses, both resident and anadromous fish can suffer injury or death by passing through turbines at hydroelectric plants (Electric Power Research Institute 1987). Turbine-caused mortality can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001); turbine mortality being caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (Electric Power Research Institute 1987) reported that Francis turbines, which are used at the Applicant's Eastside and Westside developments, have an average mortality of about 24 percent. It is estimated that "several tens of thousands of resident fish" are annually entrained at "each of the Projects" facilities (ALJ Decision at 28, FOF 4-2). It is anticipated that annual entrainment of anadromous fish would be on the same order of magnitude, if not greater. Once entrained, the fish face a high risk of mortality. For juvenile fish, the risk is between 10 to 30 percent (ALJ Decision at 29, FOF 4-5). Based upon these studies and findings, turbine similarities, and known entrainment, the Services conclude that turbine entrainment at the Applicant's Eastside and Westside

developments causes comparable levels of mortality to downstream migrating fish as found in studies cited above. Volitional fish passage would be consistent with fish movement through the Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat. Volitional fish passage would be consistent with the goals and objectives for resource management of the Klamath River Basin Fishery Task Force and the Services. Downstream fishways at the Applicant's Eastside and Westside developments would screen and divert both resident and anadromous fish from turbine intakes. This would guide downstream migrating fish, minimize mortality of federally listed suckers, and ensure that delay and entrainment mortality of redband trout, other resident species, and anadromous outmigrants would be minimized. To ensure that these fish can outmigrate, downstream passage facilities at the Eastside and Westside developments are necessary.

Temporary, seasonal trap and transport for downstream migrants would be necessary due to seasonal water quality problems in Lake Ewauna and Keno Reservoir. During most years, the Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) has dissolved oxygen concentrations less than 6 mg/L and temperatures greater than 20°C from mid-June through mid-November (Jason Cameron, BOR, pers. comm.). While there is evidence that some juvenile Chinook salmon can tolerate temperatures near 20°C in Upper Klamath Lake (Maule et al. 2007), these conditions are not within criteria (U.S. Environmental Protection Agency 2003) for outmigrating juvenile anadromous salmonids and may not be conducive to downstream migration during this period. Transporting outmigrant anadromous salmonids around Keno Reservoir during this period would avoid poor water quality during summer months until restoration efforts improve reservoir dissolved oxygen and water temperatures.

The Services expect that the major outmigrations of juvenile Chinook salmon would occur from March to June for spring-run Chinook and February to May for fall-run juveniles. The Services expect trap and haul to be an effective interim, seasonal fish passage method for Chinook salmon under these summer conditions because only this species would be transported for a short distance. Other species need volitional fishways to access habitat in Keno Reservoir\Lake Ewauna and Link River year round. Seasonal trap and haul would be performed on an interim basis. Water quality is expected to improve over the term of a new Project license through the implementation of the Total Maximum Daily Load (TMDL) process, imposition of state water quality certification conditions, and provisions of a new license (the inclusion of 10(j) recommendations).

Migrating suckers make use of habitat in Lake Ewauna as long as water quality is adequate (i.e., outside of July, August, September (Rich Piaskowski, BOR, pers. comm.)). Downstream migrating suckers captured during periods when water quality is inadequate in Keno Reservoir\Lake Ewauna would be returned to Upper Klamath Lake.

Eastside and Westside Tailrace Barrier Prescription Rationale: These developments have no tailrace barriers and have never been tested for mortality to federally listed suckers, other resident fish, or anadromous salmonids. Water discharging from the Eastside and Westside powerhouses represents a significant portion of the total river flow of the Klamath River. The

natural tendency for fish attracted to such an area is to hold and wait for passage conditions to improve, or to attempt to move past the obstacle either by swimming or leaping. Depending on powerhouse operations, draft tube discharge velocities at Project facilities are between 3.4 and 10.4 feet per second (fps) (CH2MHill 2006); these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985).

Adult anadromous fish are attracted into oncoming flows (National Marine Fisheries Service 2004). Migration upstream may be delayed when tailrace flows from the powerhouse exceed river bypass reach flows. A migration delay, or combined delays at several facilities, may prevent fish from reaching suitable spawning habitat when they are ready to spawn or conditions are optimal for survival. Migration delays caused by tailrace effects may have a greater impact on fish populations than injury and mortality from turbine impacts (Federal Energy Regulatory Commission 1994). Migration delays may occur to a greater percentage of migrating fish than the percentage of fish impacted by turbine mortality.

Migration delays are well documented for anadromous salmonids in the Pacific Northwest (Haynes and Gray 1980; Rondorf et al. 1983; Schadt et al. 1985; Vogel et al 1990). For migratory fish, false attraction occurs when upstream migrants are attracted to turbine discharge or spillway flows rather than to fishway flows. False attraction also occurs when upstream migrants detect the scent of their natal stream downstream of its natural outlet (Fretwell 1989). This happens when water from a natal stream is diverted through a canal or pipe to a hydroelectric project. In either instance, without proper Project design or operation modifications, there may be migratory delays. In order to prevent injury, delay, or mortality to suckers and salmonids, caused by attempts to swim upstream into the tailraces, barriers are required to guide migrating fish away from the tailrace area to continue their upstream migration. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

In the Preliminary Prescriptions, the Services based specific tailrace barrier prescriptions on the evidence cited above. In its request for hearing on disputed issues of material fact, the Applicant disputed facts supporting the tailrace barrier prescriptions. The Applicant subsequently withdrew its request for hearing regarding tailrace barrier prescriptions based on a stipulation with the Services (*In the Matter Of: Klamath Hydroelectric Project*, Docket Number 2006-NMFS-0001, Order Granting the Applicant's Motion to Withdraw USFWS/NMFS Issues 5 and 9, September 14, 2006 (Administrative Law Judge 2006b)). In accordance with the stipulation, the Services have revised the tailrace barrier prescriptions in the Modified Prescriptions below to allow the Applicant to study the need for and design of tailrace barrier s for anadromous and native resident fish. The Applicant must perform any such studies in consultation with the Services, and provide the results of any such studies to the Services for approval before design and construction of the tailrace barriers in order to inform the need for and design of tailrace

barriers. However, unless and until such site-specific studies are done, the Services must rely on the available information concluding that tailrace barriers are necessary for the safe, timely, and effective upstream passage of fish at the Eastside and Westside developments.

8.1 Eastside and Westside Downstream Fishways

8.1.1 Intake Fish Screens and Bypass Facilities: The Licensee shall construct, operate, maintain, and evaluate fish screens and bypass facilities at both Eastside and Westside developments to provide for the safe, timely, and effective downstream passage of Chinook salmon, steelhead trout, Pacific lamprey, federally listed suckers, and redband trout. The fish screens and bypass facilities shall be located as close as is practicable to the beginning of each diversion to minimize entrapment in the diversion canals. The fish screens and bypass facilities shall transport fish to holding, sorting, counting, and tagging facilities. Fish would then continue through the bypass facility downstream except during the period from June 15 and November 15, when trap and haul downstream to below Keno Dam would be employed for the purposes of restoration and the safe, effective, and timely passage of fish. If agreed to by the Services, seasonal trap and haul downstream shall be discontinued and fish routed downstream through the bypass when dissolved oxygen concentrations are greater than 6 mg/L and temperatures lower than 15°C, as measured at Miller Island using a method that is acceptable to the Services. The bypass facilities shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology), including features to detect and record data from fish tagged above the facilities to evaluate survival and fishway effectiveness. The downstream fishway shall be operated year-round regardless of trap and haul operations to allow for the passage of steelhead, redband trout, lampreys, suckers, and other species. The screens and bypass facilities shall be operated year-round and shall be designed in accordance with sucker criteria (Table 2 in Preliminary Prescription), or alternative criteria as acceptable to the Services. The screens and bypass facilities shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The construction shall include features to return suckers to Upper Klamath Lake. The downstream fishways shall be constructed and operational within 3 years of the issuance of the new license.

8.1.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS-Engineering. The design of the bypass facilities shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar

technology) and to hold, sort, count, and mark downstream migrating anadromous fish by age and species. The facilities shall include features to detect and record data from fish tagged above the facilities to evaluated survival and fishway effectiveness. The design shall include features to accomplish the transfer of these fish downstream between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. The design shall include features to return suckers to Upper Klamath Lake. Facilities shall be designed so that fish to be trapped and hauled are held a maximum of 8 hours before transport.

8.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above.

8.2 Tailrace Barriers at Eastside and Westside Developments

8.2.1 Tailrace Barrier Construction: Unless the Services determine, based on site-specific studies, that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 8.2.2 and 8.2.3, the Licensee shall construct a tailrace barrier and guidance system at the Eastside and Westside powerhouses to provide for the safe, timely, and effective upstream passage of Chinook salmon, steelhead trout, suckers, redband trout, and lamprey. The tailrace barriers and guidance system shall be constructed according to approved design plans and within 3 years of the issuance of the new license.

8.2.2 Tailrace Barrier Studies: The Licensee may, in consultation with the Services, study the need for and design of a tailrace barrier and guidance system at Eastside and Westside Developments. The Licensee shall submit a plan for any such studies to the Services for review and approval prior to conducting studies. After approval of any such plan, the Licensee shall complete the studies and submit study results and recommendations on the need for and design of tailrace barriers for review and approval by the Services consistent with the provisions for timing of the tailrace barrier design under Modified Specific Prescriptions 8.2.3.

8.2.3 Tailrace Barrier Design: Unless the Services determine based on site-specific studies that tailrace barriers are unnecessary in accordance with Modified Specific Prescriptions 8.2.2, the Licensee shall, within 1 year of the issuance of the new license, develop design and construction plans according to the terms of the Modified General Prescriptions 1.1.1 for review and approval by the Service and NMFS-Engineering prior to construction.

8.2.4 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in Modified General Prescriptions, above

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UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE

IN THE MATTER OF:	**DOCKET NUMBER**
KLAMATH HYDROELECTRIC PROJECT	2006-NMFS-0001
(License Applicant Pacific Corp)	**FERC PROJECT NUMBER:**
	2082

DECISION

Dated: September 27, 2006

Issued By:

Hon. Parlen L. McKenna, Presiding

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SUMMARY OF THE CASE

This expedited trial-type proceeding was brought pursuant to Section 241 of the Energy Policy Act of 2005, Pub. L. 109-58, § 241, 119 Stat. 594, 674-75 (Aug. 8, 2005) ("EPAct") (codified in 16 U.S.C. §§ 797(e) and 811), and the underlying procedural regulations codified in 50 C.F.R. Part 221. Section 241 amends sections 4(e) and 18 of the Federal Power Act ("FPA") (amended and codified in 16 U.S.C. §§ 791-823d). Those sections provide certain federal agencies authority to include conditions and/or fishway prescriptions in any hydroelectric license issued/re-issued by the Federal Energy Regulatory Commission ("FERC"). See 16 U.S.C. §§ 797(e) and 811. [1]

More specifically, under section 4(e), the Secretary of Interior ("Interior"), acting through the Bureaus of Land Management ("BLM") and/or Reclamation ("BOR"), may establish conditions deemed necessary for the protection of Indian reservations and public lands to be included in a hydroelectric license. See 16 U.S.C. § 797(e). Likewise, under section 18 of the FPA, the Secretaries of Commerce (acting through the National Marine Fisheries Service ("NMFS")), and Interior (acting through the United States Fish and Wildlife Service ("USFWS")) may prescribe fishways to provide for the safe, timely, and effective passage of fish. Id. at 811. Pursuant to section 241 of EPAct, any party to

[1] On November 17, 2005, the Departments of Agriculture, Interior, and Commerce jointly published procedural regulations governing the expedited trial-type hearings conducted under section 241 of EPAct. See 70 Fed. Reg. 69,804 (Nov. 17, 2005). Agriculture's regulations are codified in 7 C.F.R. Part 1, Interior's regulations are codified in 43 C.F.R. Part 45, and Commerce's regulations are codified in 50 C.F.R. Part 221. The three versions of the regulations are substantively identical with minor variations to account for the different Department's organizational components, and a slight variation on the reference to conditions and prescriptions. Id. at 69,808. Since this case was referred by NMFS to the United States Coast Guard (its designated Administrative Law Judge Office) for adjudication, 50 C.F.R. Part 221 governs this proceeding. See 50 C.F.R. § 221.26 (a).

the FERC license proceeding is entitled to a determination on "disputed issues of material fact" concerning the conditions and fishway prescriptions following an expedited evidentiary hearing on the record before a judge. See Pub. L. 109-58, § 241, 119 Stat. 594, 674-75 (codified in 16 U.S.C. §§ 797(e) and 811).

As the party requesting the hearing, the burden of proof rests with PacifiCorp to establish its version of the facts on each disputed issues of material fact by a preponderance of the evidence. See Order Granting Motion to Confirm Burden of Proof (July 6, 2006); 5 U.S.C. § 556(d) (establishing that the burden of proof rests with the proponent); and 50 C.F.R. § 221.57 (adopting the preponderance of the evidence standard of proof).

The parties framed fourteen disputed issues of material fact for decision. In this case, PacifiCorp partially proved its version of the facts with respect to USFWS/NMFS Issue 8. The utility company also proved its version of the facts with respect to BLM Issue 19 and partially proved its version of the facts with respect to BLM Issues 10 and 11. However, PacifiCorp failed to prove its version of the facts with respect to the remaining disputed issues of material fact.

This decision is made following a two-day prehearing conference; the submission of thousands of pages of written direct and rebuttal testimony, exhibits, and transcripts; the filing of and ruling on numerous pretrial motions; and over forty-five hours of hearing over a five day period. The preliminary statement, a listing of the stipulated disputed issues of material fact to be decided, the findings of fact on each of those disputed issues of material fact, a discussion analyzing the basis for the findings of fact, and rulings on the proposed findings of fact and conclusions of law are set forth below.

PRELIMINARY STATEMENT

This case concerns disputed issues of material fact with respect to preliminary prescriptions and conditions that the NMFS and Interior agencies seek to include in any FERC issued re-license for the operation of the Klamath Hydroelectric Project No. 2082 ("Project"). The Project is located on the upper Klamath River beginning in Northern California and extending through Southern Oregon. The Project consists of five ("5") main stem dams: 1) Iron Gate Dam; 2) Copco II Dam; 3) Copco I Dam; 4) J.C. Boyle Dam and Diversion; and 5) Keno Dam. PacifiCorp is the current owner, operator, and holder of the FERC license to operate the Project.

On February 26, 2004, PacifiCorp filed an application with the FERC for a license to continue operations at the Project. In response to this application, FERC issued a Notice of Application Ready for Environmental Analysis, which included a Request for Preliminary Prescriptions and Conditions. By letter to the FERC dated March 24, 2006, NMFS filed its "Comments, Recommended Terms and Conditions, and Preliminary Prescriptions for the Klamath Hydroelectric Project, FERC Project No. 2082." Included with that letter were NMFS' section 18 preliminary prescriptions for the construction and/or modification of fishways at multiple Project facilities. The preliminary prescriptions were developed jointly with USFWS. A copy of the preliminary prescriptions is contained in Attachment A.

Separately, in a letter to the FERC dated March 27, 2006, the BLM and the BOR each filed section 4(e) preliminary conditions (together with USFWS section 18 preliminary prescriptions that were jointly developed with NMFS) (collectively referred to as "Interior Agencies"). A copy of the preliminary conditions and prescriptions is contained in Attachment B.[2]

Pursuant to 16 U.S.C §§ 797(e) and 811 (as amended), and 50 C.F.R. Part 221, in letters dated April 28, 2006, PacifiCorp requested an expedited trial-type hearing to challenge the factual bases supporting the preliminary prescriptions and conditions. Since three of the five, Project dams are located in Siskiyou County, California, its County Counsel filed a notice of intervention concerning the preliminary conditions in support of PacifiCorp's hearing request. The California Department of Fish and Game ("CDFG"), the Klamath Tribes, the Hoopa Valley Tribes, and the Conservation Groups all filed notices of intervention concerning the preliminary conditions and prescriptions. Attachment C provides a chart that details each intervenor and their disputed issue(s) of concern.[3]

[2] Since they were jointly developed, the USFWS' section 18 preliminary prescriptions are identical to the NMFS section 18 preliminary prescriptions. The only distinction between the two is the Secretary of Interior is responsible for filing USFWS' preliminary prescription whereas the Secretary of Commerce is responsible for NMFS' preliminary prescription.

[3] The Conservation Groups are comprised of eight separate organizations: 1) American Rivers; 2) Trout Unlimited; 3) Northcoast Environmental Center; 4) Pacific Coast Federation of Fishermen's Associations and the Institute of Fisheries Resources ("PCFFA/IFR"); 5) WaterWatch of Oregon; 6) California Trout; 7) Friends of the River; and 8) Oregon Natural Resources Council.

Pursuant to 50 C.F.R. § 221.23, NMFS consulted with the Interior Agencies. They jointly decided to consolidate the hearing requests, and refer the consolidated matter to the United States Coast Guard ALJ Docketing Center for assignment of an Administrative Law Judge. On June 22, 2006, Chief Administrative Law Judge Joseph N. Ingolia assigned the Hon. Parlen L. McKenna to preside over the consolidated hearing and issue a decision on the disputed issues of material fact within ninety (90) days from the date of referral in accordance with section 241 of EPAct and 50 C.F.R. Part 221.

In accordance with 50 C.F.R. § 221.12, an initial prehearing conference was held on July 6 and 7, 2006. During the initial prehearing conference, the disputed issues of material fact were narrowed. The next section of this decision contains a list of the disputed issues of material fact.

The hearing commenced in Sacramento, California on August 21, 2006, and ended on August 25, 2006. Post-hearing briefs, including proposed findings of fact, were filed on September 5, 2006. Reply briefs were filed on September 11, 2006. Rulings on each parties proposed findings of fact are contained in Attachment D. Several Motions to Strike have yet to be ruled upon; the rulings on those Motions will be addressed in this decision. The witnesses and exhibit lists are set forth at the end of this decision.[4]

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[4] The parties agreed to file joint post-hearing briefs as follows:

a) PacifiCorp and Siskiyou County filed a joint post-hearing brief;
b) NMFS and FWS filed a joint post-hearing brief (adopted by CDFG);
c) BLM filed a post-hearing brief;
d) The Conservation Groups filed a post-hearing brief; and
e) The Indian Tribes filed a joint post-hearing brief.

DISPUTED ISSUES OF MATERIAL FACT

Fourteen (14) disputed issues of material fact were identified in this proceeding as follows:

1. USFWS/NMFS ISSUE 2(A): Whether stocks of anadromous fish suitable to conditions above Iron Gate are available to use prescribed fishways?

2. USFWS/NMFS ISSUE 2(B): To what extent facilitating the movement of anadromous fish via prescribed fishways presents a risk of introducing pathogens to resident fish inhabiting the basin above Iron Gate?

3. USFWS/NMFS ISSUE 2(C): To what extent facilitating the movement of steelhead above Iron Gate Dam via prescribed fishways presents a risk of residualizing, and whether and to what extent that [residualization] would pose adverse effects to the resident trout fishery resource?

4. USFWS/NMFS ISSUE 3: Whether and how current Project operations affect the resident trout fishery resource in the absence of passage?

5. USFWS/NMFS ISSUE 4: Whether entrainment at Project facilities is adversely affecting resident fishery resources?

6. USFWS/NMFS ISSUE 6: Whether 58 miles of habitat suitable for use by anadromous fish exists with[in] the Project?

7. USFWS/NMFS ISSUE 7: Whether access to habitat within the Project would benefit coho salmon, and if so, to what extent?

8. USFWS/NMFS ISSUE 8: Whether access to habitat within the Project would benefit Pacific lamprey, and if so, to what extent?

9. BLM ISSUE 10: Whether the seasonally high flows will help to improve riparian conditions in the J. C. Boyle bypass reach; and if so, whether and to what extent such improved riparian conditions will affect native riparian-focal bird species?

10. BLM ISSUE 11: Whether project operations adversely affect riparian resources and native riparian-focal bird species in the J.C. Boyle peaking and bypass reaches?

11. BLM ISSUE 14: Whether the seasonal high flow specified in BLM Conditions 4 A.1(c) will have a net adverse effect on redband trout spawning?

12. BLM ISSUE 16: Whether and how current Project operations affect the redband trout fishery resources, insofar, as that resource would be addressed by the River Corridor Management Condition?

13. BLM ISSUE 17: Whether and to what extent BLM's two-inch-per-hour upramp rate for the J.C. Boyle facility will affect fish resources and other aquatic organisms?

14. BLM ISSUE 19: How the flows proposed by BLM may affect the existing whitewater boating and flyfishing in the J.C. Boyle peaking reach?

Pursuant to 50 C.F.R. § 221.60, the undersigned's findings of fact with respect to each disputed issue of material fact will be final and binding on the Secretaries of Interior and Commerce in their final actions under sections 4(e) and 18 of the FPA.

RULINGS ON PENDING MOTIONS

There are six pending motions to strike that have not yet been ruled upon. The Motions are as follows: (1) Yurok Tribe's Motion To Strike Testimony of PacifiCorp Witnesses Chane and Giorgi dated August 15, 2006; (2) Federal Fisheries Services Motion to Strike Certain Portions of the Written Direct Testimony filed by PacifiCorp dated August 16, 2006; (3) BLM's Motion to Strike Testimony of PacifiCorp Witness Forrest Olson dated August16, 2006; (4) Klamath Tribe's Motion to Strike Certain Testimony of PacifiCorp's Witness dated August 16, 2006; 5) Klamath Tribe's Motion to Strike Alteration of Direct Testimony dated, August 16, 2006; and 6) NMFS/FWS Motion to Strike Certain Portions of the Written Rebuttal Testimony Filed by PacifiCorp dated August 18, 2006. A Motion for Reconsideration of an Order Granting PacifiCorp's Motion to Supplement Rebuttal Exhibits of Ken Carlson filed by the Federal Fisheries Services, dated August 28, 2006, is also pending. The rulings on said motions are set forth below.

1. Motions to Strike and Motion for Reconsideration are DENIED.

The Federal Fishery Services, the BLM, the Yurok Tribe, and the Klamath Tribe all seek to strike certain written direct and/or rebuttal testimony of all five of PacifiCorp witnesses: (1) Mr. Ian Chane addressing USFWS/NMFS Issue 8; (2) Dr. Albert E. Giorgi addressing USFWS/NMFS Issue 8; (3) Mr. Ken Carlson addressing USFWS/NMFS Issue 6; (4) Mr. Kevin Malone addressing USFWS/NMFS Issues 2 and 6; (5) Forrest Olson addressing the Tennant Method. In support of each motion, the Federal Fishery Services, the BLM, the Yurok Tribe, and the Klamath Tribe argue that the aforementioned evidence is irrelevant because it is outside of the scope of the issues agreed upon by the parties for the hearing and, in many instances, seek to introduce subjects that have previously been dismissed/withdrawn from the proceeding. The Agencies also filed a motion on August 28, 2006, seeking reconsideration of this judge's Order Granting PacifiCorp's Motion to Supplement the Rebuttal Exhibits of Mr. Carlson.[5]

In these proceedings, "relevant, reliable, and probative evidence" is admissible at the hearing so long as the evidence is not privileged, unduly repetitious, or cumulative; and its probative value is not substantially outweighed by the risk of prejudice, confusion of the issues, or delay. See 50 C.F.R. § 221.55. Although the Federal Rules of Evidence do not apply in these proceedings, those rules do serve as guidance. Id. at § 221.55(a)

[5] The Federal Fisheries Services also sought to strike portions of Mr. Malone's testimony addressing USFWS/NMFS Issue 9. Since that issue has been withdrawn and removed from this proceeding, the motion to strike is dismissed as moot.

(4). Under those rules, relevant evidence is broadly defined as any evidence [however slight] tending to make the existence of consequential fact more or less probable. See Fed. R. Evid. 401. The Advisory Committee Notes to Federal Rules of Evidence 401 make clear that a fact to which the evidence is directed need not be in dispute to be relevant. See 56 F.R.D. 183, 216 (1972). Those notes provide that "[w]hile situations will arise which call for the exclusion of the evidence to prove a point conceded by the opponent, the ruling should be made on the basis of such consideration as waste of time and undue prejudice (see Rule 403), rather than under any general requirement that evidence is admissible only if directed to matters in dispute." Id.

The undersigned recognizes that issues concerning the effectiveness of volitional passage, the Tennant Method, and the prospective temperature effects from the BLM 4(e) conditions were either withdrawn/dismissed from this proceeding. However, the controversial testimony and evidence contains information that bears on the issues in this case. Thus, it is relevant and admissible. This is especially true given the fact that the parties are not prejudiced by the admission of this evidence. The parties have been aware of the information for sometime now (for instance the United States Geological Survey Report, dated September 20, 2005, entitled "JC Boyle Bypass Segment Temperature Analysis" was received by PacifiCorp from the government in discovery). Further, the parties received the written direct/rebuttal testimony in advance of the hearing, they had an opportunity to cross-examine the witness, and they introduced countervailing evidence at the hearing. Therefore, the motions to strike testimony filed by the Federal Fishery Services, the BLM, the Yurok Tribe, and the Klamath Tribes are **DENIED**.

2. Klamath Tribes Motion to Strike Errata of Mr. Malone's Direct Testimony is DENIED.

Klamath Tribes moved to strike PacifiCorp's Errata Regarding the Direct Testimony of Kevin Malone, arguing that the change to the testimony was substantive and impermissible.

With respect to discovery, the regulations place continuing obligations on the parties to promptly amend or supplement any prior response to discovery upon learning that the response is incomplete or incorrect when made. See 50 C.F.R. § 221.42(a). The regulations are silent whether the same rule applies with respect to written direct testimony. Recognizing that a rule requiring a party to go forward with evidence that is known to be incomplete or incorrect would be an exercise in futility, PacifiCorp's Errata is **GRANTED**, and Klamath Tribes' motion to strike is **DENIED.**

PRELIMINARY FINDINGS OF FACT

The Findings of Fact on the disputed issues of material fact are based upon a complete review of all evidence of record. The facts are as follows:

A. BACKGROUND

1. Four of the five Project dams are at issue in this trial-type expedited proceeding conducted under section 241 of EPAct and 50 C.F.R. Part 221: a) Iron Gate Dam; b) Copco I Dam; c) Copco II Dam; and d) J.C. Boyle Dam and Diversion or the Klamath Hydroelectric Project. (*Entire Administrative Record*).

2. Iron Gate development consists of a dam, reservoir, and an 18 megawatt ("MW") powerhouse. It was constructed in 1962, and is the farthest downstream development in the Project area located at river mile ("RM") 190 in Siskiyou County, Ca. The Iron Gate development also includes Iron Gate Fish Hatchery, which was constructed at the same time as the power generation facility. The Iron Gate Fish Hatchery releases fall-run Chinook

salmon, Coho salmon, and winter steelhead trout under the terms of its existing FERC hydroelectric license. (*KTr-CWH-Ex. 1 at 8-9; KTr-CWH-Ex. 5 at 11; KTr-CWH-Ex. 20 at 79*).

3. Copco I development consists of a dam and a 20 MW power plant. It is the first development that was constructed in the Project area in 1917. Copco I is located upstream from Iron Gate Dam at RM 198.6 in Siskiyou County, Ca. (*KTr-CWH-Ex. 1 at 8-9; KTr-CWH-Ex. 5 at 11*).

4. Approximately a quarter-mile downstream from Copco I at RM 198.3 in Siskiyou County, Ca is the Copco II development. Copco II was constructed in 1925, and diverts water to a 5,900 foot water conveyance system serving a 27 MW power plant. Because it has very minimal active storage capacity, Copco II powerhouse operates as a "slave" to Copco I. (*KTr-CWH-Ex. 1 at 8-9; KTr-CWH-Ex. 5 at 11*).

5. The J.C. Boyle development was constructed in 1958 and consists of a dam, reservoir, and powerhouse. It is located farthest upstream at RM 224.7 and the 80 MW powerhouse is located several miles downstream at RM 220.4, both in Southern Oregon. (*KTr-CWH-Ex. 1 at 8-9*).

B. **USFWS/NMFS DISPUTED ISSUES OF MATERIAL FACT**

1. FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 2(A)

2A-1. The selected anadromous stocks of fish at issue in this proceeding are: a) wild Chinook salmon; b) Coho salmon; c) steelhead trout; and d) Pacific lamprey. (*Entire Administrative Record*).

2A-2. An anadromous fish is a fish that migrates to and from the ocean and spawns in its river of origination in order to complete its life cycle. (*Aug. 23, 2006 Tr. at 26:7-11*).

a. Historically, Anadromous Fish were distributed above Iron Gate Dam

2A-3. While the precise geographic distribution is uncertain, historical records and tribal accounts demonstrate that anadromous fish (Chinook salmon, Coho salmon, and steelhead trout) migrated past the present site of Iron Gate Dam which provided a viable ecosystem and habitat for those stocks of fish. (*Aug 24, 2006 Tr. at 11:1-6, 26:21 - 27:7, and 68:10-14; NMFS/FWS-Issue 2A-Garza-Ex. 7 at 1; NMFS/FWS-Issue 2C-Hooton-Ex. 1 at 2:1-17; NMFS/FWS-Issue 6 Hamilton-Ex. 1 at 3:1-14; NMFS/FWS-Issue 6-Hamilton-Ex. 10 at 5; NMFS/FWS-Issue 16-Hamilton-Ex. 16; NMFS/FWS-Issue 8 Hamilton-Ex. 6 at 6-7;HVT-Franklin-Ex. 1 at 2:3-9; 2:20 to 3:5; HVT-Franklin-Ex. 6;CDFG Pisano Exhibit 1 at 6:10-15; Yurok Tribe's Direct Testimony, Witness: Cleveland R. Steward, Issue: NMFS/FWS 8 ("Yurok-Steward 8 Direct") at 3:18-4:8; KTr-CWH-Ex. 5 at 10; NMFS/FWS PFF 2A.1 and 8.2; NGO PFF 2A.1; Indian Tribes PFF 2A.2*).

2A-4. Chinook salmon (both spring and fall-run) were abundant in the tributaries of Upper Klamath Lake, including Jenny, Fall, and Shovel Creeks, as well as the Wood, Sprague, and Williamson rivers. (*NMFS/FWS-Issue 2A-Garza-Ex. 7. at 5-6; NMFS/FWS-Issue 2C-Hooton-Ex. 17 at 20; NGO Ex. 3 at 6; NGO Ex. 19; KTr-CWH-Ex. 1 at 5-6; KTr-CWH-Ex. 4 at 225; KTr-CWH-Ex. 5 at 13-15; KTr-CWH-Ex. 18 at 5-14*).

2A-5. Steelhead trout utilized habitat in Spencer, Shovel, Fall, Camp, and Scotch Creeks, and they were likely distributed as far upstream as Link River. (*NMFS/FWS-Issue 2A-Garza-Ex. 7 at 6-7; KTr-CWH-Ex. 1 at 5-6; KTr-CWH-Ex. 5 at 15-16; KTr-CWH-Ex. 18 at 5-14; KTr-CWH-Ex. 20 at 79*).

2A-6. Coho salmon spawned in Fall Creek. (*Aug. 24, 2006 Tr. at 273:11-274:8; NMFS/FWS-Issue 2A-Garza-Ex. 7 at 7-8;NMFS/FWS-Issue 8-Hamilton-Ex. 1 at 4:3-13; NMFS/FWS-Issue 8-Hamilton-Exhibit 6 at 6-7;NMFS/FWS-Issue 8-Hamilton-Ex. 11 at 236; Yurok-Steward 8 Direct at 3:20- 4:8; Yurok Tribe- Steward 8 Rebuttal at 4:12 to 5:8; KTr.-CWH-Ex. 4 at 216; KTr-CWH-Ex. 5 at 16; NMFS/FWS-Issue 7-Simondet-Ex. 5 at 117; NMFS/FWS-Issue 7-Simondet-Ex. 1 at 4:7-18; NMFS/FWS-Issue 7-Williams-Ex. 1 at 5:8-6:4; KTr-CWH-Ex. 4 at 216-224; Indian Tribes PFF 7.1*).

2A-7. There is insufficient evidence in the record to determine whether Pacific lamprey historically were distributed above the present site of Iron Gate Dam. (*Aug. 24, 2006 Tr. at 121:2-122:1, 124:2-125:19, 250:23-252:13; 253:13-23; 255:8-13; PAC-Chane-R-1 at 2:23-3:1; CDFG Pisano Ex. 1 at 13:8-9; KTr-CWH-Ex. 5 at 16-17*). However, the evidence does show that Pacific lamprey do occur in the Lower Klamath River, below Iron Gate Dam.[6]

b. Project Dams Have Changed the Migratory Behavior of Anadromous Fish in the Klamath River

2A-8. The construction of the Project dams has changed the migratory behavior of anadromous fish in the Klamath River System, blocking upstream migration and limiting those fish to habitat below the dam. (*Aug. 24 Tr. at 11:2-12:9; NMFS/FWS-Issue 2C-Hooton-Ex. 1 at 2; NMFS/FWS-Issue 2A-Garza Ex. 1 at 3; NMFS/FWS-Issue 2A-Garza Ex. 7 at 1; KTr-LKD-Ex.-13, at 1; NMFS/FWS-Issue 2C-Hooton- Ex. 17, at 20; KTr-CWH-Ex. 3*).

2A-9. No anadromous fish presently inhabit the waters above Iron Gate Dam. (*Id*).

2A-10. Migration is one of several defining life history characteristics of anadromous fish, especially salmonids. (*NMFS/FWS-Issue 2A-Garza-Ex. 1 at 2:8-3:25; NMFS/FWS-Issue 2A-Garza-Ex. 6 at 6; NMFS/FWS-Issue 2A-Garza-Ex. 8 at 13; NMFS/FWS-Issue 2A-Garza-Ex. 4 at 3; Aug. 24, 2006 Tr. at 11:24-15:9; NMFS/FWS 2A.7*).

2A-11. Today, wild anadromous fish (Chinook salmon, Coho salmon, and steelhead trout) can only migrate up to the base of Iron Gate Dam, using nearby tributary and main stem habitat to spawn. (*Aug 24, 2006 Tr. at 10:18 to 11:1; 17:15-18; NMFS/FWS-Issue 2A-Garza-Ex. 1 at 4:4 to 5:7; NMFS/FWS-Issue 2A-Garza-Ex. 7 at 1-2; NMFS/FWS-Issue 2A-Curtis Rebuttal Testimony Ex. 1at 2:1-16; CDFG Pisano Exhibit 1 at 4:20 to 5:28; CDFG Pisano Exhibit 4; HVT, Franklin, Ex. 1 at 2, lines 10-17; Yurok-Steward 8 Direct at 3:1-9; Steward Yurok Ex 5; KTr.-LKD-Ex. 13; see also NMFS/FWS PFF 2.A.2 and 8.2; NGO PFF 2A.2; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 2*).

[6] The issues concerning whether Pacific lamprey stocks suitable to conditions above Iron Gate Dam are available, and whether Pacific lamprey would benefit from access to habitat within the Project area are discussed in great detail below in response to USFWS/NMFS Issue 8.

2A-12. If access was provided, anadromous fish would migrate past Iron Gate Dam. (*Aug. 24, 2006 Tr. at 11:12-23; 170:2-17; 273:11-274:8; NMFS/FWS-Issue 2A-Garza-Ex. 1 at 2-3, 5:3-4; NMFS/FWS-Issue 2A-Garza-Ex. 6 at 6; NMFS/FWS-Issue8-Moser-Ex. 1 at 8:4-9:16 and 13:11-17; HVT-Franklin-Ex. 1 at 3:10-20 and 5:3-6; NGO Ex. 3, at 5:22-23, 7:11-9:20 and 13:11-17; CDFG-Pisano-Ex. 1 at 10:12-11:8; NGO PFF 2A.5; see also Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 3*).

c. The Habitat above Iron Gate Dam is Similar to the Habitat in Some Tributaries below Iron Gate Dam

2A-13. Habitat below Iron Gate Dam, like habitat in the Project-bounded area, has variable suitability across locations, time, and life stages. (*Aug. 24 at 283:25-20*). Anadromous salmonids have used downstream habitat that is no more favorable than that located above Iron Gate Dam. (*CDFG Pisano Ex. 1 at 4:18-51, 7:10-9:7 (Coho in other parts of the Klamath system occupy water with temperatures in excess of 26°C), 9:8-10:12 (spawning in degraded streams); Yurok-Hillemeir Direct Testimony-NMFS/FWS Issue 7 at 4:24-5:3; KTr-CWH-Ex 4 at 219 (juvenile Coho salmon observations in the main stem Klamath River where temperatures exceed 20°C)*).

2A-14. Warm water temperatures in the summer and cold water temperatures in the winter will not preclude anadromous fish from successfully utilizing habitat above Iron Gate Dam. (*NMFS/FWS-Issue 2A-Garza-Ex. 1 at 2:8-3:25; NMFS/FWS-Issue 2A-Garza-Exh. 6 at 6; NMFS/FWS-Issue 2A-Garza-Ex. 8 at 13; NMFS/FWS-Issue 2A-Garza-Exh. 4 at 3; Aug. 24, 2006 Tr. at 11:20-15:9*).

2A-15. The findings of fact in USFWS/NMFS Issue 2B addressing disease is incorporated herein.

2A-16. The findings of fact in USFWS/NMFS Issue 6 addressing the mileage of suitable habitat within the Project-boundaries are incorporated herein.

2A-17. The amount of delay associated with anadromous fish migrating above Iron Gate Dam is uncertain. (*c.f. Aug. 23, 2006 Tr. at 224:18- 227:17, 237:7-20*; *226:20-25; Aug. 24, 2006 Tr. at 42-11:15, 54:10-55:2; NMFS/FWS-Issue 7-Simondet Rebuttal, at 7:7-8; KTr Huntington Rebuttal Ex. 6, at 9:7-20, 11:18-19, 13:16 to 14:16; KTr LKD Rebuttal Ex. 15, at 3:11-4:2, 4:20-5:12; KTr CWH Rebuttal Ex. 6, at 3:22-4:2; NMFS/FWS-Issue 2-Hamilton Rebuttal, Ex. 1 at 2:18 to 3:20; NMFS/FWS-Issue 6-Hamilton Rebuttal at 6:7-24; NMFS/FWS-Issue 2-Hamilton Rebuttal Ex. 8; KTr LKD Rebuttal Ex. 15, at 3:8-5:12; KTr CWH Rebuttal Ex. 6, at 4:2-10; Indian Tribes PFF 2A.8, 2A.10, 2A.11*).

2A-18. Likely mortality rates of juvenile anadromous salmonids migrating through reservoirs will vary widely among species, and will depend largely on size (larger migrants will do better) of the migrating fish. Thus, small sub-yearling fall Chinook are likely to experience lower passage success than larger Coho, yearling Chinook or steelhead out-migrants. (*KTr-CWH Rebuttal Ex. 6 at 2:6-17, 3:10-14; Aug. 25, 2006 Tr. at 64:7- 65:8, 65:14-22; Indian Tribes PFF 2A.12*).

2A-19. Predation of outmigrating salmonids above Iron Gate Dam is likely to be low. (*NMFS/FWS-Issue 2 Hamilton-Rebuttal Ex. 4 at 224-225*; *Aug. 25, 2006 Tr. at 64:7 to 65:8, 65:17-22*).

2A-20. The fact that anadromous fish currently complete life cycles through eight dams and reservoirs on the Columbia and Snake rivers, and historically completed life cycles through Upper Klamath Lake, provides strong evidence that anadromous salmonids could also migrate through the reservoirs created by Project facilities. (*Aug. 24, 2006 Tr. at 26:21-27:7*; *KTr FAE Rebuttal Ex. 7, at 2:2-17; KTr FAE Ex. 32, at 5:21-25; Indian Tribes PFF 2A.9*).

d. There are Stocks of Fish Suitable to Conditions above Iron Gate Dam

2A-21. The NMFS and the USFWS (collectively referred to as "Federal Fishery Services") seek to, among other things, restore native anadromous fish species to their historical habitats above Iron Gate Dam. *See NMFS/FWS-Issue 7-White-Ex. 14, Attachment A, at A-9 through A-12.; Yurok-Hillemeir Direct-Issue 7 at 6*).

2A-22. The record shows that those anadromous fish proximate to Iron Gate Dam are genetically most similar to those populations that existed in the Upper Klamath basin prior to the construction of the dams. (*NMFS/FWS Issue 2A-Garza-Ex. 1 at 4:1-5:7 and 6:1-3; NMFS/FWS-Issue 2C-Hooton-Ex. 1 at 2:19-3:11, 4:12-5:10, and 6:1-3*). The evidence shows that these stocks of fish have genetic traits suitable for reintroduction into the upper Klamath River basin. (*Id.; see also NGO PFF 2A.3*).

2A-23. There are numerous examples from other streams and rivers systems that provide persuasive evidence that anadromous fish possess the capacity and capability to successfully adapt and colonize new habitat or recolonize historic habitat, including streams or river systems with lakes or reservoirs. (*NMFS/FWS-Issue 2A-Garza-Ex. 1 at 2:8-3:25; NMFS/FWS-Issue 2A-Garza-Ex. 6 at 6; NMFS/FWS-Issue 2A-Garza-Ex. 8 at 13; NMFS/FWS-Issue 2A-Garza-Ex. 4 at 3; NGO Ex. 3 at 12:13-13:9; NGO Ex. 20; HVT, Franklin, Ex. 1 at 4:-5:2; CDFG Pisano Ex. 1 at 10:20-22; NMFS/FWS PFF 2A.8*).

2A-24. The record evidence shows that Chinook salmon, Coho salmon, and steelhead have varying life histories and would use differing areas of habitat within the Project at somewhat different times of year as they did prior to construction of the Project. (*Aug. 24, 2006 Tr. at 212:5-10; HVT-Franklin-Ex. 2 at 2:20-26; NMFS/FWS-Issue 6-Hamilton-Ex. 1 at 3:1-14; NMFS/FWS-Issue 6-Hamilton-Rebuttal-Ex. 1 at 1:22-25, 4:21-5:11*).

i. ***Stocks of fall-run Chinook salmon Suitable to Conditions above Iron Gate Dam are Available to use Prescribed Fishways***

2A-25. Chinook salmon historically were and continue to be the most abundant anadromous fish in the Klamath basin. In the last 25 years, annual runs of Chinook salmon have ranged between 30,000 and 240,000. Historically, the runs were much higher. (*KTr-CWH-Ex. 4 at 225*).

2A-26. In the Klamath River basin, there are at least two distinct Chinook salmon populations: the fall-run and spring-run. The runs are named for the season of entry and migration up the river, which do not necessarily coincide with the spawning time. (*KTr-CWH-Ex. 4 at 225*).[7]

[7] Some literature indicates that there are three populations of Chinook salmon in the Klamath River Basin: 1) fall-run; 2) late fall-run; and 3) spring run. (*KTr-CWH-Ex. 4 at 225*).

2A-27. The majority of adult fall-run Chinook salmon enters the river to spawn in early September and continues through late October. Although the optimal temperature for adult Chinook salmon is below 14° C, they can withstand temperatures exceeding 20° C for short periods of time. It takes approximately 2 to 4 weeks after entering the river to reach the spawning grounds, where the adult fall-run Chinook salmon spawns and dies. This spawning period coincides with the declining temperatures, which by early November are within the optimal range for the developing embryos (i.e., 4-12° C). (*KTr-CWH-Ex. 4 at 225-26*).[8]

2A-28. The record evidence shows that juvenile fall-run Chinook salmon begin outmigration to the ocean as early as January and migration is complete by the beginning of April. Juvenile Chinook salmon are thermally tolerant and can withstand temperatures exceeding 20° C provided there is abundant food, thermal refugia (i.e., areas of cool water where the fish can seek refuge when the water temperature becomes to warm), and other conditions are not stressful. (*Aug. 24, 2006 Tr. at 202:9-12, 212:5-10*; *KTr-CWH-Ex. 4 at 226-27; KTr-LKD-Ex. 13 at 6, 7-8*).

2A-29. Historically, the success of fall-run Chinook salmon in the drainage basin above Iron Gate Dam was associated with the thermally moderate spawning and incubation environments (which included spring-fed streams and/or areas of strong groundwater input). In addition, the warming, nutrient-rich waters also provided excellent habitat during the spring for sub-yearling Chinook. (*NGO Ex. 3 at 6; NGO Ex. 19*).

2A-30. The fall-run Chinook salmon in Bogus and Scott Creeks are most suitable to conditions above Iron Gate Dam. (*KTr-CWH-Ex. 13 at 17; NGO Ex. 3 at 7; NGO Ex. 19*).

[8] Historically, fall-run Chinook salmon entered the river to spawn in July, peaked in August, and they were largely completed by September. Today, the time the fall-run Chinook salmon enter the river to spawn has shifted by 2 to 4 weeks presumably because the high temperatures in the main stem Klamath River has become unfavorable for the adult salmon or because of excessive harvest of early run fish. (*KTr-CWH-Ex. 4 at 225-26*).

ii. ***Minimal stocks of spring-run Chinook salmon Suitable to Conditions above Iron Gate Dam are Available to use Prescribed Fishways***

2A-31. Today, wild spring-run Chinook salmon have been significantly reduced. The vast majority of Chinook salmon is fall-run. (*KTr-CWH-Ex. 4 at 225 and 229; NGO Ex. 3 at 8-9; NGO Ex. 19*).

2A-32. Habitat degradation is the primary cause of the decline of spring-run Chinook salmon in the Klamath system. (*KTr-CWH-Ex. 4 at 229-30*).

2A-33. Like Coho salmon, spring-run Chinook salmon has a stream-type life history (meaning that the juveniles remain in the stream for one year or more before outmigrating to the ocean). (*KTr-CWH-Ex. 4 at 229*).

2A-34. Unlike adult fall-run Chinook salmon that spawn soon after reaching their spawning habitat, adult spring-run Chinook salmon enter the river before they are ready to spawn and reside in deep pools for 2-4 months before they spawn. (*KTr-CWH-Ex. 4 at* 229).

2A-35. Adult spring-run Chinook salmon enter the Klamath system to spawn in April through July and aggregate in deep pools where they hold until September. Water temperatures below 16° C are generally regarded as optimal for adult spring-run Chinook salmon. However, in Salmon River located below Iron Gate Dam, temperatures of pools holding spring-run Chinook salmon often exceed 20° C. (*KTr-CWH-Ex. 4 at 229*).

2A-36. Spawning peaks in October, juvenile Chinook salmon emerge between March and July, rear through the summer and fall, and migrate to the ocean in the following spring. (*KTr-CWH-Ex. 4 at 229*).

2A-37. The record evidence demonstrates that the Lower Williamson and Wood Rivers provide the best near term potential sites for producing spring-run Chinook salmon above Iron Gate Dam. The North Fork Sprague also has significant potential assuming effective habitat rehabilitation occurs. (*NGO Ex. 3 at 7-8; NGO Ex. 19*).

2A-38. However, finding suitable candidates of wild spring-run Chinook salmon might be problematic. Currently, the spring-run Chinook salmon in the Salmon River provide the only alternative for using wild fish in the reintroduction effort but that stock of Chinook salmon is also not highly abundant. (*KTr-CWH-Ex. 13 at 17-18; NGO Ex. 3 at 8-9; NGO Ex. 19*).

2A-39. Further, deteriorating water temperatures in the summer are likely to block migration of adult spring-run Chinook salmon before they reach suitable holding or natal areas. (*KTr-CWH-Ex. 13 at 11*).

iii. ***Stocks of Coho Salmon Suitable to the Conditions above Iron Gate Dam are Available to use Prescribed Fishways***

2A-40. The findings of facts in USFWS/NMFS Issue 7 addressing Coho salmon are incorporated herein.

2A-41. The evidence shows suitable stocks Coho salmon are available to used prescribed fishways above Iron Gated Dam. (*FOF 7-1 through 7-15*).

iv. ***Stocks of Steelhead Suitable to the Conditions above Iron Gate Dam are Available to use Prescribed Fishways***

2A-42. Steelhead trout are the most widely distributed anadromous salmonids in North America. They have been able to succeed in a wide variety of habitat because of their keen ability to adapt to changing conditions, higher physiological tolerance than other salmonids, and ability to spawn more than once. This variability ensures that runs of steelhead can continue through periods of adverse conditions. (*KTr-CWH-Ex. 4 at 230*-31).[9]

2A-43. Adult steelhead trout enter the Klamath River to spawn from August to February. Spawning, which takes place any time from January through April, peaks in February and March. (*Kr-CWH-Ex. 4 at 231*).

2A-44. Juvenile steelhead trout emerge in the spring and most spend approximately two years in freshwater before outmigrating to the ocean. Although juvenile steelhead trout demonstrate a preference for cold water temperatures (of 15-19° C), they can withstand incrementally higher temperatures exceeding 22° C provided food is abundant and by finding thermal refuge or by living in areas where nocturnal temperatures drop below the thermal threshold. (*Aug. 24, 2006 Tr. at 213:20-214:6; KTr-LKD-Ex. 13 at 8-9; KTr-CWH-Ex. 4 at 231*).

[9] The evidence suggests that like Chinook salmon, steelhead trout may be divided into two population: a) winter steelhead (ocean-maturing); and b) summer steelhead (stream-maturing). (*KTr-CWH-Ex. 4 at 230*). The summer steelhead trout is on the verge of extinction and is not addressed in this proceeding. (*KTr-CWH-Ex. 4 at 233*).

2A-45. Historical numbers of steelhead trout in the Klamath are unknown, but total run sizes in the 1960s were estimated at 170,000. In the 1980s, the estimated population numbers dropped to 100,000 and the numbers are still declining to the extent that now the winter steelhead trout is considered to be at risk of extinction. (*KTr-CWH-Ex. 4 at 231-32*).

2A-46. Habitat that is presently suitable for anadromous wild steelhead is more widespread in the upper basin than is habitat suitable for Chinook salmon. (*NGO Ex. 3 at 9; NGO Ex. 19*). This habitat is presently being used in varying degrees by resident rainbow/redband trout. (*NGO Ex. 3 at 9; NGO Ex. 19*).

2A-47. Many streams or segments of streams contain fair to good steelhead habitat above Iron Gate Dam. (*NGO Ex. 3 at 9*). While access to habitat for steelhead trout might be a problem because of gradients, it is critical because the diversity of life history strategies enables the fish to adapt to changing environmental conditions and habitat (*Aug. 23, 2006 Tr. at 24:21-26:19; 63:9-65:9; 68:22-69:10; NGO Ex. 3 at 9*)

2. *FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 2(B)*

2B-1. The pathogens present below Iron Gate Dam include: *Ceratomyxa Shasta* (*C. Shasta*); *Ichthyophithirius multifiliis* (*Ich*); *Flavobacterius columnaris* (*F. columnaris*); *Paravicapsula minibicornis* (*P. minibicornis*); and *Trematode metacercaria*. (*Aug. 24, 2006 Tr. at 39:11-40:5, 199:2-200:1; Aug. 25, 2006 Tr. at 42:18-25; NMFS/FWS-Issue 2B-Foott-Ex. 1 at 2:1-3:3;NMFS/FWS-Issue 2B-Foott-Ex 5 at 5; CDFG Cox Ex. 1 at 3:8-23 and 4:20-21; NMFS/FWS PFF 2B.1; NGO PFF2B.2; Indian Tribe PFF 2B.1; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 14*).

2B-2. For the most part, the pathogens existing in the lower basin historically and currently exist in the upper basin of the Klamath River above Iron Gate Dam. (*Aug. 24, 2006 Tr. at 199:1-8 and 199:22-200:12; NGO PFF 2B.2*).

2B-3. The existence of virus *Infectious Hematopoietic Necrosis* (*IHN*) in the Klamath River system is exceedingly rare. (*Aug. 24, 2006 Tr. at 199:10-11; NMFS/FWS-Issue 2B Foott-Ex. 1 at 2:4-5; CDFG Cox Ex. 1 at 4:2-13; see also NMFS/FWS PFF 2B.11; Indian Tribes PFF 2B.2; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 16; but see Aug. 25, 2006 Tr. at 43:22-44:6; NMFS/FWS FF 2B.12; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 17*).

2B-4. To date, no research or studies have been performed to detect the occurrence of *IHN* in the upper basin of the Klamath River. (*Aug. 24, 2006 Tr. at 199: 12-15; Aug. 25, 2006 Tr. at 44:7-9*).

2B-5. There is insufficient evidence in the record to make a determination whether *IHN* exists in either the upper or the lower basins of the Klamath River.

2B-6. In addition, multiple surveys on adult and juvenile Chinook salmon in the Klamath River show that *Renibacterium salmoniranrum* (*R. salmoniranrum*), a rare, insignificant bacterial pathogen, is present in the lower basin. (*NMFS/FWS-Issue 2B-Foott-Ex. 1 at 2:15-17 and 3:25-4.4; see also NMFS/FWS PFF 2B.2; Indian Tribes PFF 2B.3, NGO PFF at 2B.3; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 14 and 18*).

2B-7. Like *IHN*, there is a lack of information concerning the presence of *R. salmoniranrum* in the upper basin. (*NMFS/FWS-Issue 2B-Foott-Ex. 1 at 3:13-16, see also NMFS/FWS PFF 2B.2; Indian Tribes PFF 2B.3, NGO PFF at 2B.3; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 14 and 18*).

2B-8. Nevertheless, because of its low levels, *R. salmoniranrum* does not appear to pose a significant risk of disease in the salmonid population in the Klamath River system, and consequently the bacteria will not pose a significant threat to fish in the upper basin. (*NMFS/FWS-Issue 2B-Foott-Ex. 1 at 3:6-11; NMFS/FWS-Issue 2B-Foott-Ex. 4 at 7-8; see also NMFS/FWS PFF 2B.2; Indian Tribes PFF 2B.3, NGO PFF at 2B.3; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 14 and 18*).

2B-9. Similarly, parasitic *Trematode Metacercaria* present in juvenile and adult Chinook salmon do not appear to present a significant health threat to resident fish in the upper Klamath. (*NMFS/FWS-Issue 2B-Foott-Ex. 1 at 3:6-11; NMFS/FWS-Issue 2B-Foott-Ex. 4 at 7-8; see also NMFS/FWS PFF 2B.2; Indian Tribes PFF 2B.5; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 14 and 18*).

2B-10. *F. columnaris* and *Ich* are ubiquitous in freshwater systems, and both are present throughout the Klamath River system above and below Iron Gate Dam. (*NMFS/FWS-Issue 2B Foott-Ex. 1 at 2:12-18; 3:1-3; CDFG Cox Ex. 1 at 3:11-15; see also NMFS/FWS PFF 2B.3; NGO PFF 2B.4*). *F. columnaris* causes disease at higher temperatures. (*Aug. 25, 2006 Tr. at 40:4-5*).

2B-11. Likewise, *C. Shasta* and *P. minibicornis* are myxozoan parasites that are found throughout the Klamath River. (*NMFS/FWS-Issue 2B Foott-Ex. 1 at 2:18-23; see also NMFS/FWS PFF 2B.4; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 15*).

2B-12. It is recognized that disease is the outcome of the interaction of a susceptible host and a pathogen in a poor environment that favors the pathogen and places stress on the fish. The passage of adult fish into a poor upper river environment would have disease, possibly pre-spawning mortality as a likely outcome. (*Aug. 25, 2006 at 36:15-37:8; PacifiCorp PFF 178; CDFG-Cox-Ex. 1 at4:23-5:25*).

2B-13. The incidence of infection from pathogens is seasonal during summer months when water temperatures and algae blooms are high thereby resulting in poor water quality. (*Aug. 25, 2006 Tr. at 40:21-41:9; 47:21-48:20; 50:1-18; NMFS/FWS-Issue 2B-Foott-Ex. 1 at 3:17-20*).

2B-14. In the upper Klamath, the water quality is only poor during the summer, but for much of the year the water system is quite good. (*Aug. 25, 2006 Tr. at 40:20-41:2*). By the time the water quality deteriorates, many of the adult salmonid most likely would have died because its life cycle was complete whereas others would have died as a result of infection from the pathogen. (*Aug. 25, 2006 Tr. at 41:8-9*).

2B-15. Opening up the upper Klamath to anadromous salmonids would not produce adverse results because adult salmonids would be passed late enough in the fall that water conditions in the upper basin would be good. (*Aug. 25, 2006 Tr. at 41:22-25*).

2B-16. As for outmigration, juvenile salmonids would be out of the system prior to water conditions deteriorating and becoming conducive to disease development. (*Aug. 25, 2006 Tr. at 42:1-5*).

2B-17. *C. shasta* has been detected in the lower Williamson River, a tributary of Upper Klamath Lake, and in areas below Iron Gate Dam in nearly equal levels. (*Aug.25, 2006 Tr. at 39:13-18; NMFS/FWS PFF 2B.8*).

2B-18. Within the Klamath River system, steelhead trout are resistant to *C. Shasta*, a disease causing pathogen that adversely affects juvenile Chinook salmon. (*Aug. 24, 2006 Tr. at 36:1-21, 68:18-22, 70:7-20, 197:17-20; Aug. 25, 2006 Tr. at 50:13-18; NMFS/FWS-Issue 2B Foott-Ex. 1 at 4:24 to 5:2; NMFS/FWS-Issue 2B-Foott-Ex. 7 at 12-13; NMFS/FWS-Issue 2C-Hooton-Ex. 1 at 5:12-16; KTr-LKD-Ex. 13 at 8; NMFS/FWS PFF 2B.5, 2B.9, and 2B.10; NGO PFF 2B.5; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 16*).

2B-19. Coho salmon are less resistant to *C. Shasta* than steelhead trout, but are more resistant to the virus than Chinook salmon. (*Aug.24, 2006 Tr. at 197:21-22; Aug. 25, 2006 Tr. at 50:13-18; NMFS/FWS PFF 2B.9*).

2B-20. Generally, with the exception of *F. columnaris* and *Ich*, pathogens associated with anadromous fish do not impact non-salmonids. (*NMFS/FWS-Issue 2B Foott-Ex. 1 at 3:25-4:3; NMFS/FWS PFF 2B.6; NGO PFF 2B.4; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 15*). For instance, both *IHN* and *P. minibicornis* are salmonid pathogens for which there exists no data associating them with non-salmonid fish in the upper Klamath. (*NMFS/FWS-Issue 2B Foott-Ex. 1 at 4:1-3*).

2B-21. In the life cycle of *C. Shasta*, the parasite multiplies primarily within the adult fish under low water temperatures of approximately 10-15 C and potentially, under certain circumstances, infects other fish if the parasite is released into the water column and is ingested by the Polykete worm of the species, manucia speciosa. (*Aug. 24, 2006 Tr. at 192:5-194:18; KTr-LKD-Ex. 13 at 8*).

2B-22. Since a majority of the pathogens currently found in the lower basin also exist in the upper basin of the Klamath River system, a logical conclusion is that migration of anadromous fish would not be a significant factor contributing to disease on resident fish. (*Aug. 25, 2006 at 52:1-20; NMFS/FWS-Issue 2B-Foott-Ex. 1 at 3:24-25, 4:7-8, and 4:16-19; CDFG-Cox-Ex. 1 at 5:6-9 and 6:6-11; NMFS/FWS PFF 2B.7 and 2B.15; NGO PFF 2B.6, Indian Tribes PFF 2B.6 and 2B.7*).

2B-23. To the extent that migrating anadromous fish carry a unique highly virulent pathogen, disease management protocols could be used as is customary. (*KTr-CWH-Ex.17 at 16 and 85-87; KTR-CWH-Ex. 34 at 8:168-74; Indian Tribes PFF 2B.9*).

3. FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 2(C)

2C-1. Resident rainbow/redband trout are distinct from anadromous steelhead trout. Although the two species are similar (both are designated *O. Mykiss*), the life histories are different. (*Aug. 22, 2006 Tr. at 160:2-15; Aug. 24, 2006 Tr. at 42:16-43:13, 43:5-13; CDFG-Chesney-Ex. 1 at 4:18-20; see also NMFS/FWS PFF 2C.1; NGO PFF 2C.3; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 21-22).* After hatching and early rearing in the riverine habitat, juvenile steelhead trout out migrate to the ocean where they mature into adults before returning to their riverine habitat for spawning. By contrast, resident rainbow/redband trout spend all of their life stages in the Klamath River. (*Aug. 24, 2006 Tr. at 42:16-43:13; PAC-Ols-D-1 at 18:22-23; PAC-Carl-D-3 at 2:18; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 21-22*).

2C-2. Historically, anadromous steelhead trout extended up to and used tributaries of Upper Klamath Lake. (*FOF 2A-3; KTr-CWH-Ex. 5 at 15-16*). The close similarities between anadromous steelhead trout and resident rainbow/redband trout suggest these species historically co-existed. (*Aug. 23, 2006 Tr. at 268:8 -11; NMFS/FWS-Issue 2C-Hooton-Ex. 1 at 2:3-17; CDFG-Dean-Ex. 1 at 4:8-14; HVT-Franklin—Ex. 1 at 6:1-10; KTr-CWH-Ex. 6 at 8; NMFS/FWS PFF 2C.2, 2C.7-2C.9*). The distribution and resistance of rainbow/redband trout in Upper Klamath Lake to *C. Shasta* lends additional support that the two species co-existed and intermingled prior to the construction of Copco I Dam in 1917. (*Id.*).

2C-3. The erection of Iron Gate Dam necessarily changed the migratory behavior of anadromous fish in the Klamath River System, limiting them to habitat below the dam. (*FOF 2A-2*). Today, anadromous steelhead trout only migrate to the base of Iron Gate Dam, using nearby tributaries and main stem habitat to spawn. (*FOF 2A-3*). However, if access was provided, steelhead would migrate past Iron Gate Dam into the upper Klamath River basin. (*FOF 2A-4*).

2C-4. The habitat for the anadromous fish has been significantly reduced subsequent to the construction of the Project dams. (*Aug. 24, 2006 Tr. at 11:15-19*).

2C-5. Although environmental conditions and habitat above Iron Gate Dam have changed, anadromous fish are resilient and can adapt to most existing environmental conditions and habitat. (*Aug. 24, 2006 Tr. at 0012:10-13*; 0020:4-6).

2C-6. For instance, steelhead trout have the genetic ability to recolonize and use new habitat. (*Aug. 24 Tr. at 0011:2-0012:13; NMFS/FWS-Issue 2A-Garza-Ex. 1 at 2:8 to 3:25; NMFS/FWS-Issue 2A-Garza-Ex. 6 at 6; NMFS/FWS-Issue 2A-Garza-Ex. 8 at 13; NMFS/FWS-Issue 2A-Garza-Ex. 4 at 3; NMFS/FWS-Issue 2-Curtis Rebuttal at 4:15-17; CDFG-Dean-Ex. 1 at 3:8-17; CDFG-Pisano-Ex. 1 at 5:15-28 and 8:14-9:7; NGO Ex. 3 at 12:3-21; HVT-Franklin-Ex. 8; HVT-Franklin-Ex. 2 at 2:20-26; see also NMFS/FWS PFF 2A.3; Indian Tribes PFF 2A.3; NGO PFF 2A.7).*

2C-7. Resident trout have the genetic capacity to adopt anadromy and some may outmigrate to the ocean if passage exists. (*Aug. 23, 2006 Tr. at 196:16-24; KTr-CWH-Ex. 8 at 22-25; NGO PFF 2C.4*).

2C-8. While residualization (remain in freshwater) is common in juvenile hatchery steelhead trout, there is an absence of evidence of high levels of residualization in juvenile naturally-spawned steelhead trout. (*Aug. 23, 2006 Tr. at 200:13-14; NGO-Ex. 3, at 11:5-7; HVT-Franklin Ex. 1 at 5:18-22; KTr-FAE Ex. 32 at 7:3-22; NMFS/FWS PFF 2C.4, 6*).

2C-9. There are no scientific studies of the Klamath basin demonstrating that reintroduction of anadromous steelhead trout would detrimentally affect the genetic makeup of the resident trout fishery. (*Aug. 23, 2006 Tr. at 208:18-23; NGO-Ex. 3, at 11:5-7; NGO PFF 2C.7; Indian Tribes PFF 2C.7, 2C.10*). The potential for residualization is largely dependent on environmental conditions in the river and ocean. (*Aug. 23, 2006 Tr. at 196:12-197:3; NMFS/FWS-Issue 2C-Hooton-Ex. 1 at 4:12-16; Indian Tribes PFF 2C.5*).

2C-10. There is little information on the nature of any competitive interactions between steelhead and resident trout in the Klamath basin. (*NGO Ex 3, Testimony of Dr. R.. Williams at 11:13-17; KTR CWH Ex 01 at 30; NMFS/FWS PFF 2C.11*). However, research does suggest that in some circumstances, resident trout may have a competitive edge over steelhead trout. (*Testimony of Dr. R.. Williams at 11:13-17; KTR CWH Ex 01 at 30; NMFS/FWS PFF 2C.12*).

2C-11. There are many examples from nearby river systems in the Pacific Northwest that show wild anadromous steelhead trout and resident rainbow/redband trout can co-exist and maintain abundant populations without adverse consequences. The Deshutes River in Oregon, the Yakima River in Washington, and the river systems in Idaho are examples. (*NMFS/FWS-Issue 2C-Hooten-Ex. 1 at 4:8-11; KTR-Espinoza-Issue 2 Direct at 7:3-11; NGO Ex. 3 at 11:13-16; Indian Tribes PFF 2C.4; NGO PFF 2C.8*).

2C-12. The risk of residualization of rainbow/redband trout may be minimized through adaptive management. (*KTr.-Huntington-Ex. 1; NGO Ex. 3 at 11:8-12*).

4. FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 3

3-1. The Project contains various habitat areas for resident trout including: a) the J.C. Boyle bypass reach which extends 4.3 miles from J.C. Boyle Dam to the J.C. Boyle powerhouse; 2) the J.C. Boyle peaking reach extending 17.3 miles and traversing the California/Oregon state line; 3) a 1.4 mile section between Copco II diversion dam and Iron Gate reservoir; and 4) other reservoirs within the Project reach. (*PAC-Ols-D-Ex. 1 at 20:20-22:2; CDFG-Dean-Ex. 1 at 4:19-25; NGO-Ex. 14 at 4; NMFS/FWS-Issue 3-Snedaker-Ex. 1 at 3:24-4:6, 6:15-18; CDFG-Dean-Ex. 1 at 4:19-26, 5:22-6:4; NGO-Ex. 2 at 19:7-9*).

3-2. The 1.4 mile section of river between the Copco II Diversion Dam and Iron Gate Reservoir contains marginal trout habitat. (*PAC-Ols-D-Ex. 1 at 21:21-23; PacifiCorp PFF 200; Appendix to National Marine Fisheries Service and United States Fish and Wildlife Service's Joint Post-Hearing Reply Brief at 20*).

3-3. There are a limited number of trout in the J.C. Boyle, Copco, and Iron Gate Reservoirs. (*PAC-Ols-D-Ex. 1 at 22:4-5; PacifiCorp PFF 201; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 32*).

3-4. Prior to the construction of the dams, redband trout within the Project area belonged to a single, large, intermixing population throughout the Klamath River Basin. (*NGO-Ex. 2 at 13:4-9; NGO-Ex. 14 at 4; NMFS/FWS PFF 3.1; NGO PFF 3.2; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 29 and 34*).

3-5. Although the trout sport fishery is robust in the Upper Klamath Basin, the juvenile trout from above J.C. Boyle Dam in the Oregon portion of the Klamath River are actually decreasing. (*NMFS/FWS-Issue 3-Hooton-Ex. 0A at 4:7-8, 6:15-17; Hooton-BLM-Ex. 4 at 22*).

3-6. Life history strategies (such as spawning above the J.C. Boyle Dam) are denied to the resident trout population below the dam. (*NMFS/FWS-Issue 3-Hooton-Ex. 0A at 6:17-20; Hooton-BLM-Ex. 4 at 22; NGO-Ex. 2 at 14:10-12, 17:15-18:2, 19:4-18; CDFG Dean Ex. 1 at 5:1-2; Aug. 23, 2006 Tr. at 161:13-162:17; NMFS/FWS PFF 3.5*).

3-7. Migration is one of several defining life history characteristic of trout. (*Aug. 23, 2006 Tr. at 166:23-168:7; CDFG Dean Ex. 1 at 4:19-26; NGO-Ex. 14 at 4; NGO PFF 3.3*). Their ability to migrate is one of several evolutionary advantages contributing to survival of trout in the Klamath River for millions of years through dramatic environmental changes. (*Id.)*.

3-8. The Project restricts migration of resident fish within the main stem and into and out of tributaries. (*NGO Ex. 2 at 19:12-14*). Iron Gate, Copco I, and Copco II Dams do not have fishways and currently block all upstream fish passage. Thus, the stocks above Iron Gate are isolated from counterparts in the lower basin. Further, the stocks between each of Iron Gate, Copco I, and Copco II Dams are similarly isolated. (*NGO PFF 3.5; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at35*).

3-9. J.C. Boyle Dam has a fishway for migration of rainbow/redband trout. (*NGO PFF 3.6*). The current fish screen and ladder at the dam do not meet current state and federal fish passage criteria and impairs upstream migration. (*PAC-MAL-D-Ex. 4 at 7-31; NMFS/FWS PFF 3.8 and 3.9; Appendix to Reply of PacifiCorp and Siskiyou County Responses to Proposed Findings on USFWS/NMFS Issues at 32*).

3-10. The effectiveness of the fishway has declined by 98% since initial operation of the fishway in 1959. (*NGO Ex. 17 at 379; NGO Ex. 2 at 20:19-20 NMFS/FWS-Issue 3-Snedaker-Ex. 0 at 2:11-12; NMFS/FWS-Issue 3-Snedaker-Ex. 8 at 8, Hooton-BLM-Ex. 4 at 11; NGO-Ex. 2 at 14:4-10; NGO-Ex. 17 at 3; NMFS/FWS PFF 3.7; NGO PFF 3.6*). A rock cascade that starts at the entry of the fishway and extends downstream may be the cause for such limited use. (*Aug. 23, 2006 Tr. at 149:22-152:15; NGO PFF 3.6*).

3-11. PacifiCorp has agreed to improve the channel configuration below the fishway so that upstream migration of trout will no longer be impeded. (*PAC-Ols-R-Ex. 1 at 25:14*).

3-12. Improvements in efficiency to the fishway at JC Boyle Dam would result in significant trout population migration above the dam over time. (*Aug. 23, 2005 Tr. at 176:17-23; NMFS/FWS PFF 3.11*).

3-13. Spencer Creek is a highly productive spawning and rearing habitat for rainbow/redband trout. (*NGO Ex. 16 at 3; NMFS/FWS PFF 3.7*). The stock of rainbow/redband trout in the bypass and peaking reaches below JC Boyle Dam is denied the use of Spencer Creek and other suitable habitat upstream of the J.C. Boyle Dam. (*NMFS/FWS PFF 3.7*).

3-14. Historically, trout in the Copco II area would have moved up and downstream to access needed habitat. To now meet essential life history needs, trout move further downstream over Copco II Dam and utilize either the bypass reach or other tributaries of Iron Gate Reservoir. However, once they exit Copco II they cannot return as there are no upstream passage facilities. Thus, the trout population is not self-sustaining. (*NMFS/FWS-Issue 3-Snedaker-Ex. 1 at 6:15-21; NMFS/FWS- Issue 3-Snedaker-Ex. 16 at 127; NMFS/FWS-Issue 4-Hamilton-Ex. 7 at 1; NMFS/FWS PFF 3.13*).

3-15. Downstream migration of rainbow/redband trout is also adversely impacted because of the Project dams. This is due to the hydraulics at the Project dams and mortality related to unscreened flow resulting in fish passage through Project dam turbines. (*NMFS/FWS-Issue 3-Snedaker Ex. 16 at 126-130; NMFS/FWS-Issue 3-Hooton Ex. 0A at 7:10-9:14; BLM-Hooton-Ex. 3 at 7-8*).

3-16. The Project's limitation on riverine migration may have reduced the genetic diversity of the remaining stocks within the Project reaches. (*NGO Ex. 2 at 3:6-10, 21:1-9; NGO Ex. 14, Figure 3 at 103; NGO PFF 3.8; NMFS/FWS PFF 3.3-3.5*).

5. <u>FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 4</u>

4-1. J.C. Boyle, Copco, and Iron Gate Dams support populations of resident fish including native and non-native species. Popular sport fisheries occur in each reservoir targeting primarily bass, perch, and catfish. Rainbow trout, resident lamprey, and Lost River/shortnose sucker fish also occur in the reservoirs. (*NMFS/FWS-Issue 4- Hamilton-Ex. 12 at 1*).

4-2. It is estimated that "several tens of thousands of resident fish" are annually entrained at "each of the Projects" facilities. (*NMFS/FWS-Issue 4-Hamilton-Ex. 12, at 28; NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 6:7-9; NMFS/FWS-Issue 4-Hamilton-Ex. 14 at 1; NMFS/FWS-Issue 4-Hamilton-Ex. 10 at 3; NMFS/FWS-Issue 4-Hooton-Ex. 14, at 112; NMFS/FWS-Issue 4-Hooton-Ex. 1, at 5:3-5; HVT-Steward-Ex. 1 at 3:19-20; NMFS/FWS PFF 4.5; Indian Tribes PFF 4.1*).

4-3. Entrainment occurs when fish are drawn into Project facilities, such as power canals, turbines, and tailraces. When drawn into turbine intakes, fish can be subject to injury and mortality. (*NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 4:22-25; NMFS/FWS-Issue 4-Hamilton-Ex. 5, at 1; NMFS/FWS PFF 4.1; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 37*).

4-4. Mortality from entrainment can occur at each Project facility, thus fish surviving through one powerhouse could be exposed to potential cumulative mortality. (N*MFS/FWS-Issue 4-Hooton-Ex. 1, at 5:19-21; HVT-Steward-Ex. 39, at 2:3-7; NMFS/FWS-Issue 4-Hooton-Ex. 14, at 113*).

4-5. Once entrained, the fish face a high risk of mortality. For juvenile fish, the risk is between 10-30%. (*PAC-Ols-D-1 at 27*).

4-6. Entrainment mortality removes fish that would otherwise add to the population base downstream of the dam. (*NMFS/FWS-Issue 4-Hamilton-Ex. 12 at 29*).

4-7. Iron Gate, Copco 1, and Copco 2 Dams are not equipped with fish screens or downstream bypass facilities to minimize fish entrainment. (*NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 5:5-6; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 37*).

4-8. J.C. Boyle Dam has fish screening and bypass systems in place, but they do not conform to current fish screen criteria for resident and anadromous fish. (*NMFS/FWS-Issue 4-Johnson-Ex. 1, at 4:21 to 6:8; NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 5:6-7; NMFS/FWS-Issue 4-Johnson-Ex. 5, at 65-66; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 37*).

4-9. The seals at J.C. Boyle Dam have rendered the fish screens partially ineffective, allowing fish to be entrained in the power canal and turbines. (*PAC-Ols-R-1, at 26:13-17 and 27:1-3; Aug. 23, 2006 Tr. at 213:13 to 214:13; NMFS/FWS-Issue 4-Hooton-Ex.1, at 4:4-5; NMFS/FWS-Issue 3-Snedaker-Ex. 1, at 3:12-14; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 38*).

4-10. The J.C. Boyle facility uses Francis turbines, at an operational head of 440 feet. A 1987 report prepared by the Electric Power Research Institute (EPRI) concluded that fish mortality from entrainment at hydroelectric projects using Francis turbines averaged 24 percent. The EPRI report found that entrainment mortality at hydroelectric projects using Francis turbines with operational head greater than 335 feet ranged from 33-48%. (*NMFS/FWS-Issue 4-Hooton-Ex. 1, at 5:23 to 6:2; NMFS/FWS-Issue 4-Hooton-Ex. 7, at 51, Table 4-1; NMFS/FWS-Issue 4-Johnson-Ex. 1, at 2:11-15; Aug. 22, 2006 Tr. at 186:1-17); CDFG Hughes Ex. 1, at 4:12-18; HVT-Steward-Ex. 1, at 2:17-20; NMFS/FWS-Issue 4-Hamilton-Ex. 12, at 28; NMFS/FWS PFF 4.10; Indian Tribes PFF 4.3; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 39*).

4-11. In light of the large percentage of river flow that is diverted into the J.C. Boyle power canal, the operation of Francis turbines, and the high operational head of 440 feet, fish mortality from entrainment at the J.C. Boyle project is likely in the higher end of the mortality ranged as described in the Electric Power Research Institute report. (*NMFS/FWS-Issue 4-Hamilton-Ex. 12, at 28; NMFS/FWS-Issue 4-Hooton-Ex. 1, at 5:23 to 6:5; NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 5:15-17; NMFS/FWS-Issue 4-Johnson-Ex. 1, at 2:11-15; NMFS/FWS PFF 4.11; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 40*).

4-12. PacifiCorp recognizes that entrainment at the J.C. Boyle Dam is a "problem that needs to be addressed." (*Aug. 23, 2006 Tr. at 214: 4-10; PAC-Ols-R-1 at 26: 21-27:1*).

4-13. PacifiCorp has not conducted site-specific studies on the mortality levels of entrained resident fish at Project facilities, but did conduct a literature review that provides insight into the potential of the fish entrainment at J.C. Boyle, Iron Gate, and Copco Dams. *NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 5:20-23; NMFS/FWS-Issue 4-Hamilton-Ex. 13, at 2; NMFS/FWS-Issue 4-Hamilton-Reb. Ex. 1, at 2:7-10; NMFS/FWS-Issue 4-Hamilton-Reb. Ex. 5, at 21; PAC-Ols-D-1, at 26:2-9; Aug. 22, 2006 Tr. at 178:16-19*).

4-14. Precise estimates of the number of fish entrained at the facility are not available. However, extrapolating from data at other comparable FERC Facilities, PacifiCorp estimates a median annual entrainment of 75,655 fish for reservoirs the size of J.C. Boyle, and 115,979 fish for reservoirs the size of Copco and Iron Gate. (*NMFS/FWS-Issue 4-Hooton-Ex. 14 at 112*).

4-15. In the Project Area, non-native species are entrained to a greater extent than native species. (*NMFS/FWS-Issue 4-Hamilton-Ex. 12 at 17 and 29; PAC-Ols-D-1 at 26:20-21; PAC-Ols-D-15*). This may be the result of the relative abundance of non-native species vis-à-vis native species. (*PAC-Olson-D-1 at 27-28*).

4-16. The J.C. Boyle reservoir contains sucker fish (shortnose and lost River) that are listed under the federal Endangered Species Act and those fish are susceptible to entrainment. (*PAC-Olson-D-15 at 8 and 10*).

4-17. Habitat degradation has been recognized as a common contributor to the decline in the abundance of shortnose and lost river sucker fish in the Klamath basin. (*KTr-CWH-Ex. 1 at 4*).

4-18. Records from canal salvage operations at the J.C. Boyle power canal show that resident fish, in particular resident trout and sucker fish, are entrained and possibly killed in the power canal each year. (*NMFS/FWS-Issue 4-Hooton-Ex. 1, at 5:6-17; NMFS/FWS-Issue 4-Hooton-Ex. 15; NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 5:17-19 and 6:3-5; NMFS/FWS-Issue 4-Hamilton-Ex. 14, at 1; Aug. 23, 2006 Tr. at 212:25-213:21; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 38*).

4-19. Salvage records show the entrainment of over 690 trout into the J.C. Boyle reach during salvage operations between 1995 and 2002. (*NMFS/FWS-Issue 4-Hamilton-Ex. 14, at 1*). During that same period of time, it appears that only 2 sucker fish were entrained. (*NMFS/FWS-Issue 4- Hooton-Ex. 15, at 3-4 (Fish Salvage Data Table*). In 2003, J.C. Boyle fish salvage totaled 86 trout and 17 suckers. (*NMFS/FWS-Issue 4-Hamilton-Ex. 14, at 1; NMFS/FWS-Issue 4-Hooton-Ex. 15 at 2-3*).

4-20. Canal salvage data provides a snapshot of the number of fish entrained at the time that salvage operations are performed, and thus such data represents only a small fraction of the total number of fish actually entrained each year. (*NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 6:3-5; NMFS/FWS-Issue 4-Hamilton-Ex. 14, at 1; NMFS/FWS-Issue 4-Hooton-Ex. 1, at 5:10-17; NMFS/FWS PFF 4.8*).

4-21. Since sucker fish are bottom dwellers, they are less prone to entrainment through the shallow intakes at Copco and Iron Gate Dams. (*NMFS/FWS-Issue 4-Hamilton-Ex. 12 at 17*). Moreover, nearly all of the non-larval sucker fish appear to be too large to pass through the existing trash racks at the powerhouse intakes at Copco and Iron Gate. (*PAC-Ols-D-1 at 30:1-6; PAC-Ols-D-15*).

4-22. While the vast majority of fish entrained consists of small juvenile fish, the record shows that adult fish are also susceptible of being entrained and killed. (*PAC-Ols-D-1 at 27; NMFS/FWS-Issue 4-Hooton-Ex. 1 at 3; NMFS/FWS-Issue 4- Hooton-Ex. 18*). (Id.).

4-23. In 1959, the year after J.C. Boyle Dam was completed, adult redband trout migrated from what are now known as the peaking and bypass reaches in large numbers to spawn in Spencer Creek and then return to the reaches after spawning. (*NMFS/FWS-Issue 4-Hooton-Ex. 13 at 22*). Currently, the peaking reach life history appears to be gone and the bypass reach life history has been reduced to less than 10% of historical abundance and is composed of significantly smaller trout. (*Id.*).

4-24. Resident trout are a migratory species. Because Spencer Creek, located upriver of the J.C. Boyle facility, is a primary spawning and early rearing area for resident trout within the Project area, it is important that adult spawners from the river below the dam and juvenile trout from Spencer Creek both are able to successfully migrate upstream and downstream past J.C. Boyle Dam. (*NMFS/FWS-Issue 4-Hooton-Ex. 1, at 3:6-17; NMFS/FWS-Issue 4-Hooton-Ex. 11, at 2; NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 4:8-12; NMFS/FWS-Issue 4-Hamilton-Ex. 14, at 2; NMFS/FWS-Issue 4-Hamilton-Ex. 17, at 4; NMFS/FWS-Issue 4-Hamilton-Ex. 13, at 4; Aug. 23, 2006 Tr. at 161:5 to 162:18; Aug. 24, 2006 Tr. at 64:20-24; NMFS/FWS PFF 4.12; Appendix to Reply Brief of PacifiCorp and Siskiyou County at 40.).*

4-25. While it is true that the present population of resident trout is robust and supports one of the finest trout fisheries on the West Coast, the losses of juvenile trout through entrainment at the Project could, in the long run, adversely affect trout abundance and distribution. (*NMFS/FWS-Issue-4-Hooton Ex. 1 at 6:9-13; NMFS/FWS-Issue 4-Hamilton-Ex. 1 at 4:16-16 and 7:3-4; NMFS/FWS-Issue 4-Hamilton-Ex. 17 at 4; HVT-Steward-Ex. 39 at 1:17-22*).

6. FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 6

6-1. The findings of fact in USFWS/NMFS Issue 2A are incorporated herein.

6-2. Habitat is deemed "suitable" if it can be used successfully at least some of the time by one or more life stages of a Coho salmon. (*NMFS/FWS-Issue 6-Smith-Ex. 1 at 2:18-2:24; PAC-MAL-D-30 at 65; HVT-Franklin-Ex. 2 at 2:20-2:26; KTr.-CWH-Ex. 35 at 2:22-3:6; KTr-CWH-Rebuttal-Ex. 6 at 5:14-6:2; Aug. 22, 2006 Tr. at 197:12-198:23; Aug. 24, 2006 Tr. at 1283:25-285:20; NMFS/FWS PFF 6.1; Indian Tribes PFF 6.1; NGO PFF 6.1*).[10]

6-3. Anadromous fish are highly adaptive to differing conditions typically can readily migrate into and colonize new habitat or recolonize historic habitat. (*Aug. 24, 2006 Tr. at 11:24-15:9; NMFS/FWS-Issue2A-Garza-Ex. 1 at 2:8-3:25; NMFS/FWS-Issue 2A-Garza-Ex. 6 at 6; NMFS/FWS-Issue 2A-Garza-Ex. 8 at 13; NMFS/FWS-Issue 2A-Garza-Ex. 4 at 3; HVT-Franklin-Ex. 8; HVT-Franklin-Ex. 2 at 2:20-2:26; CDFG-Pisano-Ex. 1 at 8:14-9:*7).

[10] The transcript indicates that the Federal Fisheries Services' definition of "suitable habitat" appears on 51 of *PAC-MAL-D-30* (NMFS/FWS Responses to Discovery Requests). The definition of "suitable habitat" actually appears on page 65 of that exhibit. It is a response to Interrogatory 51.

6-4. While the exact amount of suitable habitat available for anadromous fish is uncertain, the record evidence shows that steelhead trout, Chinook salmon, Coho salmon, and Pacific lamprey will likely find suitable spawning and rearing habitat in the Project-bound area. (*Aug. 24, Tr. at 28:24-29:1; Aug. 25, 2006 Tr. at 75:2-11; Malone Supplemental Rebuttal Ex., Attachment 2 at 1; NMFS/FWS-Issue 6-Smith-Ex. 1 at 2:1-8; KTr-CWH-Rebuttal-Ex. 6 at 2:16-17 and 3:7-18; KTr-FAE-Rebuttal Ex. 7 at 6:18-20*).

6-5. Spawning and rearing habitat requirements are similar among resident rainbow/redband trout, anadromous steelhead trout, anadromous Coho salmon, and anadromous Chinook salmon. Habitat suitable for redband trout will generally be suitable for steelhead trout, Coho salmon, and Chinook salmon. (*HVT-Franklin-Ex. 12 at 3:4-8 and 3:19-25; NMFS/FWS-Issue 2-Curtis Rebuttal-Ex. 1 at 2:10-15*).

6-6. Stocks of resident rainbow/redband trout are self-sustaining in habitat above Iron Gate Dam, suggesting that anadromous stocks will probably do the same. (*HVT-Franklin-Ex. 12 at 1:14-4:25; PAC-Kirk-D-1 at 2:6-3:7; PAC-Carl-D-7 at 2-68; PAC-Bald-D-2 at 28; KTr-CWH-Ex. 21 at 2*).

6-7. The record evidence shows that Coho and Chinook salmon may use tributary habitat with a gradient of up to 7%. (*Aug. 22, 2006 Tr. at 208:19-21*). Steelhead trout may use tributary habitat with gradients as high as 15% and could therefore re-colonize areas inaccessible to Coho or Chinook salmon. (*Aug. 22, 2006 Tr. at 44:1-46:11; KTr-CWH-Ex 7, Tables at 6-8*).

6-8. USFWS/NMFS Issue 2A-47 is incorporated herein.

6-9. Expansive bottomland areas with abundant low-gradient channels, which are preferred salmon habitat, are more common in the Upper Klamath Basin than in the remainder of the Klamath system. Such areas are particularly extensive above Keno Dam and Upper Klamath Lake, where spring-fed streams include the Williamson and Wood Rivers, smaller springbrooks flowing into these two rivers, Sprague River, and various streams. (*KTr-CWH-Ex. 1 at 5*).

6-10. The record, however, shows that there are approximately 28 miles of suitable habitat for anadromous fish to spawn in the main stem provided gravel is placed in those areas. (*NMFS/FWS-Issue 7-White Ex. 14, Table 3 at A-21*). Such habitat includes areas cooled by springs (thermal refugia) in the J.C. Boyle bypass (*Aug. 25, 2006 Tr. at 98:10-14 and 101:20-102:7; NMFS/FWS-Issue 6-Sneadker-Ex. 1 at 5:18-6:2; NMFS/FWS-Issue 4-Hooton-Ex. 1 at 3:6-9; KTr-Dunsmoor Direct-Issue 2 at 3:6-9 and 4:3-4:5; HVT-Franklin-Ex. 2 at 3:9-22; KTr-CWH-Ex. 7 at 6-8; NMFS/FWS-Issue 6-Smith-Ex. 1 at 1:19-3:5; CDFG-Pisano-Ex. 6*).

6-11. There are at least 12 miles of perennial stream reaches within the Project area that have gradients at or below 15%. (*NMFS/FWS-Issue 7-White-Ex. 14, Table 3 at A-21*). These include: Jenny, Fall, Shovel, and Spencer Creeks, which presently support spawning by resident salmonids thereby suggesting that those habitat would be suitable for use by anadromous fish. (*Aug. 24, Tr. at 65:10-15; NMFS/FWS-Issue 6-Smith-Ex. 1 at 2:18-24; PAC-Ols-D-1 at 6:18-20, 7:22-8:11, and 22:19-23; NMFS/FWS-Issue 6-Hamilton-Ex. 1 at 4:12-5:9; NMFS/FWS-Issue 4-Hooton-Ex. 1 at 3:6-9; KTr-CWH-Ex. 20 at 82; KTr-CWH-Ex. 21 at 2*).

6-12. The only area in Fall Creek that is not suitable habitat for anadromous fish is the portion of the stream below the PacifiCorp diversion to the penstock and the powerhouse. Further, Fall Creek upstream of the Spring Creek diversion experiences low flows in the summer months which would also make it unsuitable habitat for anadromous fish. (*KTr-CWH-Ex. 20 at 82*).

6-13. Fall and Shovel Creeks have the water temperatures most suited for juvenile Coho salmon rearing. Spencer Creek also has a reach extending 2.6 to 9.5 km above its mouth that contains abundant beaver ponds which, if they include pockets of cool groundwater, could provide good summer rearing habitat for Coho salmon. (*KTr-CWH-Ex. 21 at 3*).

6-14. There are also approximately 18 miles of intermittent stream reaches within the Project area that have gradients at or below 15%. (*NMFS/FWS-Issue 7-White-Ex. 14, Table 3 at A-21; NMFS/FWS-Issue 7-Simondet Rebuttal Ex. 1 at 4:6-11; HVT-Franklin-Ex. 2 at 2:20-26; NMFS-FWS-Issue 6-Hamilton-Ex. 1 at 5:11-7:17; NMFS/FWS-Issue 6-Smith-Ex. 1 at 2:13-16 and 3:7-22*).

7. FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 7

7-1. The findings of fact under USFWS/NMFS Issue 2A are incorporated herein.

7-2. Today, the runs of Coho salmon have greatly diminished in the Klamath River system, which is now composed largely of hatchery fish. (*NMFS/FWS-Issue 7-Simondet-Ex. 5 at 117; KTr.-CWH-Ex. 4 at 216 and 224*).

7-3. The Coho salmon stock of the Klamath River is a sub-population of the Southern Oregon/Northern California Coast ("SONCC') Evolutionarily Significant Unit ("ESU"), and is listed as a threatened species under the Endangered Species Act. (*NMFS/FWS-Issue 7-Williams-Ex. 7 at 1; NMFS/FWS-Issue 7-Williams-Ex. 6 at 34; NMFS/FWS-Issue 7-Williams-Ex. 1 at 2:17-3:9; NMFS/FWS-Issue 7-Williams-Ex. 14 at 41; NMFS PFF 7.1; NGO PFF 7.2; NMFS/FWS-Issue 7-Simonet Ex. 5 at 117; Appendix to Reply Brief of PacifiCorp and Siskiyou County at 60 and 64; KTr.-CWH-Ex. 4 at 224*).

7-4. The SONCC Coho salmon population has experienced a 70% decline since the 1960s. (*NMFS/FWS-Issue 7-Williams-Ex. 7 at 1; NMFS/FWS-Issue 7-Williams-Ex. 6 at 34; NMFS/FWS-Issue 7-Williams-Ex. 1 at 2:17-3:9; NMFS PFF 7.1; NGO PFF 7.2; NMFS/FWS-Issue 7-Simonet Ex. 5 at 117; Appendix to Reply Brief of PacifiCorp and Siskiyou County at 60*).

7-5. Habitat degradation is a primary cause for the decline of the SONCC Coho salmon. (*NMFS/FWS-Issue 7-White-Ex. 1 at 6:3-5; NMFS/FWS-Issue 7-White-Ex. 18 at 6; NMFS/FWS-White-Ex. 4 at 3; NMFS/FWS-White-Ex. 5 at 363 (page 401 of the report); NMFS/FWS-Issue 7-Simondet-Ex. 1 at 5:22 to 6:1. KTr-CWH-Ex. 1 at 4; NMFS PFF 7.21; Appendix to Reply Brief of PacifiCorp and Siskiyou County at 60*).

7-6. Coho salmon below Iron Gate Dam still utilize the habitat below the dam even though it has suffered degradation commensurate with that above the dam. (*Aug. 25, 2006 Tr. at 118:16-119:2*; *CDFG-Pisano-Ex. 1 at 7:10-11:17; Yurok-Hillemeir at 4:15-5:3; NMFS/FWS-Issue 7-Simondet at 5:22-6:7; Indian Tribes PFF*).

7-7. Although portions of the habitat above Iron Gate Dam have been degraded, much of this habitat remains suitable and restoration projects are currently in progress or planned. (*NMFS/FWS-Issue 7-White-Ex. 1 at 6:7-9; NMFS/FWS-Issue 7-Snedaker-Ex. 1 at 8:7-9:17; NMFS/FWS-Issue 6-Hamilton-Ex. 1 at 8:11-13; NMFS/FWS-Issue 7-Snedaker-Ex. 7 at 35-48; NMFS/FWS-Issue 6-Smith-Ex. 1 at 6:1 to 9:18; NMFS/FWS PFF 7.6*).

7-8. Habitat is deemed "suitable" if it can be used successfully at least some of the time by one or more life stages of a Coho salmon. (*FOF 6-1; NGO PFF 7.7*). Such suitability varies across locations, life stages, and time. Faced with such variability in a given tributary, Coho salmon will move to the extent feasible to more suitable habitat within that given tributary so long as access is provided. (*KTr-CWH-Ex. 4 at 216; FOF 2A-14; NGO PFF 7.7*).

7-9. Suitable habitat above Iron Gate Dam includes Spencer, Fall, Beaver, Deer, Shovel, Scotch, and Jenny Creeks. The main stem also has suitable habitat. (*NGO Ex. 27 at 2:3-3:10, 6, 7; NMFS/FWS-Issue 7-Simondet Rebuttal-Ex. 1 at 2:22-5:5; HVT-Franklin-Ex. 1 at 3:9-4:6*; *KTr-CWH-Ex. 12 at 1-20; KTr-CWH-Ex. 21 at 1-4; KTr-CWH-Ex. 36 at 2:18-26; KTr-FAE-ex. 34 at 2; Yurok-Hillemeir Direct Testimony-NMFS/FWS Issue 7 at 3:6; NGO PFF 7.6; Indian Tribes PFF 7.5*).

7-10. Adult Coho salmon enter the river to spawn in late September and reach peak migration strength between late October and mid-November. While it appears that adult Coho salmon migration is keyed to water temperature (below 16° C) and river flow, adult Coho salmon migration have been observed where these stimuli are reduced. (*KTr-CWH-Ex. 4 at 217*).

7-11. The record evidence shows that juvenile Coho salmon begin outmigrating to the ocean in late February, and continue migration through early July. While juvenile Coho salmon rear in streams for one year and have a preference for cold water (ranging between 12 and 14° C), they can tolerate higher water temperatures (exceeding 20° C) where food is abundant, there are areas of thermal refugia, and other conditions are not stressful. (*KTr-CWH-Ex. 4 at 218-19*).

7-12. Although water temperature in the summer above Iron Gate Dam is an issue, the record evidence shows that water temperature will not preclude Coho salmon from successfully utilizing the habitat within the Project area. (*CDFG Pisano Ex. 1 at 4:18-51, 7:10-9:7 (Coho in other parts of the Klamath system occupy water with temperatures in excess of 26° C), 9:8-10:12 (spawning in degraded streams); Yurok-Hillemeir Direct Testimony-NMFS/FWS Issue 7 at 4:24-5:3; KTr-CWH-Ex 4 at 219 (juvenile Coho salmon observations in the main stem Klamath River where temperatures exceed 20°C)*).

7-13. Predation may also be a slight problem that could be minimized through use of remedial measures. (*NMFS/FWS-Issue 7-White-Ex. 14 at A-10, B-2, and B-40; NGO PFF 7.10*).

7-14. In restoration efforts elsewhere in the Pacific Northwest, Coho salmon and other anadromous juveniles successfully pass through reservoirs under similarly difficult circumstances. (*NGO Ex. 3 at 12:13-13:9; KTr-FAE-Ex. 1 at 3:4-12; NGO PFF 7.11*).

7-15. Coho salmon below Iron Gate Dam would migrate above the dam if access was provided through fishways. (*FOF 2A-10; NMFS/FWS PFF 7.8; Appendix to Reply Brief of PacifiCorp and Siskiyou County at 62*).

7-16. Over time, access to habitat above Iron Gate Dam would benefit the Coho salmon population by: a) extending the range and distribution of the species thereby increasing the Coho salmon's reproductive potential; b) increase genetic diversity in the Coho stocks; c) reduce the species vulnerability to the impacts of degradation; and d) increase the abundance of the Coho population. (*Aug. 23, 2006 Tr. at 163:1-2; Aug. 25, 2006 Tr. at 107:5-20; NGO Ex. 27 at 3:11-4:7 (allowing access to additional habitat does not decrease the size of the population existing below Iron Gate Dam); Yurok-Hillemeir Direct Testimony-NMFS/FWS Issue 7 at 5:7-8 (access to project area is one of the quickest ways to increase population abundance, 6:4-22; CDFG-Pisano-Ex. 1 at 5, 11:18-12:23; NMFS/FWS-Issue 7-Simondet-Ex. 1 at 5:21-6:15; NMFS/FWS-Issue 7-Williams-Ex. 1 at 6:15-19, 7:15-9:22 (explaining that additional spatial structure reduces species vulnerability to changing environmental conditions); HVT-Franklin-Ex. 1 at 6:16-7:12 (explaining that diverse habitat leads to populations adapted to diverse life history forms and greater viability for the species; NGO ex. 4 at 11:15-28*).

8. FINDINGS OF FACT CONCERNING USFWS/NMFS ISSUE 8

8-1. The Findings of Fact in 2A are incorporated herein.

8-2. Today, Pacific lamprey is found throughout the Klamath River main stem and tributaries downstream of the Project area and some have also been found in tributaries near Iron Gate Dam. (*NMFS/FWS-Issue 8-Hamilton-Rebuttal Exhibit 4; Yurok-Steward 8 Rebuttal at 2:9 to 3:2; FOF 2A-8; NMFS/FWS PFF 8.3; Indian Tribes PFF 8.2*). The Pacific lamprey fishery resources in the lower Klamath River are in decline. (*PAC-Chan-D-1 at 4:7-9; NMFS/FWS PFF 8.1*).

8-3. Although the historical upstream distribution of Pacific lamprey is unknown, suitable habitat for spawning and juvenile rearing is available within tributaries and stream reaches in the Project area. (Y*urok-Hillemeier 2and 8 Direct at 6:4 to 7:15; Yurok-Steward 8 Direct at 5:1-8; NMFS/FWS PFF 8.4*).

8-4. Resident lamprey ammocoetes (juveniles) already rear within tributaries within the Project. (*Yurok-Steward 8 Rebuttal at 4:2-11; CDFG Pisano Ex. 16; NMFS/FWS PFF 8.5*).

8-5. Ammocoetes of resident and Pacific lamprey have similar habitat requirements. (*PAC-Chan-D-1 at 8:8-9; Yurok- Steward 8 Rebuttal at 4:4-6; NMFS/FWS PFF 8.5*).

8-6. There is no measurable genetic difference between Pacific lamprey inhabiting different river basins along the Pacific coast. (*Yurok-Hillemeier 8 Direct at 4:14 to 5:25. NMFS/FWS-Issue 8-Hamilton-Rebuttal Ex. 3 at 15; Aug. 24, 2006 Tr. at 105:9-24; NMFS/FWS PFF 8.6*).

8-7. Pacific Lamprey below Iron Gate Dam would migrate above the dam if access was provided through fishways. (*FOF 2A-10; NMFS/FWS PFF 8.9; Indian Tribes PFF 8.5*).

8-8. Volitional passage for Pacific lamprey has been designed and is in place in other river systems. (*NMFS/FWS-Issue 8-Johnso-Rebuttal Ex. 1 at 2:3-19, 3:5-7; Aug. 24, 2006 Tr. at 178:8-179:1, 184:1-185:15; NMFS/FWS-Issue 8-Moser-Ex. 1 at 9:12-16; Yurok-Steward 8 Direct at 5:12-26; NMFS PFF 8.8; Indian Tribes PFF 8.6*).

8-9. Access to habitat would benefit Pacific lamprey by increasing their viability through: a) extending the range and distribution of the species; b) providing additional spawning and rearing habitat; c) increasing the generic diversity of the species; and d) increasing the abundance of the Pacific lamprey population. (*NMFS/FWS-Issue 8-Hamilton-Ex. 1 at 8:1-11; Yurok-Steward 8 Direct at 4:27 and 5:17; NMFS/FWS-Issue 8-Mesa-Ex. 1 at 5:16-6:6; CDFG-Pisano-Ex. 1 at 11:19*).

C. **BLM DISPUTED ISSUES OF MATERIAL FACT**

1. FINDINGS OF FACT CONCERNING BLM ISSUE 10

10-1 About eighty ("80") percent of the J.C. Boyle bypass reach (an area of 4.3 miles in length) is confined by steep canyon walls. Thus, only twenty ("20") percent of the bypass reach (less than one mile in length) has potential for "riparian restoration." (*PAC-Dwer-D-1 at 5:12-14, 5:20-23; Aug. 21, 2006 Tr. at 71:13-22; BLM Reply Brief at 4-5*).

10-2 Relatively coarse bed sediment (*i.e.*, gravel and cobble) can be mobilized in the bypass reach with flows of 1,700 cubic feet per second (cfs) and greater. (*PAC-Tomp-R-1 at 4:8-10*).

10-3 The seasonal high flows proposed by BLM for the bypass reach will create more frequent and larger magnitude high flow events. (*BLM-Turaski-Ex. 4 at 59, 89-91; BLM-Gard-Ex. 0 at 2:4-9*).

10-4 BLM high flows, as compared to current conditions, will mobilize and transport sediment more frequently within the Project. (*PAC-Tomp-D-1 at 12:20-23*).

10-5 Seasonal high flows, in combination with the BLM's proposed gravel augmentation program, will likely create a more dynamic channel with a wider range of sediment deposits. This sediment will be deposited higher on the channel margin which will serve as an ecological benefit. (*BLM-Cluer-Ex. 0 15:5-7, 24-16:4; Aug. 22, 2006 Tr. at 54:4-23; BLM-Cluer-Ex. 0 at 15:5-7*).

10-6 With the construction of dams and their operation, changes have occurred to the riparian community of the bypass reach. Specifically, reed canary grass has encroached into the channel in places that have been exposed by Project-diverted flows. (*PAC-Dwer-D-5 at 6-66; NGO-Ex. 1 at 13:7-9, 16:7-10; Aug. 21, 2006 Tr. at 102:24-103:3*).

10-7 Reed canary grass can adversely affect downstream channel formation by effectively trapping sand, gravel, and small cobble in its dense root mass. Such material would otherwise have been transported downstream where it would replenish similar sized bed material scoured by floods. (*NGO-Ex. 1 at 16:11-17:3*). This may adversely affect abundance and quality of fish and terrestrial habitat. (*NGO-Ex. 1 at 10:13-22*).

10-8 Approximately two-thirds of the riparian habitat in the J.C. Boyle bypass reach is riparian grass land, which is predominately reed canary grass. (*Aug. 21, 2006 Tr. at 97:24 to 98:9*).

10-9 Riparian-focal bird species are birds that use riparian habitats. (*BLM-Alexander-Ex. 0 at 5:19-24; BLM-Alexander-Ex. 6 at 35; BLM-Turaski-Ex. 4 at 74*). These species often have a special management or conservation status. (*Id.)*

10-10 Avian riparian focal species consistently use riparian habitat in the J.C. Boyle bypass and peaking reaches during breeding season. (*PAC-Tres-D-1 at 7:6-9:12*).

10-11 The eight species of riparian-focal bird species in the Project area do not nest in reed canary grass. Nesting is such grasses make the birds accessible to predators. (*PAC-Tres-D-1 at 4:17-23, 11:14-20); Aug. 21, 2006 Tr. at 124:14–125:23).*

10-12 Avian riparian focal species prefer structurally diverse habitat. (*Aug. 21, 2006 Tr. at 124:20-22; PAC-Tres-D-1 at 13:7-11*).

10-13 In the J.C. Boyle bypass and peaking reaches, riparian-focal bird species are associated with and primarily nest in woody riparian vegetation. (*BLM-Alexander-Ex. 0 at 6:22 to 7:2; Aug 21, 2006 Tr. at 124:14–125:23*).

10-14 Numerous factors determine how useful riparian patches are to avian riparian focal bird species. An increase in the amount of riparian habitat does not necessarily correspond to a similar increase in birds that would use that habitat. (*Aug. 21, 2006 Tr. at 128:21 to 129:10; Aug. 22, 2006 Tr. at 18:3-14*).

10-15 A relative increase in early woody riparian vegetation and a relative decrease in reed canary grass will likely increase abundance of riparian-focal bird species in the J.C. Boyle bypass reach. (*BLM-Alexander-Ex. 0 at 9:10-14; Aug. 21, 2006 Tr. at 120:21-25*).

10-16 BLM proposed flows would not increase woody riparian habitat. (*PAC-Tres-R-1 at 1:16-17; NGO-Ex. 1 at 7:11-18, 10:5-22 (which suggests that high flows, such as that associated with the proposed flows, scour woody riparian vegetation*)).

2. FINDINGS OF FACT CONCERNING BLM ISSUE 11

11-1. J.C. Boyle Dam has captured an average of 6,124 tons/year of channel bedload and thus blocked its transport into the bypass and peaking reaches. (*PAC-Tomp-D-1 at 14:9-15; Aug. 21, 2006 Tr. at 74:22-75:2).*

11-2. Channel bedload is the totality of cobble, gravel, and other sediment that form the channel bed. Bedload mobilization is the natural geomorphic process whereby flow moves gravel for deposit on alluvial features and cleanses gravel of sediment. (*Aug. 21, 2006 Tr. at 64:12-23*). Diversion has reduced the capacity of flow to mobilize the bedload by an estimated eighty-three ("83") percent to ninety-six ("96") percent in the bypass reach. (*PAC-Tomp-D-3 at 6-139; Aug. 21, 2006 Tr. at 64:3-70:1*).

11-3. The bed material in the J.C. Boyle bypass and peaking reaches has coarsened due to the J.C. Boyle Dam limiting the sediment supply. (*BLM-Cluer-Ex. 5 at 111, 129; BLM-Cluer-Ex. 0 at 6:14-16; BLM-Turaski-Ex. 4 at 70*). In addition, the sediment that is delivered to the channel or was in the channel at the time of Project construction is transported downstream during Project spill events in the bypass reach and during peaking flows in the peaking reach. (*BLM-Cluer-Ex. 0 at 8:5-7, 14:10-12*).

11-4. In the J.C. Boyle bypass reach, the average annual flow released from the J.C. Boyle Dam has been reduced by eighty-one ("81") percent—from approximately 1,560 cfs to 296 cfs—with the 100 cfs minimum flow occurring eighty-nine ("89") percent of the time. (*BLM-Turaski-Ex. 4 at 68, 83*).

11-5. Low base flows combined with sediment being blocked by the J.C. Boyle Dam result in smaller alluvial features. (*NGO-Ex. 1 at 10:13-16, 11:1-2; BLM-Cluer-Ex. 0 at 8:1-4*).

11-6. High flows can scour (uproot and dislodge) reed canary grass. Moderate flows are likely to scour plants with less well-established root mats. (*NGO-Ex. 1 at 15:14-16*). Larger flow events are likely to scour older plants with more well-established root mats. (*NGO-Ex. 1 at 16:1-7; PAC-Dwer-D-1 at 13:21-23*).

11-7. Project diversions decrease high flow events in the bypass reach by approximately fifty ("50") percent. (*PAC-Dwer-D-5 at page 5-46, Table 5.7-16 (as explained at page 5-45*).

11-8. By decreasing the frequency of larger flows, the Project operations have reduced the number of flow events that can scour established reed canary grass. (*NGO-Ex. 1 at 16:4-10*).

11-9. If Project related coarsening of the bed had not occurred, it is likely that active features (e.g., point bars, islands) would have been characterized by finer sediment. (*Aug. 21, 2006 at 68:8 to 69:6; PAC-Tomp-D-3 at 6-129*).

11-10. Willow is a desirable riparian plant that germinates and establishes itself on freshly deposited alluvium (material transported and deposited by river flows). (*BLM- Turaski-Ex. 4 at 74*).

11-11. Current operations continue to maintain, to a certain degree, woody riparian vegetation in the bypass reach. (*PAC-Dwer-R-1 at 8:24-26; PAC-Dwer-R-1 at 3:14-20; NGO-Ex. 1 at 12:14-18*).

11-12. Reed canary grass is adapted to survive in frequently inundated coarse substrate and is capable of out-competing woody riparian vegetation. (*BLM-Turaski-Ex. 4 at 73; PAC-Dwer-D-4 at 3-28*).

11-13. In the bypass reach, there is more riparian vegetation as a result of Project operations. This increase of vegetation is attributed mainly to the encroachment of reed canary grass. (*Aug. 21, 2006 Tr. at 107:112-108:8*).

3. <u>FINDINGS OF FACT CONCERNING BLM ISSUE 14</u>

14-1. In the J.C. Boyle bypass reach, the channel bed is dominated by sixty-four ("64") percent boulders and twenty-eight ("28") percent cobble. A reduction in find grain deposits diminishes the quantity and quality of fish habitat. (*BLM-Cluer-Ex. 11 at 2; BLM-Cluer-Ex. 0 at 1-5*).

14-2. Sediment trapping by J.C. Boyle Dam is the primary cause of low sediment availability in the bypass reach. (*FOF 11.1, 11.3; BLM-Cluer-Ex. 0 at 6:14-20; BLM-Cluer-Ex. 5 at 111*).

14-3. BLM has proposed a gravel management plan in which 1,226 to 6,134 tons of sediment per year would be added to the Klamath River below J.C. Boyle Dam. (*BLM-Turaski-Ex. 4 at 60-61*).

14-4. Implementation of coordinated sediment delivery with seasonal high flows can result in deposition of gravel in velocity pockets on the bed and fine sands on the banks. These deposits have ecological benefits including creating spawning pockets around boulders and in pools. (*BLM-Cluer-Ex. 0 at 13:10-14;* Aug*. 21, 2006 Tr. at 201: 10-15*; *BLM-Gard-Ex. R0 at 2:6-9*).

14-5. Fine sediment can infiltrate salmonid spawning gravel and reduce incubation success or affect the ability of fry to emerge from the gravel. (*PAC-Carl-D-1 at 7:4-6; BLM-Snedaker-Ex. 0 at 3:20-26*).

14-6. Gravel embedded with greater than ten ("10") percent fine sediment results in a substantial reduction in suitability of steelhead spawning habitat. (*BLM-Gard-Ex. R0 at 1:20-21*).

14-7. Trout spawning gravel in the bypass reach is embedded with fine silt. (*BLM-Gard-Ex. 0 at 4:1-6; BLM-Snedaker-Ex. 0 at 3:20-25*). In July 2006, the spawning gravel in the bypass reach below the emergency spillway was fifty ("50") percent embedded with silt and sand. (*BLM-Gard-Ex. 0 at 4:1-14*).

14-8. An annual flushing flow can clean and redeposit gravel to provide quality spawning habitat. (*PAC-Carl-D-8 at 116-121*). To be effective, flushing flows need adequate duration and frequency to mobilize and redistribute fine sediments in the spawning beds. (*BLM-Turaski-Ex. 4 at A-41*).

14-9. The BLM River Corridor Management Condition calls for a one week seasonal high flow between February 1st and April 15th in years when inflow to J.C. Boyle Reservoir exceeds 3,300 cfs. (*BLM-Gard-Ex. 0 at 2: 4-13; BLM-Turaski-Ex. 4 at 59*). Based on an analysis of the historical flow record, the seasonal high flow would be implemented approximately every other year. (*Id.*; *PAC-Carl-R-1 at 1:10 to 2:*3). The seasonal high flow would occur in February twenty-four ("24") percent of the years, in March twenty-four ("24") percent of the years, and in April three ("3") percent of the years. (*Id).* The median start date for the seasonal high flow would be February 18. (*Id).*

14-10. BLM's proposed seasonal flushing flow would commence at 3,300 cfs and the medium flow would exceed 4,200. (*BLM-Turaski-Ex. 4 at A-16; PAC-Carl-D-1 at 4:15-19; BLM-Gard-Ex. 0 at 2:11-13*).

14-11. The spawning period for redband trout between Copco 1 Reservoir and J.C. Boyle Dam is from February through May. (*BLM-Gard-Ex. 0 at 2:19-23*). Most of the spawning takes place between March 15 and April 15. (*Id).*

14-12. Based on an analysis of the historical flow record, the seasonal high flow would be implemented between March 15 and April 15 in fourteen ("14") percent of the years. (*BLM-Gard-Ex. 0 at 2:23-25*).

14-13. Salmonids will hold during high flows and resume spawning once the flows have dropped. (*BLM-Gard-Ex. 0 at 3:6-10*). The one week seasonal high flow will still leave 21 weeks for rainbow trout to spawn. (*Id).*

14-14. BLM's proposed flushing flow would always occur during spawning season. (Aug. *22, 2006 Tr. at 59:23-25*).

14-15. Flushing flows scheduled during or immediately after fish spawning could dislodge eggs and result in reduced recruitment. (*PAC-Carl-D-8 at 116*). Flushing flows released just prior to spawning would produce more beneficial effects. (*Id*.).

14-16. In the bypass reach, PacifiCorp provides flows limited to 100 cfs eight-nine ("89") percent of the time. (*BLM-Turaski-Ex. At 68*). When flows greater than 100 cfs do occur in the bypass reach, they are abrupt, are short in duration, and do not reflect a flow regime with seasonal variability. (*Id).*

14-17. The timing of the BLM seasonal high flow condition reflects the natural hydrologic flood regime under which redband trout evolved. (*BLM-Gard-Ex. 0 at 3:11-17*). The BLM seasonal high flow condition will be implemented during the normal peak flow period. (*BLM-Gard-Ex. 0 at 3:11-17; Aug. 21, 2006 Tr. at 175:20-22*).

14-18. Historically, redband trout rearing in the Oregon portion of the Klamath River downstream of the J.C. Boyle Dam migrated upstream to spawn in Spencer Creek. (*BLM-Hooton-Ex. 0A at 2:5-6*). Redband trout rearing below J.C. Boyle Dam moved upstream in two peak spawning migrations, one in the spring and one in the fall. (*Id. at 2:12-13*). Both spring and fall spawning migrations were associated with increases in the river flow. (*Id).*

14-19. Spring and fall freshets attract spawning rainbow trout upstream past J.C. Boyle Dam and juvenile trout migrant downstream to rearing areas below J.C. Boyle Dam. (*BLM-Hooton-Ex. 0B at 4:1-3; BLM-Hooton-Ex. 18 at 1; BLM-Hooton-Ex. 19 at 1*).

14-20. Soon after the installation of J.C. Boyle Dam, upstream spawning migrations of redband trout were reduced and recent data shows little successful migratory movement occurs from downstream to upstream of J.C. Boyle Dam. (*BLM-Hooton-Ex. 0B at 4:10-16*).

14-21. The only observed trout spawning activities, including the presence of redds, currently occur in the main stem bypass reach just downstream of the existing J.C. Boyle emergency canal spillway. (*PAC-Carl-D-1 at 8:11-21; PAC-Carl-R-1 at 5:22-6:1*).

14-22. Erosion from PacifiCorp's use of the emergency spillway has significantly increased the rate of fine and coarse sediment delivery to the area below the emergency spillway. (*BLM-Cluer-Ex. 0 at 8:14-16; PAC-Carl-D-1 at 8:15-17*). Since J.C. Boyle Dam operations began in 1958, approximately 69,000 cubic yards of hillside sediment has been delivered to the stream from the erosional washout. (*BLM-Cluer-Ex. 0 at 8:14-16*).

14-23. The location of the redds, near the erosional feature, is relatively unstable for two reasons. First the spillway can be used at any time and its use probably destroys or buries redds and spawning gravel patches. (*BLM-Cluer-Ex. 0, 10:1-8*). Second, the slope of the channel in this location is very steep (*Aug. 21, 2006 Tr. at 56:10 to 57:7*), making this location inherently unstable during flood flows in the bypass channel. (*BLM-Cluer-Ex. 0, 10:1-8; BLM-Gard-Ex. 0 at 4:9-14*).

14-24. Seasonal high flows can mobilize sediment accumulated at the emergency spillway deposit and distribute that sediment downstream where it can be deposited in more stable locations. (*BLM-Cluer-Ex. 0 at 15:17-25*).

14-25. If the gravel at the emergency spillway were transported downstream by seasonal high flows, they would be more valuable fish habitat because the gravel would be transported to more stable locations and better sorted into spawning sizes. (*Id.*; *Ex. PAC-Carl-D-8 at 120-121).*

14-26. If PacifiCorp installs bypass valves at the J.C. Boyle powerhouse, the emergency spillway will no longer be used and the unnatural sediment loads in the area will not be replenished. (*PAC-Carl-D-1 at 8:21-9:3*).

4. FINDINGS OF FACT CONCERNING BLM ISSUE 16

a. Low Flows Reduce Fish Habitat

16-1. Trout presently do not spawn in the peaking reach. (*PAC-Ols-D-1 at 7:20*).

16-2. Before the J.C. Boyle Dam was built, rainbow trout would use the Frain Ranch area of the J.C. Boyle peaking reach to spawn. (*BLM-Denman-Ex. 0 at 3:6-15; BLM-Snedaker-Ex. 0 at 3:9-13*).

16-3. There are locations in the peaking reach with suitable spawning gravel, but these areas were on the margins of the stream channels and were exposed during lower flows. (*BLM-Snedaker-Ex. 0 at 3:13-19; BLM-Gard-Ex. 6 at 21-24*).

16-4. Low flows contribute to the lack of spawning in the peaking reach. (*BLM-Simons-Ex. 0 at 7:12-20; BLM-Simons-Ex. 16 at 69, section 4.10*; *"[M]uch of the gravel at this location [in the peaking reach] was exposed during low flow conditions. Since peaking operations often begin in mid-May, trout embryos would still be in the gravel when daily desiccation begins. Therefore, much of the available gravel would not be suitable for incubation of trout embryos during most years." BLM-Gard-Ex. 6 at 24.*").

16-5. Depositional features, such as gravel bars and side channels, are suitable spawning and rearing habitat for redband trout and serve as an oasis from the higher-velocity flows that occur during springtime snowmelt. (*NGO-Ex. 1 at 21:9-16, 21:1-2).*

16-6. The Project reduces the frequency and extent of inundation of depositional features in the bypass and peaking reach. (*NGO-Ex. 1 at 21:3-16, 32:4-7.*). This hydrologic impact reduces the availability of suitable rearing habitat for juveniles. (*Id. at 21:3-16).*

b. Stranding

16-7. Peaking is the most widely documented source of fish stranding. (*BLM-Snedaker-Ex. 6 at 25*). Peaking fluctuations can result in severe cumulative impacts to fish populations. (*Id*). Stranding is the separation of fish from flowing surface water as a result of declining river state. (*Id. at 5*).

16-8. PacifiCorp's peaking operations cause high mortality to fish and other aquatic organisms through stranding. (*BLM-Snedaker-Ex. 0 at 4:25 to 5:11; KTR-LKD-DT-BLM 16 at 4:3-22; KTR-FAE-DT-BLM 16 at 7:13-17*).

16-9. On July 5, 2006, a severe stranding along 225 feet of the peaking reach was documented near Frain Ranch. (*KTR-LKD-DT-BLM 16 at 4:3-10*). "[A]bout 5,000 fish, more crayfish, and an order of magnitude more aquatic insects perished in a single peaking cycle . . . ." (*KTR-LKD-Ex. 3 at 5*). No redband trout mortalities were documented, however few trout fry exist in the peaking reach. (*Id.*).

16-10. The severe loss of fish and other aquatic life on July 2006 is directly attributable to PacifiCorp's peaking operations. (*Aug. 21, 2006 Tr. at 153:18-21*).

16-11. July 5, 2006, was the first major downramp event of the season. No stranded fish were found on July 6, during the second major peaking cycle, or on July 7-8, 2006, during the third major peaking cycle. (*KTR-LKD-DT-BLM 16 at 4:8-13; PAC-Ols-R-1 at 16:7-11*).

16-12. Peaking operations that cause high mortality likely only happen a few times a year, following the first peaking event after several months of steady flow. (*PAC-Ols-R-1 at 16:16-17:7*)

16-13. Reduced ramp rates can resolve the problem of fish stranding. (*PAC-Ols-R-1 at 17:1-9*).

16-14. The downramp rate at the site where the severe mortality of aquatic organisms occurred was about 4.0 inches/hour. (*KTR-LKD-DT-BLM 16 at 4:14-22*). At a site further downstream where no mortalities of fish were observed, the ramp rate was 2.4 inches/hour, similar to BLM's proposed condition of a 2 inch/hour maximum downramp rate. (*Id.*).

16-15. Project peaking operations kill, through stranding, large numbers of young fish and aquatic invertebrates that are the primary prey food for trout. (*KTR-LKD-Ex. 17 at 4:3-133 (enormous prey losses from stranding); KTR-LKD-Ex. 3 at 4-5 (field study finds enormous prey loss from stranding); KTR-FAE-Ex. 31 at 8:19-20 (redbands feed primarily on invertebrates; invertebrate "drift" 5 to 6 times higher in Keno reach than in peaking reach); Aug. 21, 2006 Tr. at 153:18-21 (significant loss of fish prey is a Project effect); BLM-Denman-Ex. 0 at 2:19-22 (crayfish were food source for trout before peaking); BLM-Denman-Ex. 0 at 3:6-8 (numerous dead crayfish were seen in the peaking reach after peaking events)).*

c. Downstream Displacement

16-16. Flushing of juvenile salmonids downstream is likely in the peaking reach. (*BLM-Snedaker-Ex. 0 at 9:16-17; BLM-Hooton-Ex. 0B at 7:12-15; BLM-Snedaker-Ex. 8 at 19 (FERC Salt Caves Project EIS concludes that flows of 1500 cfs in the peaking reach "lead to fry and fingerling trout being flushed downstream"*)).

16-17. Few fry have been captured in the Oregon section of the peaking reach; the section of the peaking reach with the highest ramp rates. (*BLM-Snedaker-Ex. 5 at 52; PAC-Ols-D-20 at App. 3A at 20; KTR-LKD-Ex. 6 at 6-46*).

16-18. PacifiCorp's mark-recapture studies did not mark or recapture any fry in the Oregon peaking reach; the area of peaking reach where peaking effects would be most pronounced. (*PAC-Ols-D-1 App. 3A at 36-37*).

16-19. In the California peaking reach, nine ("9") of seventy-three ("73") fry were recaptured, indicating some ability to maintain their location during peaking events. (*PAC-Ols-D-1 App. 3A at 36-37*).

16-20. Very few salmonid fry or other fish species are observed in the margins of the peaking reach. (*BLM-Hooton-Ex. 0A at 11:7-10; BLM-Snedaker-Ex. 0 9:16-23; KTR-LKD-DT-BLM 16 at 3:16 to 4:8*).

d. Energetic Costs/Size

16-21. Flow fluctuations from peaking operations increase energetic demands on salmonids, decreasing energy available for overall health, growth, and reproduction. (*BLM-Simons-Ex. 19 at 16, 165*).

16-22. Peaking operations induce trout movement that would not be expected in a stable-flow regime. Holding territory, while flows increase, force trout to swim faster to stay in place. (*BLM-Simons-Ex. 0 at 5:8-6:7*). Fish move laterally with changes in flow. (*KTR-LKD-DT-BLM 16 at 7:13-17; KTR-LKD-Ex. 10 at 26*). During low flows fish will move towards the center of the channel and during high flows fish will move toward the edges of the channel. (*Id*.).

16-23. Larger fish operate closer to the energetic margin, so energetic costs of peaking would be expected to reveal themselves in larger fish. (*KTR-LKD-R-BLM 16 at 7:12-17*).

e. Macroinvertebrate

16-24. Peaking operations reduce the production of sessile organisms, like macroinvertebrates, by ten ("10") percent to twenty-five ("25") percent. (*BLM-Simons-Ex. 13 at 26*).

16-25. Macroinvertebrate drift rates, a measure of food availability for trout, in the non-peaking Keno reach were five to six times greater than in the peaking reach. (*BLM-Simons-Ex. 13 at 70*). Fluctuations in the peaking reach are undoubtedly a contributing factor to the lower macroinvertebrate drift rates. (*Id*.).

f. Keno vs. Peaking Reach

16-26. When comparing growth of trout in the non-peaking Keno reach to growth in the J.C. Boyle peaking reach, the following is observed: growth is greater for trout in the peaking reach through age two ("2"), similar growths are recorded between ages two ("2") and three ("3"), and growth is greater in the Keno reach after age three ("3"). (*BLM-Simons-Ex. 13 at 64*).

16-27. Average trout size has decrease since Project operations began. (*BLM-Hooton-Ex. 28*). For trout residing below J.C. Boyle Dam, the average length has decreased from about twelve inches (30 cm) in 1961, shortly after the J.C. Boyle facility was completed, to about seven inches (18 cm) in 1990. (*Id.*)).

16-28. The average condition factor for trout in the peaking reach is similar to that in the Keno Reach. (*PAC-Ols-D-1 at 12:12-14; PAC-Ols-R-1 at 13:4-7; PAC-Ols-R-5*).

16-29. While the average condition factor for trout may be similar, condition factors vary in the peaking reach and Keno Reach from season to season. (*PAC-Ols-D-6 at 4*).

16-30. Trout in the Keno reach are older than those in the peaking reach. (*PAC-Ols-D-12 at 3-4; PAC-Ols-D-5*).

16-31. Forage fish will provide a higher energy source than invertebrate drift for mature fish and allow for increased growth rates. (*BLM-Snedaker-Ex. 0 at 10:19-23, BLM-Simons-Ex.14 at 17, 53).*

16-32. The Project-caused impacts to forage fish in the peaking reach help explain the lower growth rates and absence of larger and older fish in the peaking reach, as compared to the Keno reach. (*BLM-Snedaker-Ex. 0 at 10:15-17, 11:8-13; KTR-LKD-DT-BLM 16 at 9:7-11*).

5. FINDINGS OF FACT CONCERNING BLM ISSUE 17

17-1. The existing upramp rate for the J.C. Boyle facility is nine inches per hour. (*BLM-Turaski-Ex. 4 at 67*).

17-2. The BLM has proposed an upramp rate of two inches per hour. (*BLM-Turaski-Ex. 4 at 59*).

17-3. Most rivers in the Pacific Northwest do not naturally experience a ramp rate in excess of two inches per hour, except during or immediately after events such as an intense storm or flood event. (*BLM-Snedaker-Ex. 0 at 7:13-15; BLM-Snedaker-Ex. 6 at 12-13; HVT-Steward Ex. 4 at 2:18-22; HVT-Steward Ex. 37 at 14-15 (showing that the "upramp" rate for the naturally flowing Williamson River in the Upper Klamath Basin rarely, if ever, exceeded two inches per hour over the three years of flow data reviewed*)).

17-4. Limiting ramp rates to no more than two inches per hour have been widely accepted as being protective of fish resources. (*BLM-Snedaker-Ex.10 at 48-49; BLM-Snedaker-Ex. 0 at 7:15-16*).

17-5. Daily peaking causes chronic increases in macroinvertebrate drift events. This in turn reduces the quality and abundance of drift forage for trout. (*BLM-Snedaker-Ex. 6:8-11; BLM-Simons-Ex. 13 at 26*).

17-6. Such drift events may increase fish feeding activity in the short term. Over the long term, however, this can result in a depletion of macroinvertebrates, resulting in lower fish productivity. (*BLM-Snedaker-Ex. 7 a t4-5*).

17-7. Macroinvertebrate sampling showed that upramping caused an increase in macroinvertebrate drift. (*BLM-Snedaker-Ex. 0 at 10:9-17; PAC-Ols-D-1 at 9:12-13*).

17-8. Species of dace, chubs, and suckers native to the Klamath River broadcast their eggs over the substrates where they remain until hatching. (*BLM-Snedaker-Ex. 0 at 11:1-5*). Eggs deposited in this fashion and weak swimming fry of these species are especially vulnerable to entrainment and transport by peaking flows. (*Id.*).

17-9. Impacts to native forage fish species (species on which trout prey) can impair growth and feeding of trout in the peaking reach. (*BLM-Snedaker-Ex. 0 at 11:8-13; KTR-LKD-DT-BLM 16 at 7:8-12 (the evidence indicates that forage fish production is impaired by the peaking operations, and this affects trout growth in the peaking reach)*)

6. FINDINGS OF FACT CONCERNING BLM ISSUE 19

a. Current Flow Regime

19-1. The current flow regime at the J.C. Boyle powerhouse has two components. (*PAC-Whit-D-1 at 4:23*).

19-2. First, there is a minimum base flow of 100 cfs from J.C. Boyle Reservoir into the J.C. Boyle bypass reach at all times, which combines with springs in the bypass reach to provide approximately 330 cfs where the J.C. Boyle powerhouse discharges water into the river at the start of the peaking reach. (*PAC-Whit-D-1 at 4:23-5:4; PAC-Carl-D-1 at 15:1-6)*.[11]

19-3. Second, remaining inflows to J.C. Boyle reservoir are stored and diverted to the J.C. Boyle powerhouse for electric generation unless they exceed Project capacity, in which case the excess is spilled over J.C. Boyle dam into the bypass reach. (*PAC-Whit-D-1 at 5:5-7; PAC-Carl-D-1 at 14:21-22*).

[11] PacifiCorp Proposed Finding of Fact 95 states that the total cfs from the bypass reach which discharges into the peaking reach is *approximately 330* cfs (100 cfs from J.C. Boyle Reservoir and 230 from springs in the bypass reach). BLM wholly disputes this proposed finding and states that the total discharge is *generally 320* (100 cfs from J.C. Boyle Reservoir and 220 from springs in the bypass reach). (*BLM Reply Brief at 15*). Inconsequential and/or picayune objections do not aid in moving this expedited process forward.

19-4. In wetter periods with higher reservoir inflows (usually from late winter through early summer), J.C. Boyle powerhouse is operated continuously, up to a two-turbine capacity of about 2,600 cfs. (*PAC-Whit-D-1 at 5:7-9; PAC-Carl-D-1 at 14:19-21*).

19-5. During drier times of the year, the powerhouse is operated in a daily "peaking" mode with alternate periods of storage and generation through a twenty-four-hour cycle. (*PAC-Whit-D-1 at 5:10-11*).

19-6. In typical peaking operations, peaking reach flows are about 330 cfs (all from the bypass) during the storage periods from early evening through early morning, and then ramp up to about 1,600 cfs (one turbine operating plus bypass flows) or 2,800 cfs (two turbines operating plus bypass flows) during the middle of the day. (*PAC-Whit-D-1 at 5:14-17*).

19-7. As active storage is used up, the project ramps back down to 330 cfs in the evening. (*PAC-Whit-D-1 at 5:17-18*).

b. BLM's Proposed Flows

19-8. The BLM condition is intended to provide an overall increased base flow and flows that are more reflective of seasonal events, including high and low flows. (*BLM-Turaski-Ex. 4 at 89*).

19-9. The BLM flow proposal would substantially alter the established flow regime. (*PAC-Whit-D-1 at 5:19).*

19-10. Under BLM's proposal, there would be a higher base flow in the bypass reach of either forty ("40") percent of the inflow to the J.C. Boyle reservoir, or a minimum of 470 cfs, whichever is greater. (*PAC-Whit-D-1 at 5:19-22; BLM-Turaski-Ex. 4 at A-16*).

19-11. Most of the time, the proposed base flows would provide a minimum flow of approximately 700 cfs in the peaking reach, about twice the current baseflow. (*PAC-Whit-D-1 at 5:22-6:1*).

19-12. The BLM proposal would provide a seasonal high flow event, for seven full days, between February 1 and April 15, when inflows first exceed 3,300 cfs, during which time power generation would be suspended to allow all inflows down the bypass reach (and on through the peaking reach) for one week. (*PAC-Whit-D-1 at 6:3-6; BLM-Turaski-Ex. 4 at A-16*).

19-13. During the period between May 1 and October 31, BLM Condition 4 would provide a single peaking event per week of 1,500 cfs to 3,000 cfs, with a priority set for Saturday, Sunday, and then Friday. (*PAC-Whit-D-1 at 6:7-8; BLM-Turaski-Ex. 4 at A-16*).

c. Whitewater Boating

19-14. Boating is a common recreation activity in the peaking reach. (*PAC-Whit-D-1 at 6:21 to 7:1*).

19-15. Whitewater boating takes place at the section of water between J.C. Boyle powerhouse and the California-Oregon border known as the peaking reach, which has been rafted commercially since 1979. (*PAC-Bald-D-1 at 3:1-3; PAC-Whit-D-1 at 7:7-10*).

19-16. Siskiyou County strongly opposes the proposed flow regime and believes it will induce severe and adverse affects on the county's commercial whitewater rafting business, which produces needed revenue for the county. (*Aug. 21, 2006 Tr. at 33:12–36:19*)[12]

19-17. Boaters in kayaks may be able to use the river with flows as low as 400 to 500 cfs, but acceptable "technical" trips begin about 700 cfs and transition into higher quality "standard trips" about 1,300 cfs to 1,500 cfs. (*PAC-Whit-D-1 at 11:14-18).*

19-18. Standard rafting opportunities are acceptable about 1,300 to 1,400 cfs, but they become optimal for commercial trips about 1,500 cfs. (*PAC-Whit-D-1 at 12:3-4; PAC-Bald-D-1 at 2:14-15*).

19-19. Big water boating is optimal from about 2,400 to 3,000 cfs. (*PAC-Whit-D-1 at 12:6-8*).

19-20. At flow levels above 3,500 cfs, the river starts to "flush" and it is up to the comfort of the individual outfitter or boater to take this on. (*PAC-Bald-D-1 at 2:18-19*).

19-21. Predictable daily flows during current peaking operations support a substantial commercial whitewater boating industry on the Upper Klamath River. (*PAC-Carl-D-1 at 15:22 to 16:1*).

[12] Siskiyou County also objects to the potential loss of peak power from Project facilities, should the proposed flows be allowed. (*Aug. 21, 2006 Tr. at 33:12–36:19*).

19-22. About 4,000 to 5,000 (of an estimated 12,000) recreation days per year are specifically associated with commercial rafting. "Recreation day" is defined as "one person visiting for any portion of a day." (*PAC-Whit-D-1 at 7:3-4*).

19-23. In 2004, there were 4,141 commercial rafting visits on the Upper Klamath between May and October with 2,712 visits, or sixty-six ("66") percent of the total visits, occurring in the months of July and August. (*PAC-Bald-D-1 at 4:5-8; BLM-Turaski-Ex. 4 at A-36; BLM-Turaski-Ex. 4 at 80, 89; BLM-Weidenbach-Ex. 0 at 5:6*).

19-24. The highest use days for whitewater boating are weekends (Friday-Sunday), with approximately sixty-five ("65") percent of commercial rafting visits occurring on the weekends (statistics are from rafting visits made between May and October 2004 on the Upper Klamath). (*BLM-Turaski-Ex. 4 at 80, 85*).

19-25. Even though the BLM conditions emphasize protecting the weekend boating opportunities, the conditions would substantially reduce the number of days when optimal whitewater boating (flows over 1,500 cfs) is available compared to existing conditions. (*BLM-Turaski-Ex. 4 at 59; BLM-Weidenbach-Ex. R0 at 3:23 to 4:2; Aug. 22, 2006 Tr. at 93:17-23; PAC-Whit-D-1 at 16:17-19*).

19-26. Given BLM's proposed flow regime, there will only be enough water through the system in very wet years to allow for boating during the week (excluding weekends), without peaking under the BLM flows. (*Aug. 22, 2006 Tr. at 84:25-85:15*).

19-27. Under the flows proposed by BLM, in an average year (such as 2000), the approximate decreases in raftable days would be as follow: total number of days would decrease forty-four ("44") percent (from 183 days to 102 days); the total number of weekend days would decrease eighteen ("18") percent (from 78 to 64); the total number of days in the July-August period would decrease seventy-one ("71") percent (from sixty-two ("62") to eighteen ("18")); and the total number of weekend days in July-August would decrease thirty-five ("35") (from twenty-six ("26") to eighteen ("18")). (*BLM Proposed Ultimate Finding of Fact - Issue 19*)

19-28. There may be a shift of some percentage of existing midweek use to weekend days. (*BLM-Turaski-Ex. 4 at 100; BLM-Weidenbach-Ex. 0 at 6:14-17*).

19-29. Under BLM's proposed flows, there would be limited opportunity for boating parties to spread out trips to avoid or mitigate potential crowding or congestion. (*BLM-Weidenbach-Ex. R0 at 2:2-5; Aug. 22, 2006 Tr. at 103:2-10*).

19-30. The BLM Flow Management Scenario (FMS) model provides estimates of available whitewater boating opportunities that would result from the BLM flow condition. (*BLM-Turaski-Ex. 0 at 2:15-18, 4:1-8*).

19-31. Model results-for both the FMS model and PacifiCorp's spreadsheet model-are approximations of what impacts might actually occur to whitewater boating opportunities. (*BLM-Turaski-Ex. 0 at 10:12-15; PAC-Carl-R-1 at 13:4-6; Aug. 21, 2006 Tr. at 181:5 to 182:4*).

19-32. BLM provided FMS model outputs for decreases in whitewater boating opportunities (raftable days) in an average, dry, and wet year for the 10-year period; the decreases were greater in a dry year and less in a wet year. (*PAC-Whit-R-3 (average year) (these are the values presented in the proposed ultimate finding of fact for Issue 19); BLM-Turaski-Ex. 5, Table 2 (presents values for average, dry, and wet years*)).

19-33. In the ten-year period used by the BLM for its FMS model, there were three average years, four wet years, and three dry years. (*BLM-Turaski-Ex. 11 (listing the entire 1960-2000 period of record, including the ten-year period of 1991 to 2000 used in the BLM FMS model); BLM-Turaski-Ex. 0 at 7:18-8:11 (explaining how the ten-year period is representative of the 1960-2000 period of record*)).

19-34. The FMS model does not explicitly consider mechanical or efficiency considerations when estimating rafting impacts. (*PAC-Smit-R-1 at 5:8 to 6:2; Aug. 22, 2006 Tr. at 88:12-16*).

19-35. The FMS model does not consider variables that affect the demand and need for generation at the Project, the value available at the J.C. Boyle project, or the variability inherent in electricity markets. (*Aug. 22, 2006 Tr. at 87:17 to 87:20*).

19-36. The FMS model does not consider whether transmission generation is available or the mechanical or physical limitations that can be imposed on generating facilities, and does not attempt to maintain reservoirs within current summer operating levels. (*Aug. 22, 2006 Tr. at 87:21-88:4*).

19-37. As a result of these limitations of the FMS model, the model likely overstates the number of days and hours rafting will be available. (*PAC-Smit-R-1 at 2:14-20; PAC-Carl-R-1 at 13:4-16*).

d. Fly-fishing

19-38. Trout fishing occurs in the J.C. Boyle bypass reach. (*PAC-Whit-D-1 at 8:1*).

19-39. Siskiyou County strongly opposes the proposed flow regime and believes it will induce severe and adverse affects on the county's fly-fishing tourism industry, which produces needed revenue for the county. (*Aug. 21, 2006 Tr. at 33:12–36:19*).

19-40. In the peaking reach, many fly-fishing anglers describe the experience as good or excellent. (*PAC-Carl-D-7 at 2-68; NGO-Ex. 5 at 10:11-19*).

19-41. The ability to wade is an integral component to fly-fishing. This includes not only the aesthetic experience of wading, but also the practical advantage of being able to better access places where fish my reside. (*Aug. 22, 2006 Tr. at 113:3-117:10*).

19-42. Optimal fly-fishing conditions, particularly for those who wade, generally occur at 330 cfs base flows. (*PAC-Whit-D-1 at 12:11-13*).

19-43. Lower flows are preferred by anglers because lower flows provide: (1) improved access to fishable water because of improved wadeability that allows river crossings, access to the middle of the channel, and more casting space for fly anglers; (2) more fishable water, with current velocities and depths appropriate to preferred tackle and techniques; (3) the ability to use lighter tackle, which decreases the possibility of snagging rocks or vegetation in the channel; (4) more concentrated fish in specific locations; and (5) better aesthetics and possibly improved fishing success due to a larger proportion of "clear water" from Boyle bypass springs rather than more turbid water from Upper Klamath Lake. (*PAC-Whit-D-1 at 12:18 to 13:3*).

19-44. Higher flows diminish the quality of this opportunity, which becomes sub-optimal at about 700 cfs and unacceptable at about 1,400 to 1,500 cfs. (*PAC-Whit-D-1 at 12:13-15; BLM-Denman-Ex. 0 at 4:9-10; PAC-Whit-R-1 at 2:1-4*).

19-45. Measured flows at a gage are not indicative of velocity conditions at all spots within the river. (*Aug. 22, 2006 Tr. at 114:23 to 115:8 (higher flows do not mean that wading is more difficult in all areas—some areas may be faster, some slower); Aug 22, 2006 Tr. at 133:15-23 (Knight cross) (noting fisherman's ability to find back water area to fish when measured flows were 1,500 cfs*)).

19-46. In an average year (2000), the existing regime provides at least three daylight hours of "preferred" fishing flows (330 to 699 cfs) for 109 days or about fifty-nine ("59") percent of the season from May through October, and fifty-two ("52") days or eighty-four ("84") percent of the season from June through August. (*PAC-Whit-R-1 at 3:7-13*).

19-47. In an average year (2000), the existing regime provides at least three hours of "preferred" fishing flows for forty-five ("45") of seventy-eight ("78") (about fifty-eight ("58") percent) of the "weekend" days (Friday, Saturday, or Sunday) from May to October. (*PAC-Whit-R-2*).

19-48. Under current operations, all day "high flow fishing" only occurs on twenty-six days or twenty ("20") percent of the May-October season. (*PAC-Whit-R-2*).

19-49. The BLM condition will make wading more difficult in the peaking reach. (*Aug. 22, 2006 2 at 120:3-20; BLM-Weidenbach-Ex. 2 at 93 (each higher flow increment may provide less wadeable area); PAC-Carl-D-7 at 2-93; NGO-Ex. 5 at 7:12-13*).

19-50. Under BLM's proposal, wading access (or fishability) at dawn and dusk will be more difficult at those locations where the flow velocity and depth will increase relative to current minimum flows. However, pools and other locations with good access will continue to exist under the proposed schedule. (*PAC-Carl-D-7 at 2-94; NGO Ex. 5 at 7:10-15; Aug. 22, 2006 Tr. at 121:1-122-16, 132:22-134:1*).

19-51. Based on experience with changed flow regulation on other rivers, it is reasonable to expect that anglers in the peaking reach will attempt to adjust their tackle and techniques to accommodate the proposed flows if implemented. (*PAC-Carl-D-7 at 2-97; id. at 2-63-64, 2-95; Aug. 22, 2006 Tr. at 130:19-21).* Thus success of any such mitigation attempts is no contained in the record.

19-52. Wading access, as set out in the "fishability" study conducted by PacifiCorp, is only one component of assessing flow needs for fishing opportunities. (*PAC-Whit-D-8 at 17, 30 (other components include fishing success or effects on the fishery); Aug. 21, 2006 Tr. at 230:18 to 231:14*).

19-53. Many anglers believe that geological concerns of the fish stock out weight their concern about maintaining water levels which are optimal for wading. (*BLM-Weidenbach-Ex. 2 at 98; PAC-Carl-D-7 at 2-98 (same); Aug. 21, 2006 Tr. at 231:18 to 233:4; Aug. 22, 2006 Tr. at 131:1-4*).

19-54. The proposed flows will increase the population of the redband trout fishery. (*See BLM Issue 16 Proposed Findings*).

DISCUSSION

A. USFWS/NMFS DISPUTED ISSUES OF MATERIAL FACT DISCUSSIONS

1. USFWS/NMFS ISSUE 2(A)

USFWS/NMFS Disputed Issues of Material Fact 2A asks whether stocks of anadromous fish suitable to conditions above Iron Gate Dam. PacifiCorp answers this question in the negative. According to PacifiCorp, the stocks of anadromous fish at issue in this proceeding do not possess the biological and behavioral traits suitable to the conditions above Iron Gate Dam. To support its position, PacifiCorp heavily relies on the KlamRas and EDT models to show that juvenile and adult fish survival rates associated with volitional passage would be minimal. While the information contained in the studies was informative, PacifiCorp's reliance on the Miller Radio-Telemetry study is misplaced.

The issue concerning suitability of stock for reintroduction above Iron Gate Dam is separate and distinct from the issue concerning survival rates associated with volitional passage. See *NMFS/FWS-Issue 2-Curtis Rebuttal at 2:18-23; Aug. 24, 2006 at 16:24-17:18*). The latter is not an issue before the judge.

a. The Miller Radio-Telemetry Study is Scientifically Unreliable.

While the Miller Radio-Telemetry study (*PAC-Mal-D-15*) was admitted into evidence, I find that it is not scientifically reliable. Accordingly, it will be accorded little, if any, weight. This study was based on a small sample of juvenile salmonids, it used hatchery fish which lack the predator avoidance skills of wild fish, and the authors

themselves admitted that fish passage success and travel time may be underestimated. (*Aug. 23, 2006 Tr. at 220:25-233:5; Aug. 24, 2006 Tr. at 53:2-55:2; PAC-Mal-D-15 at 15, 19, 27 and 31; NMFS/FWS-Issue 7-Simondet Rebuttal-Ex. 1 at 7:3-11; NMFS/FWS-Issue 2-Hamilton Rebuttal Ex. 1 at 2:18-3:7; NMFS/FWS-Issue 2-Hamilton Rebuttal Ex. 8*). Further the study: 1) lacked a control group; 2) was conducted during one-water year type and so it does not represent the normal range of flow conditions; 3) was conducted with highly variable peaking flows; and 4) produced widely varying results between 18 and 100 percent survival for different groups of salmonids in one reservoir. (*Id*.).

As the presiding judge in this case, I have an affirmative duty of ensuring that this decision is based on "relevant, reliable, and probative evidence." See 50 C.F.R. § 221.55(a) (1). The reliability requirement of 50 C.F.R. § 221.55(a) (1) adopts the "spirit" of Daubert v. Merrell Dow, 509 U.S. 579 (1993), as the standard to be used for determining the reliability of expert testimony in this administrative proceeding.

In Daubert, the Supreme Court held that Rule 702 of the Federal Rules of Evidence imposes upon the trial court a gatekeeper obligation in order to "ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." Daubert, 509 U.S. 579. The judge's gate keeping function was later extended to apply to all expert testimony. Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137 (1999). Daubert and its progeny interpret the Federal Rules of Evidence. Although the Federal Rules of Evidence do not apply in these proceeding, they do serve as guidance. 50 C.F.R. at § 221.55(a) (4). As the 7th Circuit noted in Niam v. Ashcroft, "'Junk science' has no more place in administrative proceedings than in judicial ones." 354 F.3d 652, 660 (7th Cir. 2004). Although the Daubert factors could be used in this case to excluded Mr. Malone's

testimony and the related exhibits concerning the Miller Radio-Telemetry study because it is unreliable, Lobster v. Evans, 346 F. Supp. 2d. 340, 344-45 (D. Mass. 2004), my practice has been to err on the side of admissibility. United States Steel Mining Co., Inc. v. United States Department of Labor, 187 F.3d 384, 388-389 (4th Cir. 1999).; Consolidation Coal Co. v. Office of Workers' Comp. Programs, 294 F.3d 885, 893-94 (7th Cir. 2002).

Because the Miller Radio-Telemetry study is not scientifically reliable, it does not offer viable support for PacifiCorp's position.

b. The Evidence Shows that There are Stocks of Anadromous Fish Suitable to the Conditions above Iron Gate Dam.

PacifiCorp failed to prove that there are no stocks of anadromous fish suitable to the conditions above Iron Gate Dam. The record shows that historically, anadromous fish, including wild Chinook salmon, Coho salmon, and steelhead trout migrated above the present site of Iron Gate Dam. (*FOF 2A-3, - 2A-6*). The record shows that construction of dams has necessarily changed the migratory behavior of anadromous fish in the Klamath River System, permanently blocking upstream migration and limiting those fish to habitat below the dam. (*FOF 2A-8*). It is undisputed that, today, wild Chinook salmon, Coho salmon, and steelhead trout only migrate to the base of Iron Gate Dam, using nearby tributary and main stem habitat to spawn. (*FOF 2A-11*). If access was provided through a properly designed, operated, and maintained fishways, anadromous fish would migrate past Iron Gate Dam into the upper Klamath River basin. (*FOF 2A-12*). The evidence further shows that because of its genetic similarity to those

populations that existed in the upper Klamath basin prior to the construction of the dams, the stocks of anadromous fish (especially fall-run Chinook salmon and steelhead trout) at the base of Iron Gate Dam are suitable candidates to the conditions above that dam. (*FOF 2A-22, 2A-25 through 2A-30, 2A-42 through 2A-47*).

PacifiCorp argues that to be suitable for reintroduction and for anadromous fish to persist and thrive, the selected anadromous fish stocks' spawning, rearing and life cycle window must fit the spatial, temporal and environmental conditions present in the Project above Iron Gate Dam. PacifiCorp's argument fails to give any weight to the fact that anadromous salmonids are highly adaptable to changing conditions and will migrate to and colonize unused habitat. (*FOF 2A-23, 2A-24, 2A-28 and 2A-29, 2A-44, 6-3*). The ability to adapt to a wide array of environmental conditions and colonize unused habitat or recolonize historical habitat are just a few life history strategies that have allowed the species to survive for millions of years in sub-optimal conditions. (*FOF 2A-15, 2A-35, 2A-36, 2A-37*). The fact that the anadromous fish adapted to life below the dams following construction of the dams is strong evidence of their capabilities. (*Id*). The fact that anadromous fish in other streams and river systems have successfully colonized new habitat or recolonize historic habitat lends further support that the wild anadromous fish in the Klamath River could and would do the same. (*FOF 2A-8 and 2A-11*).

Pacific lamprey is the only stock for which there is no clear evidence regarding its historical presence above Iron Gate Dam. (*FOF 2A-7*). PacifiCorp has proven, by a preponderance of the evidence, that historical observance of Pacific lamprey above Iron Gate Dam was most likely a misidentification because of the lack of genetic analysis at the time and the similarities between Pacific lamprey and resident lamprey. (*Aug. 24,*

2006 Tr. at 121:17-122:2, 124:2-8; 125:13-19, 252:2-255:19; NMFS/FWS-Issue 3–Snedaker-Ex. 14 at 21-23; NMFS/FWS-Issue 8-Hamilton Ex. 6 at 17 (recognizing that it is difficult to distinguish anadromous Pacific lamprey from resident taxa). Therefore, the evidence concerning the historical presence of Pacific lamprey above Iron Gate Dam is inconclusive.

2. *USFWS/NMFS ISSUE 2(B) Discussion*

In response to USFWS/NMFS Issue 2(B), PacifiCorp argues that facilitating movements of anadromous fish via prescribed fishways will provide increase risk of disease exposure of resident fish inhabiting the basin above Iron Gate Dam to pathogens, such as *C. Shasta* and *IHN*. This argument is rejected. The weight of the evidence shows that many pathogens are already present in the upper and lower Klamath Basin. Thus, establishing fish passage will not increase the risk of disease. (*FOF 2B-2, 2B-10, 2B-11, 2B-17, and 2B-22*). *C. Shasta and P. minibicornis* exist throughout the Klamath River System in both the upper and lower basins, so migration of wild anadromous fish upstream from below Iron Gate Dam would not increase the risk of introducing pathogens to resident trout residing above Iron Gate Dam (*FOF 2B-11, 2B-17 and 2B-22*). This is especially true given the fact that trout are resistant to *C. Shasta* and with respect to the remaining known pathogens, except *F. columnaris* and *Ich*, they do not impact non-salmonids. (*FOF 2B-20*).

As for *IHN*, there is insufficient evidence to determine whether that virus exists in either the lower or upper basin of the Klamath River. (*FOF 2B-4*). The record evidence shows that there has only been a single detection of *IHN* documented in the lower basin

in 1997, and since then there has been no further detection. (*FOF 2B-3*). The virus was detected in one adult Chinook salmon returning to Iron Gate Hatchery. (*Id*). Based on the Chinook salmon population size existing in the lower basin, I do not find a single detection nearly ten years ago in a fish suspected to be a "hatchery fish" to be significant or cause for alarm. Moreover, to date, there has been no work or surveys completed concerning the actual occurrence of *IHN* in the upper basin. (*FOF 2B-6).* Therefore, any suggestion that *IHN* exists in either the lower or upper Klamath Basin would be mere speculation.

Furthermore, there is insufficient evidence to determine whether *R. salmoniranrum* exists in the upper Klamath Basin. Like *IHN*, no research or studies have been performed to detect the occurrence of *R. salmoniranrum*. (*FOF 2B-7*). Consequently, PacifiCorp failed to prove that facilitating the movement of anadromous fish would present a high risk of introducing pathogens to resident fish inhabiting the basin above Iron Gate Dam.

3. USFWS/NMFS ISSUE 2(C) Discussion

USFWS/NMFS Issue 2(C) asks to what extent facilitating the movement of steelhead above Iron Gate Dam via prescribed fishways presents a risk of residualizing, and whether residualization would adversely effects to the resident trout fishery resource. The experts are in agreement that residualization is characteristic of hatchery fish, and is quite rare in wild anadromous steelhead trout. (*FOF 2C-8*). During the hearing, PacifiCorp's sole witness on USFWS/FWS Issue 2(c) conceded that the residualization of steelhead is not really an issue of concern. (*PAC-Ols-R-1*). The issue of concern to

PacifiCorp and Siskiyou County is the genetic effects on the resident trout. (*Id*). It is undisputed that resident trout have the genetic capacity to adopt anadromy and outmigrate to the ocean, where passage exists. (*FOF 2C-7*). However, there exist no scientific studies demonstrating that reintroduction of anadromous steelhead trout would detrimentally affect the genetic make up of the resident trout fishery. (*FOF 2C-10*). The undisputed evidence shows that residualization is largely dependent on environmental conditions. (*Id*).

Historically, anadromous steelhead trout extended up to and used tributaries of upper Klamath Lake. (*FOF 2A-3, 2A-5, and 2C-2*). The close similarities between anadromous steelhead trout and resident trout, together with the distribution and resistance of the resident trout to *C. Shasta* provides strong evidence that the two species likely co-existed prior to the construction of the dams. (*FOF 2C-2*). While the competitive interactions between the steelhead and resident trout in the Klamath basin is unknown, there are many examples from nearby river systems in the Pacific Northwest that show wild anadromous steelhead and resident rainbow/redband trout can co-exist and maintain abundant populations without adverse consequences. (*FOF 2C-10 and 2C-11*). To minimize the risk of residualization by resident trout adaptive management may be utilized. (*FOF 2C-12*).

4. USFWS/NMFS ISSUE 3 Discussion

In response to USFWS/NMFS Issue 3, PacifiCorp argues that current project operations do not adversely affect the resident trout fishery resource in the absence of passage. Indeed, PacifiCorp has proved that the redband fishery is excellent and robust,

as indicated by angling success in the J.C. Boyle bypass and peaking reaches. While this is true, the evidence also shows that the Project confines the population between the Project's dams and associated reservoirs. (*FOF 3-8*). Resident trout are not able to utilize their full range of life history strategies and spawning productivity and genetic diversity of the stock is impaired. (*FOF 3-13. through 3-16*). Further, unscreened flows through Project turbines result in mortality of juvenile and adult trout migrating downstream. Therefore, the record evidence demonstrates that the resident trout fishery is adversely affected by current Project operations.

5. USFWS/NMFS ISSUE 4 Discussion

USFWS/NMFS Issue 4 asks whether entrainment at Project facilities is adversely affecting resident fishery resources. There is no dispute that entrainment is occurring at J.C. Boyle, Copco, and Iron Gate Dams. (FOF 4-2). In its literature based review, PacifiCorp admits that tens of thousands of resident fish are being entrained on an annual basis at each Project. (FOF 4-2). The facts show that non-native species are entrained to a greater extent than non-native species. (*FOF 4-13*). This is primarily because of the relative abundance of non-native versus native species. Id. The Federal Agencies appear to be most concerned with the impact entrainment is having on two species of fish, sucker fish and resident rainbow trout.

Precise estimates on the number of fish entrained are unavailable. However, records from canal salvage operations at the J.C. Boyle power canal show that some resident fish, in particular resident trout and sucker fish, are entrained and possibly killed in the power canal each year. (*NMFS/FWS-Issue 4-Hooton-Ex. 1, at 5:6-17;*

NMFS/FWS-Issue 4-Hooton-Ex. 15; NMFS/FWS-Issue 4-Hamilton-Ex. 1, at 5:17-19 and 6:3-5; NMFS/FWS-Issue 4-Hamilton-Ex. 14, at 1; Aug. 23, 2006 Tr. at 212:25-213:21; Appendix to Reply Brief of PacifiCorp and Siskiyou County, at 38). Salvage records show the entrainment of over 690 trout into the J.C. Boyle reach during salvage operations between 1995 and 2002, whereas only 2 sucker fish were entrained during the same period of time. (*FOF 4-17*). In 2003, J.C. Boyle fish salvage totaled 86 trout and 17 suckers. (*NMFS/FWS-Issue 4-Hamilton-Ex. 14, at 1; NMFS/FWS-Issue 4-Hooton-Ex. 15 at 2-3*). Of the two species, sucker fish are less prone to entrainment because they are bottom dwellers making it less likely for them to pass through the shallow intakes at Copco and Iron Gate Dams. (*FOF 4-19*). Therefore, it is reasonable to conclude that the adverse effect of entrainment for sucker fish would be minimal.

The Federal Fisheries Services rely on the "Link River Hydroelectric Project, Final Entrainment Study Report" (*NMFS/FWS-Issue 4-Hamilton-10*) to rebut PacifiCorp's evidence that entrainment is not adversely affecting sucker fish. The Link River Dam and Westside/Eastside are not in the proposed Project area. They are currently proposed for decommissioning. Therefore, reliance on this study is misplaced since they are not necessarily comparable.

Moreover, a review of the canal salvage data demonstrates that there is a significantly higher rate of sucker fish entrainment at the Link River and Eastside/Westside facilities than at the J.C. Boyle facility. (*NMFS/FWS-Issue 4- Hooton-Ex. 15, at 2-4 (Fish Salvage Data Table*)). Of the 785 sucker fish recovered during entrainment salvage operations in 1995 through 2002, it appears that only 2 were entrained at the J.C. Boyle facility. (*Id.*). The number of entrained sucker fish recovered

during salvage operations at the J.C. Boyle in 2003 increased to 17. This increase might be a result of the ineffectiveness of the fish screens. But given the low numbers, it is difficult to conclude that entrainment is adversely affecting sucker fish. This is especially true given the fact that the record shows that sucker fish are bottom dwellers that are less prone to entrainment through shallow intakes, such as those found at Copco and Iron Gate Dams. The non-larval sucker fish residing in those two reservoirs appear to be too large to pass through the existing trash racks at the powerhouse intakes. (*FOF 4-20*). If there is an adverse affect from the low number of sucker fish being entrained, it is minimal.

The same is not true for resident trout. The record shows that Spencer Creek located upriver of the J.C. Boyle facility has historically been a primary spawning and early rearing habitat for trout. (*FOF 4-22 and 4-23*). The construction of J.C. Boyle has adversely affected the migratory behavior of the resident trout. Currently, the peaking reach life history appears to be gone and the bypass reach life history has been reduced to less than 10% of historical abundance and is composed of significantly smaller trout. (*FOF 4-22*). Thus, the rainbow trout are not experiencing their full range of life history. Losses of juveniles through entrainment at the Project could, in the long run, adversely affect trout abundance and distribution. (*NMFS/FWS-Issue-4-Hooton Ex. 1 at 6:9-13; NMFS/FWS-Issue 4-Hamilton-Ex. 1 at 4:16-16 and 7:3-4; NMFS/FWS-Issue 4-Hamilton-Ex. 17 at 4; HVT-Steward-Ex. 39 at 1:17-22*). Therefore, PacifiCorp's argument that entrainment is not adversely affecting resident trout must be rejected.

6. USFWS/NMFS ISSUE 6 Discussion

USFWS/NMFS Issue 6 asks whether 58 miles of habitat suitable for use by anadromous fish exists within the Project reach. PacifiCorp answers this question in the negative, and in actuality, it is difficult to ascertain exactly how much suitable habitat exists within the Project reach. Since the determination of what constitutes "suitable habitat" is within the realm of agency expertise, the Federal Fisheries Services definition of suitable habitat is hereby adopted. Under that definition, habitat is deemed "suitable" if it can be used successfully at least some of the time by one or more life stages of a Coho salmon. (*FOF 6-2*).

Based upon this definition, it is clear that a significant amount of habitat that is suitable for anadromous fish exists above Iron Gate Dam. Those habitat areas include: 1) The main stem (containing approximately 28 miles of suitable habit), which PacifiCorp admits is suitable for anadromous fish; 2) perennial tributaries (containing approximately 12 miles of suitable habitat) and intermittent streams (containing approximately 18 miles of suitable habitat). (*FOF 6-9 through 6-14*).

While connectivity is a problem, the record evidence shows that anadromous fish will not be precluded from using the areas identified as suitable habitat. (*FOF 6-8*). Moreover, the fact that much of the habitat deemed suitable for anadromous fish are currently being used by resident fish strongly suggests that anadromous fish would utilize the habitat if access is provided. (*FOF 6-7*). Accordingly, PacifiCorp's argument that the riverine and tributary habitat with the Project area is not suitable for production of anadromous fish must be rejected.

7. USFWS/NMFS ISSUE 7 Discussion

In response to USFWS/NMFS Issue 7, PacifiCorp argues that providing access to habitat within the Project would not benefit Coho salmon but instead would harm the overall health of the Klamath Coho salmon population. PacifiCorp's argument rests on two grounds: first, that the Coho salmon habitat above Iron Gate Dam is "limited and marginal"; and second, that mortality risks of out-migrating smolts in the reservoir are great because of the high water temperatures and predation that providing access would be counterproductive. Both arguments must be rejected.

a. There is Significant Suitable Habitat above Iron Gate Dam for Coho Salmon.

As explained in the discussion addressing USFWS/NMFS Issue 6, there is significant suitable habitat for anadromous fish (including Coho salmon) above Iron Gate Dam. Suitable habitat above Iron Gate Dam includes Spencer, Fall, Beaver, Deer, Shovel, Scotch, and Jenny Creeks. The main stem also has suitable habitat (which is a fact recognized by PacifiCorp). (*FOF 7-9; see also PAC Ols-D-1, at 38:11; NGO Ex. 27,*

at 3:6-10). Much of this habitat is currently being used by resident rainbow/redband trout that have similar habitat requirements to those of Coho salmon. (*FOF 6-5*). Said resident rainbow/redband trout are a self-sustaining population above Iron Gate Dam, and the evidence suggests that similar results could occur for the Coho salmon population. (*FOF 6-6*). As such, PacifiCorp's argument that the habitat above Iron Gate Dam is limited and marginal for Coho salmon is not persuasive.

b. Habitat above and below Iron Gate Dam are Equally Degraded.

PacifiCorp's argument that the high water temperatures and predation above Iron Gate Dam is so severe that providing access above Iron Gate Dam would be counterproductive is not supported by the evidence. The record evidence shows that the runs of Coho salmon have greatly diminished in the Klamath River to the extent that the species is listed as threatened under the Endangered Species Act. (*FOF 7-2 through 7-4*). Habitat degradation has been recognized as the primary cause for the decline of Coho salmon. (*FOF 7-5*). Historically, Coho salmon spawned in abundance at Fall Creek, and some evidence suggests that the upstream distribution extended as far as Spencer Creek. (*FOF 2A-6*). However, the construction of the Project dams has prevented Coho salmon from accessing its historic spawning grounds above the present site of Iron Gate Dam. (*FOF 2A-8 and 2A-11*). Coho salmon continue to use the habitat below Iron Gate Dam even though it has suffered degradation commensurate with that above the dam. (*FOF 7-6*). While water temperature above Iron Gate Dam is a problem for juvenile Coho salmon, the record evidence shows that water temperature will not preclude Coho salmon from successfully utilizing habitat within the Project area. (*FOF 7-11 and 7-12*). As a

matter of fact, it is well documented that Coho salmon have been known to occupy waters below Iron Gate Dam where temperatures exceed 20° C. (*Id*).

Further, the evidence shows that adult Coho salmon enter the river to spawn in late September and reach peak migration strength between late October and mid-November when the water temperatures above Iron Gate Dam is low. (*FOF 7-10*). On the other hand, juvenile Coho salmon begin outmigrating to the ocean in late February, and continue migration through early July. (*FOF 7-11*). For a significant amount of the outmigration period, water temperatures are low. Therefore, contrary to PacifiCorp's argument, water temperature should not significantly affect adult or juvenile Coho salmon. Further, with respect to predation, that can be minimized through use of remedial measures. (*FOF 7-13*).

c. Providing access above Iron Gate Dam will Benefit Coho Salmon.

Last, the record shows that restoring access to historical habitat above Iron Gate Dam will improve the viability of the Coho salmon population by: a) extending the range and distribution of the species thereby increasing the Coho salmon's reproductive potential; b) increasing genetic diversity in the Coho stocks; c) reducing the species vulnerability to the impacts of degradation; and d) increasing the abundance of the Coho population. (*FOF 7-16*). As such, PacifiCorp's arguments must fail.

8. USFWS/NMFS ISSUE 8 Discussion

USFWS/NMFS Issue 8 asks whether access to habitat within the Project would benefit Pacific Lamprey. PacifiCorp answers this question in the negative and focuses much of its argument on the fact that lamprey-friendly ladders are unavailable.

The issue concerning habitat benefit and whether lamprey-friendly ladders exist are two separate and distinct questions. The latter, is not an issue in this proceeding. While the evidence concerning the upstream distribution of Pacific lamprey above Iron Gate Dam is inconclusive, the evidence shows that those species would indeed benefit from access to habitat within the Project reach. (*FOF 2A-7, 8-3, and 8-9*). Essentially, Pacific lamprey would be gaining additional habitat for spawning and rearing. Therefore, PacifiCorp failed to show that Pacific lamprey would not benefit from access within the Project reaches.

B. **BLM DISPUTED ISSUES OF MATERIAL FACT**

1. BLM ISSUE 10 and 11 Discussion

BLM Issues 10 and 11 are closely related – has the Project adversely affected riparian habitat and riparian-focal species in the two J.C. Boyle reaches (Issues 11) and would the proposed BLM seasonal high flows improve those resources (Issue 10).[13] The evidence shows that Project operations have negatively affected riparian habitat and the proposed BLM high flows will help improve riparian habitat. However, the evidence

[13] Many of the findings of facts associated with Issue 10 and 11 apply to both issues. Therefore, each is cross-referenced and incorporated therein.

does not show that riparian-focal species have been negatively affected by Project resources or that the proposed seasonal high flows will assist riparian-focal bird species.

The Project has greatly affected and continues to affect the Project reaches. One of the Project's largest impacts involves effects to sediment supply. (*FOF 11-1, 11-3*). On average, 6,124 tons of channel bedload is blocked each year at the J.C. Boyle dam. (*FOF 11-2*). By limiting sediment supply, the bed material in the reaches has coarsened and active features (e.g., point bars, islands) are made up of less fine sediment. (*FOF 11-3; 11-9*). Negative impacts can occur from such limited sediment supply. For example, desirable riparian plants use freshly deposited sediment to germinate and a lack of sediment adversely affects fish habitat. (*FOF 10-5, 11-10, 14-4*). A gravel augmentation program has been developed which will offset some of the negative effects of the bedload blockage.[14] Therefore, an important question to ask is whether the gravel augmentation program together with the current flow regime can improve the channel conditions, and whether BLM's proposed seasonal high flow would provide additional benefit.

PacifiCorp argues that the results of a study it sponsored indicate current flows effectively mobilize some coarse bed sediment.[15] However, BLM high flows, as compared to current operations, will mobilize and transport sediment more frequently within the Project. (*FOF 10-4*). Higher flows will allow for a wider range of sediment

[14] PacifiCorp entered into a stipulation with BLM to clarify the composition of the sediment to be used and the intent of the BLM gravel augmentation plan. (*See Order Granting PacifiCorp's Motion to Withdraw Disputed Issue of Material Fact 12 (issued Aug. 2, 2006*)).

[15] This study contained several biases. The tracer particles used in the study at the bypass reach were placed in the steepest section of the river and were limited to the center of the channel. Both of these actions bias the study toward a finding that a given flow can greatly mobilize particles. (*Aug. 21, 2006 Tr. 1 at 56:10-58:14*).

deposits and allow sediment to be deposited higher on the channel margin. (*FOF 10-5*). Both of which can serve as an ecological benefit. (*Id.*)

Current low flows not only affect the ability to mobilize coarse bed sediment, low flows also increase the prevalence of reed canary grass. (*FOF 11-7, 11-8*). Reed canary grass is a non-native invasive riparian plant. (*FOF 10-7; 11-12*). Moreover, it is not used by riparian-focal bird species for nesting. (*FOF 10-11*). Finally, reed canary grass can adversely affect the abundance and quality of fish habitat and out-compete woody riparian vegetation. (*FOF 11-7, 11-8*). High and medium flows can scour (uproot and dislodge) reed canary grass. (*FOF 11-6*). The current low base flows result in a diminished scouring effect on the reed canary grass. (*FOF 11-6, 11-7, 11-8*). Increasing flows would allow for an increased scouring effect. (*Id.*). Low flows also allow reed canary grass to encroach into the channel in places that have been exposed by Project-diverted flows. (*FOF 10-6*). Project operations result in more riparian vegetation; however, this increase is attributed mainly to the encroachment of reed canary grass. (*FOF 11-13*). Approximately two-thirds of the riparian habitat in the J.C. Boyle bypass reach is currently riparian grassland, which is predominately reed canary grass. (*FOF 10-8*).

While the proposed high flows will effectively scour and limit channel encroachment of reed canary grass, evidence fails to show that riparian-focal bird species habitat will be improved or that Project operations have adversely affected such habitat. Eight species of riparian-focal birds exist within the Project. (*FOF 10-11*). These birds prefer structurally diverse habitat and primarily nest in woody riparian vegetation. (*FOF 10-12; 10-13*). An increase in woody riparian vegetation would likely result in an

increase of riparian-focal bird species. (*FOF 10-14, 10-15*). Seasonal high flows, in combination with the BLM's proposed gravel augmentation program, will likely create a more dynamic channel with a wider range of sediment deposit, therefore increasing ecological benefits. (*FOF 10-5*). However, woody riparian vegetation (the key habitat for riparian-focal bird species) will not increase under BLM's proposed flows.[16] Without an increase in woody riparian vegetation, an increase in riparian-focal birds species is not likely. Furthermore, while low flows allow for the encroachment of reed canary grass, higher flows have a tendency to scour woody riparian vegetation. (*NGO Ex. 1 at 10:5-8*). Because pre-project flows would have likely scoured any woody riparian vegetation where reed canary grass is currently located, it is not likely that the Project has decreased the potential establishment of woody riparian habitat.

PacifiCorp has established that the extent of any improvement on ripariam-focal bird species is indeterminate since an increase of woody riparian vegetation is not expected.

2. <u>BLM ISSUE 14 Discussion</u>

BLM Condition 4.A.1(c) will provide a net positive effect on redband trout spawning. Specifically, the proposed flows will assist in the distribution of gravel used for spawning, will clean established spawning beds, and will assist in migratory

[16] BLM believes that larger floods will decrease reed canary grass and allow the woody riparian community to have a relative competitive advantage. (*BLM PFF 10.4*). BLM's only cite for this proposition is Dr. Trush's testimony at NGO Ex. 1. While this testimony does state that the proposed flows will "benefit native birds," it clearly states that, "[t]he River Corridor Management Condition will change the baseline conditions of the riparian resources in the bypassed reach. **It will support less, rather than more, woody riparian vegetation than today**." (*NGO Ex. 1., at 17:11-13 (bold added)*).

movement of trout. (*FOF 14-1 to 14-8, 14-17 to 14-21*). Negative effects include a loss of spawning habitat below the emergency spillway and the possible scouring of trout eggs. (*FOF 14-14, 14-15, 14-24, 14-25*). PacifiCorp has not met its burden to show that the negative effects outweigh positive effects.

The J.C. Boyle bypass reach channel bed consists mainly of course material not suitable for trout spawning. (*FOF 14-1*). On average, 6,124 tons of channel bedload is blocked a year at the J.C. Boyle Dam. (*FOF 11-1*). This blockage is the primary factor in the coarsening of the channel. (*FOF 14-2*). A gravel management plan has been introduced that would place sediment in the Klamath River below the J.C. Boyle Dam. (*FOF 14-3*). For this plan to be effective, the gravel needs to be deposited downstream where it can create spawning pockets. (*FOF 14-4*). The implantation of seasonal high flows would assist in the deposition of this gravel.[17] (*Id*.).

Fine sediment buildup on spawning gravel reduces the successful emergence of fry. (*FOF 14-5, 14-6*). An annual flushing flow can clean fine sediments from the spawning beds, thus improve the quality of habitat. (*FOF 14-8*). Since fine sediment buildup has been observed on the limited spawning habitat in the bypass reach, an annual flushing flow would assist in developing a quality habitat. (*FOF 14-7)*. PacifiCorp classifies the J.C. Boyle bypass reach as a "transport" reach and believes fine sediment buildup will not occur on spawning grounds.[18] (*PC Reply Brief Appendix at 19*).

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[17] Current flows would mobilize augmented gravel to an extent. However, BLM high flows, as compared to current operations, will mobilize and transport sediment more frequently and to a greater extent within the Project. (*FOF 10-4*).

[18] PacifiCorp defines "transport reach" as "the capacity of the channel to transport sediments is significantly higher than the supply of sediment to the channel." (*PC PFF 40*).

However, the observance of fine sediment buildup on the spawning habitat in the bypass shows that a buildup can occur, even in a "transport" reach.[19]

Historically, trout in the Klamath River downstream of the J.C. Boyle Dam migrated upstream to spawn and juvenile trout migrated downstream to rearing areas. (*FOF 14-18, 14-19*). Heavy spring and fall river flows signal to spawning trout and juvenile trout to begin their migrations. (*Id*.). Such migrations have diminished after the installation of the J.C. Boyle Dam and reduction in river flows. (*FOF 14-16, 14-20, 14-21*). The BLM seasonal high flows will better reflect the natural flood flows and improve fish migration. (*FOF 14-17*). PacifiCorp believes the presence of spawning trout, in the bypass reach, show that current flows provide favorable spawning conditions. (*PC PFF 48*). However, the only area where trout spawning is observed is directly downstream of the emergency canal spillway. (*FOF 14-21*). This very limited spawning, in a very unnatural environment, does not demonstrate that the current flow regime provides favorable conditions.

PacifiCorp correctly states that the BLM flows will adversely impact the spawning redds just downstream of the existing J.C. Boyle emergency canal spillway. (*PC PFF 45*). BLM counters this argument by showing that the current location is unstable and seasonal high flows could mobilize the sediment accumulated in the emergency spillway and distribute the sediment to a more stable location. (*FOF 14-22,*

[19] It is noted that the only spawning habitat in the bypass is found downstream of the emergency spillway and the emergency spillway significantly increases the rate of fine and coarse sediment in the area. (*FOF 14-21, 14-22).* It may be argued that this is the only reason fine sediment buildup has occurred on the spawning gravel. However, with the introduction of additional sediment by means of the gravel

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14-23). However unstable the current location is, the proposed flows would still disrupt the only spawning grounds in hope that more productive grounds would develop. These arguments are rendered basically irrelevant when another factor is considered. PacifiCorp has proposed to install bypass valves at the J.C. Boyle powerhouse. (*FOF 14-26*). This means the emergency spillway will no longer be used and the unnatural sediment loads in the area will not be replenished. (*Id.*). Since this unnatural habitat will no longer be self-sustaining, any detrimental results of the seasonal high flows will not be relevant.

Another negative factor to consider is the possible scouring effect high flows will have on spawning trout and their fry. The spawning period for trout between the Copco 1 Reservoir and J.C. Boyle Dam takes place between February and May, with the majority of spawning taking place between March 15 and April 15. (*FOF 14-11*). BLM's proposed flushing flows, which last for seven days, would always occur during the spawning season. (*FOF 14-13, 14-14*). The high flows would be implemented between March 15 and April 15 in fourteen percent of the years. (*FOF 14-12*). Flushing flows scheduled during spawning may scour eggs and result in less successful spawning. (*FOF 14-15*). Ideally, flushing flows should occur just prior to spawning. (*Id.*). While spawning trout will hold during high flows and resume spawning once flows have dropped, this does not discount the negative effects the high flows will have on already established egg nests. (*FOF 14-13*).

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management plan, the entire bypass reach will be inundated with an increased supply of fine and coarse sediment – resulting in an increased need to have annual flushing flows.

The proposed seasonal high flows will result in the scouring of some trout eggs. Such effects will be felt most severely during the fourteen percent of the years when the high flows occur during peak spawning times. However, the median start date for the seasonal high flows is February 18, which corresponds close to the beginning of the spawning season. (*FOF 14-9, 14-11*). Since fewer egg nests will have been established at the beginning of the spawning season, the effects of the high flows will be less intrusive than if the flows were to commence near the end of the twenty-two week spawning season. It has been shown that the proposed seasonal high flows will assist in the creation of fish spawning grounds, will clean established spawning beds, and will improve migratory movement of trout. The creation of new and healthier spawning grounds will offset the loss of some eggs to scouring. PacifiCorp has not met is burden to show, by a preponderance of the evidence, that the negative effects of scouring is greater than the positive effects created by the seasonal high flows.

3. BLM ISSUE 16 and 17

The evidence in the record establishes that current operations have adversely affected the redband trout fishery resource. First, the J.C. Boyle Dam traps sediment necessary for spawning habitat. Second, the existing flow regime has increased the embedment of fine sediment in spawning gravel, impairs spawning migrations, and

causes low flows, which contribute to the lack of successful spawning.[20] Third, the peaking operations cause stranding of aquatic organisms, results in downstream displacement of juvenile fish, increases the energetic demands placed upon adult trout, and lowers the production of macroinvertebrate prey. The proposed River Corridor Management Condition would address these negative impacts.

The Project's artificial low flow regime contributes to the lack of available spawning gravel in the J.C. Boyle peaking and bypass reaches. (*FOF 16-3 to 16-6*). Prior to the J.C. Boyle Dam, trout were observed spawning in the peaking reach. (*FOF 16-2*). Currently, trout do not spawn in the peaking reach and only limited spawning has been observed in the bypass reach. (*FOF 14-21; 16-1*). While sediment blockage at the J.C. Boyle Dam has contributed to lack of suitable spawning gravel in both reaches, low flows reduce access to spawning gravel that remains. Spawning gravel has been observed along channel margins and on depositional features in the peaking and bypass reach. (*FOF 16-3 to 16-6*). However, when low flows occur, portions of this margin-habitat are no longer inundated with water, making the spawning gravel unusable. (*Id*.). The proposed conditions would substantially alter the current flows by providing an overall increase in base flows. (*FOF 19-8 to 19-10*). Higher base flows allow for greater inundation of habitat suitable for spawning.

[20] Issue 14 addresses the negative effects associated with the J.C. Boyle Dam's trapping of sediment, embedment of fine sediment in spawning gravel, and low flow (limiting spawning migrations). Therefore, these effects will not be discussed in Issue 16.

PacifiCorp's peaking operations cause extreme daily flow fluctuations and create upramp rates as high as nine inches/hour in the J.C. Boyle peaking reach. (*FOF 17-1*). BLM conditions propose an upramp rate of no more than two inches/hour. (*FOF 17-2*). Upramp rates of two inches/hour are similar to naturally occurring rates and will be protective of fish resources. (*FOF 17-2 to 17-4*). The current peaking operations and their unnatural upramp rates create several conditions that are harmful to the trout fishery.

First, PacifiCorp's peaking operations create strandings that lead to the loss of thousands of fish and other aquatic animals.[21] (*FOF 16-9, 16-10*). Few trout fry exist in the peaking reach where the strandings occurred and none were reported stranded. (*FOF 16-9*). However, such strandings do kill large numbers of young fish and aquatic invertebrates that are the primary prey for trout. (*FOF 16-15*). The peaking operations that cause high mortality only happen a few times a year following the first peaking event after several months of steady flow. (*FOF 16-12*). Reduced ramp rates can resolve the problem of fish standing. (*FOF 16-13, 16-14*). The BLM proposed conditions calls for a two inch/hour maximum downramp rate, a drop from the four inch/hour ramp rate used at the sites where severe mortality of aquatic organism occurred. (*FOF 16-13, 16-14*). Ramp rates of two inch/hour have been shown to be effective at stopping the occurrence of stranding. (*Id.*)

[21] Stranding is the separation of fish from flowing surface water as a result of a declining river state. (*FOF 16-7*).

BLM provides evidence that Project peaking flows above 1,500 cfs result in the downstream displacement of juvenile salmonids. (*FOF 16-16*). Trout prey is affected in a similar manner, since peaking flows can displace forage fish eggs and push fry downstream. (*FOF 17-8, 17-9*). BLM proposed conditions would eliminate the Project's peaking flows, thus eliminating the downstream displacement. (*FOF 19-1 to 19-13*). PacifiCorp counters this evidence by citing a study it sponsored, which indicates trout fry can maintain their location during peaking flows. (*FOF 16-17 to 16-19*). The mark retrieved study recaptured nine of seventy-three marked fry in portions of the California peaking reach. (*FOF 16-19*). This indicates that fry do have an ability to maintain their position in the lower portions of the peaking reach. (*Id.*). However, the study did not mark or recapture any fry in the Oregon portion of the peaking reach; the section of the peaking reach with the highest ramp rate. (*FOF 16-17*). Therefore, the study is inconclusive as to the effects higher ramp rates have on fry.[22] PacifiCorp did not meet its burden to show that peaking flows, in the Oregon portions of the peaking reach, do not result in downstream displacement of juvenile salmonids.

Peaking operations also affect the energetic demands placed on trout and decrease macroinvertebrates prey. Peaking operations force trout to increase movement, which in turn decreases energy available for overall health, growth, and reproduction.[23] (*FOF 16-*

[22] PacifiCorp's distribution-over-time study had similar flaws, capturing only a few fry in the Oregon portion of the peaking reach. (*PAC-Ols-D-20 at App. 3A at 20; KTR-LKD-Ex. 6 at 6-46*).

[23] PacifiCorp's radio-telemetry study indicated that peaking operations did not induce any significant trout movement. (*PAC PFF 75*). However, PacifiCorp's radio-telemetry study only detects upstream-downstream fish movement, so it would not detect all fish movement that would increase energetic costs. (*PAC-Ols-D-20 at Sec. 5, 5-8, 5-9*). High water flows force trout to swim faster to stay in place. (*BLM-Simons-Ex. 0 at 5:8-6:7).* Fish also move laterally with changes in flow; fish move from the center of the

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21). Peaking operations reduce the production of macroinvertebrates by ten to twenty-five percent. (*FOF 16-24*). Macroinvertebrate drift rates, a measure of food availability for trout, is five to six times greater in the non-peaking Keno reach than in the peaking reach. (*FOF 16-25*). Peaking operations contribute to the lower macroinvertebrate drift rates, which in turn decrease the macroinvertebrate prey available for trout. (*Id*.).

Comparing growth of trout in the non-peaking Keno reach to the trout in the J.C. Boyle peaking reach provides insight into the effects peaking has on trout growth. Growth rates are greater in the peaking reach through age two. (*FOF 16-26*). Growth rates are similar in both reaches between ages two and three. (*Id*.). Growth rates are greater in the non-peaking Keno reach after age three, and the Keno reach trout are older. (*FOF 16-26, 16-30*). Since larger fish operate closer to the energetic margins than smaller fish, it makes sense that lower energetic demands in the non-peaking reach would result in larger adult trout. (*FOF 16-23*). Mature fish grow larger when they prey on forage fish, a higher energy source than invertebrate drift. (*FOF 16-31*). The Project-caused impacts to forage fish (via stranding and displacement) help explain the lower growth rates and absence of larger trout in the peaking reach.[24] (*FOF 16-32*). High growth rates of younger trout in the peaking reach indicate that peaking effects on macroinvertebrate prey are not substantial. Since younger fish prey mainly on macroinvertebrate, if peaking operations were having a substantial effect on

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channel at low flows to the edges of the channel at high flows. (KTR-*LKD-DT-BLM 16 at 7:13-17; KTR-LKD-Ex. 10 at 26*).

[24] PacifiCorp cites a study they sponsored which asserts that Keno trout are larger because they have access to a minnow forage base and reservoirs. (*PAC Reply Brief Appendix at 28*). Such conditions may

Footnote continued on next page.

macroinvertebrate prey, a lower growth rate in younger fish would be expected. By comparing the growth of trout in the non-peaking Keno reach to the growth of trout in the J.C. Boyle peaking reach, it has been established the peaking operations decrease growth rates for mature trout. Therefore, PacifiCorp has failed to meet its burden of proof with respect to BLM Issues 16 and 17.

4. BLM ISSUE 19 Discussion

a. Whitewater Rafting

The BLM Flow Management Scenario model was used to predict the effects of the BLM conditions on whitewater boating opportunities. (*FOF 19-30*). While this model has limitations, it provides the best quantitative evidence of anticipated impacts on whitewater opportunities. (*FOF 19-30 to 19-37*). This evidence shows the proposed flows will severely limit whitewater boating opportunities and impact the viability of the commercial rafting operations. (*FOF 19-25 to 19-27*).

BLM acknowledges in its proposed ultimate finding of fact that the proposed flows will decrease raftable days by an estimated forty-four percent a year. (FOF 19-27). At the peak of the rafting season, July and August, the proposed flows will decrease the total raftable days by seventy-one percent. (*Id.*). While PacifiCorp/Siskiyou County believes the proposed decreases should be even greater, the decreases cited by BLM are sufficient to justify a finding that significantly detrimental effects on rafting operations will occur. (*PC PFF 126*). When an industry's ability to conduct business is reduced by

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contribute to the increased size of Keno reach trout, however PacifiCorp has failed to adequately discount the effects that stranding and downstream displacement will have on forage fish supply.

nearly half (forty-four percent), the financial viability of that industry will be severally diminished.

PacifiCorp/Siskiyou County has shown, by the preponderance of the evidence, that a forty-four percent reduction in raftable days will substantially reduce the whitewater boating opportunities. Having met this initial burden of proof, the burden of persuasion shifts to BLM and BLM must establish other factors which may offset the decrease in raftable days. BLM conditions emphasis the protection of weekend boating opportunities. (*FOF 19-25*). As such, BLM contends that there may be a shift of some historical weekday to weekend use. (*FOF 19-28, 19-29*). However, BLM fails to provide evidence indicating the size of this potential shift. Without having an estimate of how many customers may shift to weekend use, BLM has failed to show, by a preponderance of the evidence, that a shift to weekend use will substantively offset the forty-four percent reduction of raftable days.

b. Fly Fishing

The ability to wade is an integral component to fly-fishing. (*FOF 19-41*). Without the ability to effectively wade, an aesthetic experience and an important element in positioning oneself to catch fish would be lost. (*Id.*) Evidence shows the proposed flows will reduce the ability to wade. (*FOF 19-42 to 19-44*). The degree of such reduction has not been established in this record.

Low flows are preferred by fly-fishing anglers. (*FOF 19-43*). BLM proposed flows will increase the current base flow and will make wading difficult in certain areas of the peaking reach. (*FOF 19-49, 19-50*). The central question is therefore, how much

more difficult will wading become? PacifiCorp/Siskiyou County cites statistics that show current operations produce "preferred" fishing flows on fifty-nine percent of the days in the May-October season. (*FOF 19-46*). PacifiCorp/Siskiyou County then argues that BLM's proposed flows will produce "preferred" fishing flows on about eight percent of the days in the May-October season. (*PC PFF 143*). However, PacifiCorp/Siskiyou County's analysis relies on a flawed use of the BLM FMS model.[25] No other statistics have been provided which show, quantitatively, how much more difficult wading will become.

BLM and the Conservation/Fisheries Groups concede that higher flows will make wading (therefore affecting the ability to fly-fish) more difficult in the short term. (*FOF 19-49, 19-50*). However, they contend that there will be no long-term negative affects on fly-fishing. (*FOF 19-50 to19-54; BLM PFF 19.14-15, 19.18*). First, BLM correctly asserts that wading access is only one component of "fishabilty" and other biological factors (e.g. – fish health) are important to consider when determining if an area is good for fishing. (*FOF 19-52 to 19-54*). BLM contends that high flows will improve such biological factors and improve overall fishing. (*Id*.). However, even if higher flows were to improve biological conditions, if flows are too high to allow wading, fly-fishing would not be possible (other forms of fishing may improve). Second, BLM argues that wading

[25] PacifiCorp/Siskiyou County relies upon a flawed interpretation of the BLM FMS model. The FMS model produces outputs on an average *daily* basis. (*BLM-Turaski-Ex. 3 at 12*). The criteria PacifiCorp/Siskiyou County used when analyzing current operations was a *three-hour window* in the "preferred" fishing flow range. (*PAC-Whit-R-1 at 2:18-21, 3:11-13*). In contrast, the PacifiCorp/Siskiyou County analysis of the proposed flows was based on *average daily flow* data (FMS model outputs), and therefore implicitly required an entire day (as opposed to three hours) in the preferred range. (*PAC-Whit-R-2 (columns 4 and 6 showing BLM FMS model outputs); PAC-Carl-R-5 (Excel spreadsheet showing*

Footnote continued on next page.

may become easier (e.g. – sediment will make the ground less rocky). (*BLM PFF 19.14*). However, BLM fails to provide sufficient evidence in support of this claim. (*Id.*). Third, BLM assumes that anglers will adjust their techniques to accommodate the proposed flows changes. (*FOF 19-51; BLM PFF 19.15*). While anglers will likely adjust their techniques to an extent, evidence has not been provided to show anglers would continue to fly-fish in area with flows higher than traditionally accepted for fly-fishing. (*FOF 19-8 to 19-13, 19-40 to 19-44, BLM PFF 19.15*). The record evidence does not support the proposition that BLM's proposed conditions will improve fly-fishing in the peaking reach.

ULTIMATE FINDINGS OF FACT AND CONCLUSIONS OF LAW

1. Under Daubert, the Miller Radio-Telemetry study is scientifically unreliable.

2. The effectiveness of volitional passage is not at issue in this case because those issues were withdrawn/dismissed following the initial prehearing conference conducted under 50 C.F.R. Part 221.

3. USFWS/ISSUE 2(A): Stocks of anadromous fish suitable to conditions above Iron Gate Dam are available to use prescribed fishways.

4. USFWS/NMFS ISSUE 2(B): Facilitating the movement of anadromous fish via prescribed fishways presents a relatively low risk of introducing pathogens to resident fish above Iron Gate Dam. Many of the pathogens (such as *C. Shasta, F. Columnaris, P. minibicornis, and Ich*) present below Iron Gate Dam, are also present above the dam. The evidence is inconclusive as to whether *IHN* exists either above or below Iron Gate Dam. The evidence is also inconclusive as to whether *R. salmoniranrum* exists above Iron Gate Dam.

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inappropriate use of BLM FMS model outputs)). Comparing an average daily flow to a three-hour window flow data does not lead to a fair comparison.

5. USFWS/NMFS ISSUE 2(C): Facilitating the movement of wild anadromous steelhead trout above Iron Gate Dam via prescribed fishways presents a low risk of residualization (a phenomenon most common among hatchery steelhead trout). Moreover, while resident trout have the genetic capacity to adopt anadromy, the risk of residualizing can be minimized through use of adaptive management.

6. USFWS/NMFS ISSUE 3: Project operations have and continue to adversely affect the resident trout fishery by, among other things: a) confining the resident trout between the Project dams and associated reservoir thereby impairing their utilization of the full range of life history strategies and spawning productivity; b) unscreened flow through Project turbines result in mortality of juvenile and adult trout migrating down stream; and the inability to effectively migrate adversely affects the genetic health and long term survival of the resident species.

7. USFWS/NMFS ISSUE 4: Entrainment at Project facilities have and continue to adversely affect the resident fishery resources.

8. USFWS/NMFS ISSUE 6: While the exact miles of habitat for use by anadromous fish within the Project reach is unknown, 58 miles is a reasonable estimate based on the evidence contained in the record.

9. USFWS/NMFS ISSUE 7: Access to habitat within the Project would benefit Coho salmon by: a) extending the range and distribution of the species thereby increasing the Coho salmon's reproductive potential; b) increasing genetic diversity in the Coho stocks; c) reducing the species vulnerability to the impacts of degradation; and d) increasing the abundance of the Coho population.

10. USFWS/NMFS ISSUE 8: Although the evidence is inconclusive as to whether Pacific lamprey were historically present above Iron Gate Dam, the record evidence shows that access to habitat would benefit that species of fish by providing it with additional spawning and rearing grounds.

11. BLM ISSUE 10: The seasonal high flows will contribute to improving the quality of riparian habitat in the J.C. Boyle bypass reach by increasing the sediment deposit within the channel and decreasing reed canary grass. However, the extent of any improvement on riparian-focal bird species is indeterminate since an increase of woody riparian vegetation is not expected.

12. BLM ISSUE 11: Project operations have adversely affected riparian resources in both the bypass and peaking reaches by supporting the perpetuation of reed canary grass and by affecting the structure, size, and nature of depositional features. However, the extent of any loss to riparian-focal bird species is indeterminate, based upon evidence that woody riparian vegetation has not decreased noticeably

13. BLM ISSUE 14: The BLM seasonal high flows will assist in the creation of redband trout spawning habitat, decrease fine sediment embedment in spawning gravel, and improve redband trout migration. These benefits provide for a net positive effect to redband trout spawning; overcoming the possible scouring effects high flows will have on spawning trout.

14. BLM ISSUE 16: Current Project operations, particularly sediment blockage at the J.C. Boyle Dam, the flow regime, and peaking operations, negatively affect the redband trout fishery. The proposed River Corridor Management Conditions would improve fishery resources.

15. BLM ISSUE 17: The BLM's proposed upramp rate will improve conditions for fish resources and other aquatic organisms by reducing adverse effects caused by the existing nine inch/hour upramp rate.

16. BLM ISSUE 19: The BLM's proposed flows will substantially reduce the frequency and quality of whitewater boating in the J.C. Boyle peaking reach. The ability to fly-fish in the J.C. Boyle peaking reach will be reduced; the extent of this reduction has not been established.

Done and dated October 16, 2006
Alameda, California

HON. PARLEN L. MCKENNA
ADMINISTRATIVE LAW JUDGE
U.S. COAST GUARD

United States Department of the Interior

FISH AND WILDLIFE SERVICE
California/Nevada Operations Office
2800 Cottage Way, Room W-2610
Sacramento, California 95825-1846

IN REPLY REFER TO:

March 27, 2006

Ms. Magalie R. Salas
Secretary
Federal Energy Regulatory Commission
888 First St, NE – Room 1A
Washington, DC 20426

Subject: Klamath Hydroelectric Project, No. 2082. Department of the Interior's Filing of Comments, Preliminary Terms, Conditions, Prescriptions, and Recommendations.

Dear Ms. Salas:

In response to the Federal Energy Regulatory Commission's (Commission) December 28, 2005, Notice of Application Ready for Environmental Analysis, the Department of the Interior (Department) herewith files its preliminary terms, conditions, prescriptions, and recommendations for the Klamath Hydroelectric Project. The Department's filing includes introductory comments, and the following sections:

Section A: Preliminary conditions for the protection and utilization of the Bureau of Land Management reservations pursuant to Section 4(e) of the Federal Power Act.

Section B: Preliminary conditions for the protection and utilization of federal lands and facilities of the Bureau of Reclamation pursuant to Section 4(e) of the Federal Power Act.

Section C: Preliminary fishway prescriptions of the Fish and Wildlife Service and National Marine Fisheries Service pursuant to Section 18 of the Federal Power Act.

Section D: Fish and Wildlife Service recommendations to protect, mitigate damages to, and enhance fish and wildlife pursuant to Section 10(j) of the Federal Power Act.

Section E: Recommendations submitted pursuant to Section 10(a) of the Federal Power Act.

The Department's preliminary terms, conditions, prescriptions, and recommendations are submitted for inclusion in the Commission's forthcoming analysis conducted under the National Environmental Policy Act (NEPA). The Department may modify these preliminary submissions in response to the Commission's NEPA process and appropriate proceedings arising from the Energy Policy Act of 2005.

If Commission staff believe that any of the fish and wildlife recommendations in Section D should not be included in a new license, then Mr. Phil Detrich, Field Supervisor, Yreka Fish and Wildlife Office should be contacted to resolve such issues prior to issuance of the license.

The Department recommends that the Commission initiate informal consultation discussions with the Department directly to jointly determine information needs to comply with section 7 of the ESA on this licensing action.

Specific questions or requests for clarification regarding any the comments contained herein may be directed to:

- Bureau of Indian Affairs:
  - Tom Dang, Regional Irrigation, Power, Safety of Dams, and FERC Program Manager, Pacific Regional Office, 2800 Cottage Way Sacramento, California 95825, (916) 978-6164.
- Bureau of Land Management:
  - Jon Raby, Klamath Falls Area Office, 2795 Anderson Avenue, Bldg #25, Klamath Falls, OR, 97603, jraby@or.blm.gov, (541) 883-6916.
- Bureau of Reclamation:
  - Cecil Lesley, Klamath Basin Area Office, 6600 Washburn Way, Klamath Falls, OR 97603, clesley@mp.usbr.gov, (541) 883-6935.
- Fish and Wildlife Service:
  - Phil Detrich, Yreka Fish and Wildlife Office, 1829 South Oregon Street, Yreka, CA, 96097, Phillip_Detrich@fws.gov, (530) 842-5763.
- National Park Service:
  - Susan Rosebrough, 909 First Ave, Fifth Floor, Seattle, WA 98104, susan_rosebrough@nps.gov, (206) 220-4121.

We appreciate the opportunity to provide these comments, recommendations, conditions, and prescriptions. Thank you for your assistance in filing these documents.

Sincerely,

Steve Thompson

Steve Thompson
Manager, California/Nevada Operations Office
For the Department of the Interior
Pursuant to Delegation Memorandum of August 3, 2005

UNITED STATES DEPARTMENT OF THE INTERIOR
COMMENTS, PRELIMINARY RECOMMENDATIONS, TERMS AND CONDITIONS, AND PRESCRIPTIONS FOR FISHWAYS
FILED PURSUANT TO SECTIONS
4(e), 10(a), 10(j), AND 18 OF THE FEDERAL POWER ACT
WITH THE FEDERAL ENERGY REGULATORY COMMISSION
FOR THE KLAMATH RIVER HYDROELECTRIC PROJECT
PROJECT NO. 2082
KLAMATH RIVER, SISKIYOU COUNTY, CALIFORNIA; AND KLAMATH COUNTY, OREGON

March 27, 2006

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INTRODUCTION

The Department of the Interior (Department) has reviewed the notice of application Ready for Environmental Analysis and Soliciting Comments, Recommendations, Terms and Conditions, and Prescriptions (REA Notice) for the Klamath Hydroelectric Project (FERC No. 2082) (Project), located primarily on the Klamath River in Klamath County, Oregon, and Siskiyou County, California, between Klamath Falls, Oregon, and Yreka, California. The December 28, 2005 REA Notice requested submission of comments, recommendations, terms, conditions, and prescriptions by February 27, 2006. On February 16, 2006 staff of the Federal Energy Regulatory Commission (Commission or FERC) approved an extension of the response deadline to March 29, 2006.

PacifiCorp (Applicant) is seeking a new license for the continued operation of the 161 megawatt (MW) Project. The existing license expired on March 1, 2006, and the Commission issued an annual license on March 9, 2006. The Department and its bureaus (the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Bureau of Reclamation (Reclamation), National Park Service (NPS), and Fish and Wildlife Service (Service or FWS)) have provided technical assistance and participated on technical subgroups with the Applicant since 2001. The Department also provided the Applicant with comments and recommendations on its Draft License Application (DLA) on September 24, 2003, the Final License Application (FLA) on April 26, 2004, and in many other letters filed with the Commission and hereby incorporated by reference. The Department formally intervened in the proceeding on September 29, 2004.

The preliminary comments, recommendations, terms and conditions, and prescriptions herein are provided in accordance with the provisions of the Federal Power Act (FPA), (16 U.S.C. § 791 *et seq.*), the Fish and Wildlife Coordination Act (FWCA), (16 U.S.C. §661 *et seq.*), the Endangered Species Act (ESA), (16 U.S.C. §1531 *et seq.*), the Federal Land Management and Policy Act (FLPMA), (43 U.S.C. § 1701 *et seq.*), the Klamath River Basin Fishery Resources Restoration Act (Public Law 99-552), the Reclamation Act of 1902 as amended and supplemented (32 Stat. 388), the Outdoor Recreation Act of 1963 (16 U.S.C. 4601-1), the NPS Organic Act (39 Stat. 535), the Wild and Scenic Rivers (WSR) Act (Pub. Law 90-542), the National Trails System Act (16 U.S.C. 1246(a)), the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq.*), and federal trust responsibilities to Indian Tribes. In this document, the Department identifies and explains these comments, recommendations, terms and conditions, and prescriptions as well as their legal and evidentiary basis:

- **Section A** contains preliminary conditions pursuant to Section 4(e) for the protection and utilization of the BLM reservations.
- **Section B** contains preliminary conditions pursuant to Section 4(e) for the protection and utilization of lands and facilities managed by Reclamation.
- **Section C** contains preliminary prescriptions for the construction, operation, and maintenance of upstream and downstream fishways pursuant to Section 18. These

prescriptions on behalf of the FWS are issued jointly with the National Marine Fisheries Service (NMFS).

- **Section D** contains recommendations to protect, mitigate impacts to, and enhance fish and wildlife resources pursuant to Section 10(j).
- **Section E** contains recommendations to protect fish and wildlife, recreation, cultural, and reservation resources pursuant to Section 10(a).

In addition, the Department is submitting for the record two technical memoranda:

- Ongoing and Future Improvement of Aquatic Habitat in the Klamath River Watershed, FWS, February 27, 2006.
- Replacement Power Values, Office of Policy Analysis, Department of the Interior, March 27, 2006.

The Department notes that the proceeding is behind schedule. PacifiCorp filed its license application on February 25, 2004 without having completed key studies. The Commission issued a Notice of Tendering of Application on February 26, 2004, and in response to that notice, the Department filed additional information requests with the Commission on April 26, 2004. The Commission did not accept the license application until August 16, 2004, and did not issue additional study requests until February 17, 2005. This order called for receipt of all additional information by August 2005. Several of the Applicant's requests for extension were granted, and final studies were not filed on key areas of water quality and fish passage until December 16, 2005. Much of this material is still incomplete, or in a form that is difficult to review and assess. The Department has filed numerous letters with the Commission on the adequacy of the Applicant's studies and information, and hereby incorporates them by reference.

Provided that our comments, recommendations, terms and conditions, and prescriptions are incorporated into the new license, the Department does not intend to object to the issuance of a new license for the Klamath Hydroelectric Project (Project). The conditions and recommendations contained herein are designed to mitigate the impacts of the Project to the fullest extent achievable under the authorities available to the Department bureaus in the traditional relicensing process, and include fish passage measures and controlled operations at the Project dams. The Department recommends that these measures be included in the Commission's NEPA analysis in order to assess their effectiveness in addressing the Project's impacts. However, the full suite of Project impacts may not be addressed through the prescription of fishways and the recommendation of other modifications to Project operations. We are hopeful that more comprehensive solutions can be attained through the ongoing settlement process, in which the Applicant is a participant. In the meantime, we continue to urge the Commission to evaluate a full range of Project alternatives during the environmental review process, including dam decommissioning and removal.

Because a Draft Environmental Impact Statement (DEIS) or Draft Environmental Assessment (DEA) has not yet been issued by the Commission, this response contains preliminary comments, recommendations, terms and conditions, and prescriptions only. The Department reserves the right to amend these preliminary comments, recommendations, terms and

conditions, and prescriptions, if warranted, based on the results of new information and conclusions developed during the Department's processes conducted pursuant to the Energy Policy Act of 2005 (EP Act) and the Commission's environmental analysis.

GENERAL COMMENTS

The Klamath River Basin in southern Oregon and northern California has sustained farming communities, provided habitat for the majority of waterfowl that migrate over the Pacific flyway, and was once the third largest salmon-producing watershed on the west coast, supporting large anadromous fish runs including Chinook salmon, coho salmon, steelhead, sturgeon, and lamprey, which supported significant commercial, recreational, and tribal harvests. Declines in populations for several species of fish have led to the restriction of fishing and tribal harvest, as well as recent reductions in deliveries of water for agricultural use.

The Commission's relicensing process provides an opportunity for government agencies, Indian Tribes, stakeholders, and the public to comprehensively address the effects of the Project on the human environment, bring the Project up to current environmental standards, strike a balance between the various competing uses of public resources, and assist the Commission in making a licensing decision that is in the public interest and based on substantial information. The Department believes that actions taken as a result of this relicensing must contribute to long-term basinwide solutions, particularly to address the Project-caused extirpation of the threatened coho salmon and other trust species such as Chinook salmon from all reaches and tributaries upstream of Iron Gate Dam.

On March 1, 2002, the President established the Klamath River Basin Federal Working Group to advise the President on immediate steps and long-term solutions to enhance water quality and quantity and to address other complex issues in the Klamath River Basin. Since the establishment of the Working Group, which is chaired by the Secretary of the Interior, five of the Department's bureaus, the Office of the Solicitor, and the Office of the Secretary have been heavily involved in activities and issues of concern to Klamath River basin communities, including Indian tribes.

The Governors of the States of California and Oregon, the President's Klamath River Working Group, and the U.S. Environmental Protection Agency signed the Klamath River Watershed Coordination Agreement in October 2004. The agreement is intended to focus science-based attention to identify and address the environmental, economic, agricultural, and Tribal trust needs of the Klamath Basin and its communities. It places a priority on the signatories' Klamath Basin activities and on their coordination and communications with one another and with tribal governments, local governments, private groups and individuals, to resolve water quantity, water quality and fish and wildlife resource problems in the basin.

Long-term solutions in the Basin are a priority for the Department, which has committed significant resources to the effort:

- The Department is committed to finding a long-term resolution to the conflict in the Klamath River basin that will provide water to farmers and Tribes while protecting and enhancing the health of fish populations. Recent budgets reflect commitment to funding habitat restoration, removal of fish migration barriers, land acquisition, and the use of water banking.
- The Department will dramatically increase habitat access for endangered sucker species by removing Chiloquin Dam, which impedes their passage to tributary habitat above Upper Klamath Lake. Removing Chiloquin Dam will improve access to more than 70 miles of the Sprague River, providing endangered suckers and other fish substantially more spawning and feeding areas.
- Reclamation has completed fish screening for the A-Canal, the largest water diversion point for the Klamath Irrigation Project, at a cost of $15 million. The fish screens bypass juvenile fish back to Upper Klamath Lake where physical injury and acute mortality for fish passing through the A-Canal pump bypass appears to be nearly negligible.
- Reclamation has also completed construction of a new fish ladder at Link River Dam at the outlet of Upper Klamath Lake to facilitate upstream passage of endangered suckers. Work will continue on screening other canals and laterals to reduce entrainment of endangered suckers.
- At the request of the Secretaries of the Interior and Commerce, the National Academy of Sciences' National Research Council (NRC) issued a final report in October 2003 that identified potential actions for the recovery of the coho salmon and the Lost River and shortnose suckers (National Research Council 2003). This report evaluated the scientific basis of the 2001 biological assessments and biological opinions on the three listed species, and identified potential actions for their recovery (National Research Council 2003). The NRC report is a timely and useful summary of what is known and what remains to be learned regarding the causes of decline and recovery strategies for the three listed species. The NRC report recommends a systematic and coordinated basinwide approach to ecological restoration and management, and urges that new information be collected and used to improve management decisions, including a serious evaluation of the benefits to coho salmon from elimination of Iron Gate Dam.
- Reclamation, in partnership with the Service, BIA, NMFS, the Natural Resource Conservation Service (NRCS), the States of Oregon and California, Klamath basin tribes, and other stakeholders in the basin, is leading an effort to develop a Klamath River Basin Conservation Implementation Program (CIP). The goals of the CIP are: 1) to largely restore the Klamath River ecosystem to achieve recovery of the Lost River and shortnose suckers, and to substantially contribute to the recovery of threatened coho salmon; 2) to contribute to the fulfillment of the Federal government's trust responsibilities to Indian tribes; and 3) to allow continued sustainable operation of existing water management facilities and future water resource improvements for human use in the Klamath Basin. The CIP was modeled after similar programs successfully being used in other river basins, such as the Upper Colorado River basin.

In addition, the Department is engaged on the question of mainstem Klamath River flows in two other forums. First, Reclamation must maintain certain lake elevations and river flows through

Biological Opinions issued by the U.S. Fish and Wildlife Service with respect to elevations in Upper Klamath Lake for ESA listed sucker fish and by the National Marine Fisheries Service with respect to Klamath River flows below Iron Gate Dam for coho salmon. Consistent with these Biological Opinions, Reclamation must also operate the Klamath Reclamation Project--including the water available in Upper Klamath Lake and the release of flows from Link River Dam into the Klamath River—consistent with its tribal trust obligations, contracts for the delivery of water for irrigation within the Reclamation project, and water supply to the Lower Klamath and Tule Lake National Wildlife Refuges.

Second, the State of Oregon is now conducting a water rights adjudication to determine the relative rights to the surface waters of the Klamath Basin in Oregon. The United States has filed claims to protect its interests as part of this adjudication, including specific instream flow claims for the Klamath River from Link River Dam to the Oregon-California border (thus including portions of the Project area at issue in this FERC proceeding) on behalf of the Klamath Tribes and other federal interests. Once the State of Oregon issues a binding decree in the adjudication, all parties with water rights in the Klamath River Basin in Oregon will exercise those rights consistent with that decree.

FERC does not have a role in either process described above. Moreover, the Department's comments, recommendations, terms and conditions, and prescriptions do not ask FERC to take any action or otherwise engage in either of these processes. This FERC proceeding, however, will result in certain conditions being imposed on the licensee in the operation of the FERC-licensed hydroelectric project. The Department is including reservations of its FPA sections 4(e) and 18 authorities to accommodate any necessary license changes resulting from Reclamation's future operational requirements or the adjudication process that will ultimately determine various water rights within the Project area.

The Department looks forward to working with the Applicant and the Commission to ensure that the Project, if relicensed, can contribute to long-term basinwide solutions.

ENERGY POLICY ACT REVIEW PROCESS

The Energy Policy Act of 2005 (EP Act) provides parties to this licensing proceeding the opportunity to request trial-type hearings regarding issues of material fact that support the conditions and prescriptions developed under FPA sections 4(e) (Federal reservations) and 18 (fishway prescriptions). Through this filing, the Department is submitting preliminary mandatory conditions and prescriptions, along with the administrative records for these conditions and prescriptions. The Act also allows parties to propose alternatives to preliminary prescriptions and conditions. Procedures for requesting a trial-type hearing on a factual issue or for proposing alternatives are set forth at 43 C.F.R. Part 45 of the Department's regulations. The Department will file modified conditions and/or prescriptions with the Commission following the completion of any EPAct processes required within 60 days of the close of the comment period on the Commission's draft NEPA document.

TRIBAL TRUST

A unique relationship exists between the Federal government and Indian tribes. The Department acts to ensure the proper discharge of the Federal trust responsibilities to Indian tribes, a responsibility shared by all Federal agencies including the Commission. With respect to interests potentially affected by the FERC-licensed Project, five federally-recognized tribes (Tribes) reside in the Klamath Basin in the geographic area affected by Project operations: the Klamath Tribes of Oregon, the Hoopa Valley Tribe, the Yurok Tribe, the Karuk Tribe of California, and the Resighini Rancheria of California. These Tribes have recognized property interests in the basin, which the United States holds in trust or otherwise tries to enhance for their benefit and which varies with the individual tribe and its associated ethnological and legal history. Among other interests, the Klamath Tribes have treaty-protected fishing, hunting, trapping, and gathering rights, and the Hoopa Valley and Yurok Tribes have federally reserved fishing rights in the Klamath Basin recognized by various court decisions and other Department memoranda. The Tribes' fishing rights entitle them to harvest for subsistence, ceremonial, and commercial purposes.

Restoration of anadromous fish to the Klamath River in and above the Project will help meet not only various statutory requirements but also the Federal Trust Responsibilities to the Basin's Indian Tribes. Basin Tribes hold Federal Reserved fishing rights to take both resident and anadromous fish within their reservation in order to support ceremonial, subsistence, and commercial needs. See, e.g., United States v. Adair, 723 F.2d 1394, 1408-15 (9th Cir. 1984), cert. denied, 467 U.S. 1252; Parravano v. Babbitt, 70 F.3d 539 (9th Cir. 1984), cert. denied 518 U.S. 1016 (1996); Memorandum from John D. Leshy, Solicitor of the Department of the Interior to the Secretary of the Interior (October 4, 1993).

Restoration of anadromous runs in the currently unutilized habitat above the dams would help restore and enhance fish harvests throughout the Basin to the benefit of the Tribes. Restoration and enhancement of fish runs would also benefit commercial, recreational, and subsistence fisheries throughout the Klamath River and off the coasts of Oregon and California.

The Department has strived to meet its Tribal trust responsibilities in all our Project relicensing activities. This includes the responsibilities described in the Department's June 5, 1997, Secretarial Order Regarding American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the ESA (U. S. Department of the Interior 1997). That document defined Tribal trust resources as those natural resources, either on or off Indian lands, retained by, or reserved by or for Indian tribes through treaties, statutes, judicial decisions, and executive orders, which are protected by a fiduciary obligation on the part of the United States. In providing these conditions and recommendations, the Department acts in accordance with its trust responsibilities on behalf of Indian tribes and individuals when Indian trust and treaty resources are involved, as they are here. In particular, on the Klamath River, the Department is committed to improving the access of Tribes to anadromous and resident fish.

COMPREHENSIVE PLANS FOR THE BASIN

The Department reviews hydropower projects in accordance with the goals and objectives of applicable national and regional resource management plans. Restoration of anadromous and resident fish habitat in the Klamath Basin is included in the plans of many agencies and organizations.

Basinwide Plans

1. Klamath River Basin Fishery Resources Restoration Act

In 1986 Congress adopted the Klamath River Basin Fishery Resources Restoration Act (Public Law 99-552, codified as amended at 16 U.S.C. § 460ss *et seq*.) (Klamath Act). This law established a federal-state cooperative called the 'Klamath River Basin Conservation Area Restoration Program' for the rebuilding of the river's fish resources. The Klamath Act also established the Klamath River Basin Fisheries Task Force (Task Force), and directed the Task Force to assist the Secretary of the Interior in the creation and implementation of *"…a 20 year program to restore anadromous fish populations of the [Klamath River Basin] Area to optimum levels and maintain such levels."* The Klamath Act also created the Klamath Fishery Management Council, and directed the Council to make recommendations to federal, state and tribal agencies for the management of ocean and in-river harvesting that affects Klamath and Trinity anadromous fisheries.

2. Long Range Plan for the Klamath River Basin Conservation Area Fishery Restoration Program

A Long Range Plan for the Klamath River Basin Conservation Area Fishery Restoration Program (LRP) and Environmental Impact Statement (EIS) for the river below Iron Gate Dam were completed by the Task Force in 1991 (USDI Klamath River Basin Fisheries Task Force 1991). The LRP generally directs that fishery restoration is to be achieved through fish habitat protection and restoration, from a total watershed perspective, not simply an instream perspective. The LRP was accepted by FERC as a "comprehensive plan" under the Federal Power Act on January 15, 2004. The goals of the LRP are:

"Restore, by the year 2006, the biological productivity of the Klamath River Basin in order to provide viable commercial and recreational ocean fisheries and in-River tribal (subsistence, ceremonial and commercial) and recreational fisheries.

I. Ensure that the Klamath Fishery Management Council devises harvest regulation recommendations that will provide for viable commercial, recreational, and tribal fisheries.
II. Recommend to the Congress, state legislatures, and local governments the actions each must take to protect the fish and fish habitats of the Klamath River Basin.
III. Inform the public about the value of anadromous fish to the Klamath River region and gain their support for the Restoration Program.

IV. Promote cooperative relationships between the lawful users of the Basin's land and water resources and those who are primarily concerned with the implementation of the Restoration Plan and Program."

Specifically, the plan calls for protection of salmon and steelhead habitat from harmful effects of water and power projects in the Klamath Basin in Objective 2.E. Sub-Objectives that pertain to this relicensing include:

- 2.E.1.A Reevaluate the currently available spawning and rearing habitat located above Iron Gate Dam, where needed.
- 2.E.1.B Monitor water quality, including water temperatures, above, within, and below the Copco and Iron Gate reservoirs... to determine the effects of water storage and power plant operations on downstream habitat conditions.
- 2.E.1.C Evaluate the instream flow needs... of each salmon and steelhead run and life stage affected by flows released from Iron Gate Dam.
- 2.E.2 A-C Identify and implement methods to rectify habitat problems identified in #1 above, including the following:
    a. Access above Iron Gate and Copco Dams to the upper Klamath Basin;
    b. Water quality above and below Iron Gate Dam;
    c. Instream flow and habitat below Iron Gate Dam.
- 2.E.3 Promote adequate fish protection requirements in the relicensing conditions for the Iron Gate Hydroelectric Project and other power projects by the FERC.
- 2.E.4 Advocate inclusion and enforcement of effective conditions for salmonid habitat protection on small and large hydroelectric projects and other water storage projects.
- 2.E.7 Require water flows adequate to achieve optimal productivity of the basin.

In a letter dated March 21, 2001, the Task Force stated its goal that the relicensing of the Klamath Hydroelectric Project will "result in the successful restoration of anadromous salmonids to their historical range as well as improvements to habitat of the Klamath River below the Project" (USDI Klamath River Basin Fisheries Task Force 2001).

<u>ESA Recovery Plans</u>

1. Federally Listed Suckers

The Recovery Plan for Lost River and shortnose suckers (USFWS 1993) calls for the improvement of habitat conditions through rehabilitating riparian areas and improving land management practices in the Klamath River watershed, developing and achieving water quality and quantity goals, and improving fish passage, spawning habitat, and other habitat conditions.

2. Bull Trout

The draft Bull Trout Recovery Plan, Klamath River Recovery Unit Chapter (USDI Fish and Wildlife Service 2002) calls for upward trends in quality to be achieved through landscape-level adjustments in land management strategies designed to maintain and/or enhance structural and functional attributes of upslope, riparian, and fluvial systems. Portions of the upper Klamath drainage, including Agency Lake and Sun Creek; portions of Coyote Creek, Long Creek, and Sycan Marsh; and portions of Boulder Creek, Brownsworth Creek, Deming Creek, Dixon Creek,

Leonard Creek, Sheepy Creek, and the North Fork of the Sprague River have been designated as Critical Habitat for Bull Trout (USDI Fish and Wildlife Service 2004a). The designated critical habitat is all above Upper Klamath Lake, and does not intersect with the Project area.

3. Coho Salmon

NOAA Fisheries initiated development of a recovery plan for Southern Oregon Northern California Coast (SONCC) coho in 2001 by convening the SONCC Technical Recovery Team (TRT). The TRT is comprised of scientists from federal, state, tribal, academic, and local agencies/groups. During Phase I of recovery planning, the TRT is focusing on development of delisting goals for the SONCC coho, identifying factors for the decline and factors limiting recovery of the species, identifying early actions that can be taken by co-managers to reduce impacts to the species and habitat, and identifying, monitoring and evaluation needs for the species and habitat conditions. During Phase II of the recovery planning process, NOAA Fisheries and stakeholders will evaluate and build on existing coho conservation programs to develop a plan that will create a "blueprint" to achieve the SONCC coho recovery goals identified by the TRT.

<u>Regional Plans</u>

1. Northwest Forest Plan

The Northwest Forest Plan's Aquatic Conservation Strategy (ACS) provides a framework for restoration and recovery of wild anadromous fish stocks on federal lands in the Pacific Northwest. Central to the ACS is the restoration of habitat and ecosystem health by maintaining and restoring aquatic habitat, restoring habitat connectivity, and maintaining flows sufficient to sustain component elements of aquatic systems. Much of the Klamath River watershed is in BLM or Forest Service ownership. Land management by these agencies adheres to this Plan.

2. Bureau of Land Management Resource Management Plans

    a. Klamath Falls Resource Area, Medford District, and Redding Field Office

The Resource Management Plans for the Klamath Falls Resource Area, Medford District, and Redding Field Office were developed as part of the Northwest Forest Plan and respond to the need for healthy forest ecosystems and habitat to support native species, including protection of riparian areas and waters, as well as the need for a sustainable supply of timber and other forest products necessary to maintain local and regional economies. The Klamath River occurs in the Northwest Forest Plan area and is administered as a riparian reserve. Riparian reserves are designed to maintain and restore aquatic ecosystem functions and together with the Aquatic Conservation Strategy (ACS) of the Northwest Forest Plan provide substantial watershed protection.

Approximately 11 miles of the Upper Klamath River is located within the Klamath Falls Resource Area in Klamath County, Oregon. According to the Klamath Falls Resource Area RMP the riparian reserve for the Klamath River includes "the stream and the area on each side of the stream extending from the edges of the active stream channel to the outer edges of the 100 year floodplain or 320 feet on each side of the river, whichever is greater." As a general rule, management of riparian reserves prohibits or regulates activities that retard or prevent attainment of objectives of the ACS.

b. Cascade Siskiyou National Monument

The Cascade Siskiyou National Monument is located within the Medford District and was established on June 9, 2000. The Monument encompasses portions of the Scotch Creek, Camp Creek, Jenny Creek, and Fall Creek watersheds which flow into Iron Gate Reservoir. The Proposed BLM Resource Management Plan and Final EIS for the Monument includes the following Primary Management Objectives for Riparian Areas:

- Protect and enhance hydrologic function, aquatic connectivity, and water quality;
- Maintain and improve wetland and riparian plant communities and structure; and
- Protect and enhance riparian areas as habitat for terrestrial and aquatic organisms.

Streams with the highest priority for aquatic habitat restoration and protection are located in the Jenny Creek watershed (USDI Bureau of Land Management 2005).

<u>National Plans</u>

1. Fisheries USA

On February 4, 1993, the Commission accepted the Service's recreational fisheries policy entitled "Fisheries USA" as a comprehensive plan pursuant to section 10(a) of the FPA. The policy identifies the Service's commitment to protect the quality and quantity of the Nation's recreational fisheries and to optimize opportunities for people to enjoy these recreational fisheries (Service 1989). The Nation's recreational fisheries are socially and economically significant, and the demand for recreational fishing opportunities is projected to increase. Actions that can be taken to meet this increasing demand include ensuring full consideration of recreational fisheries in water resource projects, restoring or enhancing depleted or declining fisheries, and optimizing productivity of existing fisheries through habitat and water quality improvements.

2. Action Plan for Fisheries Resources and Aquatic Ecosystems

The Action Plan (USDI Fish and Wildlife Service 1994) presents a comprehensive ecosystem- and watershed-based conservation, restoration, and enhancement program focusing on nationally significant fishery resources through scientific management of aquatic communities and wild populations. Interjurisdictional waters and those with National Wildlife Refuges, such as the Klamath River watershed, are covered by the plan. Among the highest priorities to be addressed through the implementation of this Action Plan are the conservation of self-sustaining native fish

populations for the maintenance of productive fisheries in healthy aquatic habitats, developing partnerships, and assuring long term ecosystem health. Among the several components of the Action Plan is the restoration and protection of the quantity and quality of water available for fishery resources and aquatic ecosystem integrity. High priority actions intended to accomplish this component include the establishment, maintenance, and protection of instream flows in important fishery habitats and the recommendation of effective approaches for fish passage for hydroelectric and other water development projects.

3. Conserving America's Fisheries - The Fisheries Program Vision for the Future

This National Strategic Plan (Plan) was developed by the Service in December 2002, in collaboration with the Sport Fishing and Boating Partnership Council, which represents a wide range of fishing and aquatic conservation organizations across the country. The Plan presents a comprehensive ecosystem- and watershed-based conservation, restoration, and enhancement program for fisheries management focusing on the management of aquatic communities, recreationally important fisheries, and native fish populations. The Plan has been "stepped down" to the Pacific Region of the U.S. Fish and Wildlife Service in the form of a "Pacific Region: Fisheries Program Strategic Plan." Both the national and regional strategic plans are implemented through cooperative partnerships with State, regional, local, and Tribal governments, non-governmental organizations, watershed councils, and a variety of businesses and private interests. The Regional Strategic Plan priorities include conserving self-sustaining native fish populations for the maintenance of productive fisheries in healthy aquatic habitats, and maintaining healthy native fish populations through genetic diversity, harvest management, habitat improvements, and judicious use of hatchery stocks. High priority actions intended to restore and protect the quantity and quality of water available for fishery resources and aquatic ecosystem integrity include the establishment, maintenance, and protection of instream flows in important fishery habitats, and the recommendation of effective approaches for fish passage for hydroelectric and other water development projects.

HISTORY AND DESCRIPTION OF THE KLAMATH HYDROELECTRIC PROJECT

1. Location

The Klamath River watershed is located in northern California and southwestern Oregon. It covers approximately 12,000 square miles and extends more than 350 river miles from its headwaters to the Pacific Ocean (National Research Council 2003). More than half the watershed is mountainous, with extensive lowlands found only in southern Oregon in the upper part of the Basin. In California, lowlands occur irregularly, primarily in major tributary streams (U. S. Department of the Interior 1985). The Wood, Williamson, Sprague, and Sycan Rivers are the significant headwater tributaries that flow into Upper Klamath Lake. Water flows from Upper Klamath Lake into Link River, a short river (about 1.2 miles long), and then into Lake Ewauna near Klamath Falls, Oregon. The Klamath River officially begins at the downstream end of Lake Ewauna. Iron Gate Dam, at 190 river miles from the Pacific Ocean, is a commonly recognized dividing point between what is referred to as the upper and lower river basins.

Significant tributaries do not enter the lower Klamath River until the Shasta River joins the Klamath River in California, downstream from Iron Gate Dam. The Scott, Salmon, and Trinity Rivers and a number of creeks enter the Klamath River as it flows through California. The Klamath River enters the Pacific Ocean about 15 miles south of Crescent City, California.

Today, the watershed includes about 96,000 acres of tribal trust lands, four million acres of private lands, and six million acres of public lands. The Klamath basin includes six National Wildlife Refuges (Bear Valley, Clear Lake, Klamath Marsh, Lower Klamath, Tule Lake, and Upper Klamath), a National Park (Crater Lake), five National Forests (Fremont-Winema, Klamath, Shasta-Trinity, Modoc, and Six Rivers), two National Monuments (Lava Beds and Cascade Siskiyou), three Wild and Scenic River designations (Klamath River from J.C. Boyle Powerhouse to the California-Oregon border, North Fork Sprague River, and the Sycan River), and other public lands.

2. Klamath Reclamation Project

The Klamath Reclamation Project (Reclamation Project, or Irrigation Project) is located in the Upper Klamath River and the Lost River Basins in southern Oregon and northern California. The Reclamation Project provides irrigation water to agricultural lands within the Project and delivers water to two National Wildlife Refuges that are wholly located within the Project (Lower Klamath and Tule Lake National Wildlife Refuges). The Klamath Reclamation Project was authorized pursuant to the Reclamation Act of 1902 and construction began in 1905. As part of the Reclamation Project development, certain lakes were drained and opened for homesteads, diversion structures, canals and drains were constructed, and project storage was provided. In 1908, the first National Wildlife Refuge was established in the area and was overlaid on the Reclamation Project. Other refuges were established within and adjacent to the Reclamation Project in 1911 (Clear Lake) and in 1928 (Tule Lake and Upper Klamath Lake).

Link River Dam, operated by the Applicant under contract with Reclamation, regulates flow from Upper Klamath Lake (UKL) into Link River and thus into the Klamath River. Water diverted from UKL provides the majority of the irrigation supplies for the Klamath Irrigation Project lands. Mean net inflow into the lake is 1.2 million acre-feet per year. The lake has a total storage capacity of about 612,000 acre-feet but a maximum operational capacity of about 486,000 acre-feet from elevations 4143.3 feet to 4137.1 feet (USDI Bureau of Reclamation 2000). Reclamation currently operates the irrigation project pursuant to two Biological Opinions issued under the Endangered Species Act (ESA). The Biological Opinions require Reclamation to release water in a way that maintains minimum levels in Upper Klamath Lake and specified flows in the Klamath River below Iron Gate Dam. Reclamation issues annual operations plans based on a forecast of available supply, generally as of April 1st of each year. The plan includes a description of the Biological Opinion Requirements for Upper Klamath Lake and the Klamath River and estimated supplies of water for agriculture and refuges within the Reclamation Project. These values are modified as necessary based on the actual hydrology for that year.

3. Klamath Hydroelectric Project

The Klamath Hydroelectric Project is located on the Klamath River in Klamath County, Oregon; and Siskiyou County, California (Figure 1). The Project consists of five mainstem dams (four of which supply powerhouses), two powerhouses at the federal Link River Dam, and one tributary facility. The dams are small to medium size, ranging in height from 25 to 173 feet in height, and impound small to medium sized, narrow reservoirs. The segment of the Klamath River between Link River Dam and Iron Gate Dam consists of about 24 miles of river reaches and about 36 miles of reservoirs, as follows:

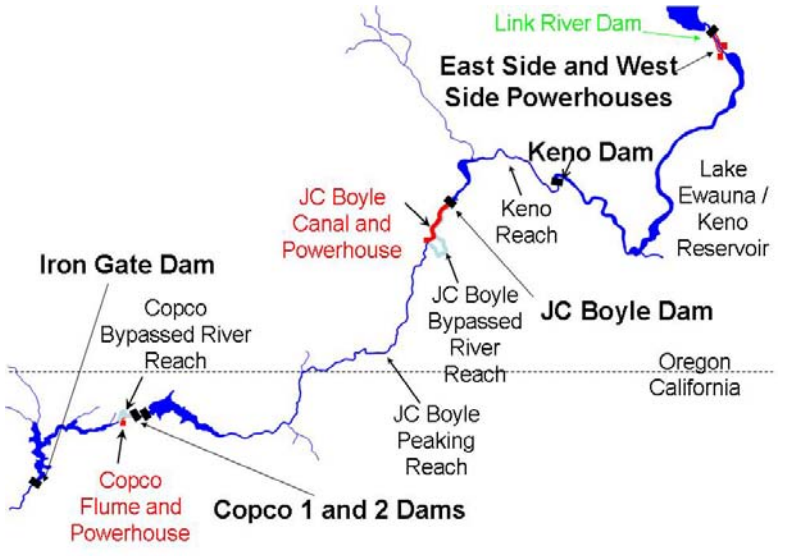


Figure 1. Project Location

- At Reclamation's Link River Dam, at the lower end of Upper Klamath Lake, the Eastside and Westside Powerhouses receive water diverted into canals on each side of the river. The Link River flows into Lake Ewauna, which is the upper end of an impounded reach of the Klamath River that is also known as Keno Reservoir, controlled by Keno Dam.
- Keno Dam is at River Mile (RM) 233, approximately 20 miles downstream from Link River Dam. Below Keno Dam, the 4.7-mile long Keno Reach flows into J.C. Boyle Reservoir (also known as Topsy Reservoir), created by J.C. Boyle Dam.
- J.C. Boyle Dam is at RM 224.7. Here most of the flow is diverted out of the river through a canal around the four-mile J.C. Boyle Bypassed River Reach. The canal extends to the J.C. Boyle Powerhouse at RM 220.4. Below the powerhouse, the 17-mile J.C. Boyle Peaking Reach of the Klamath River receives a daily peaking regime.
- Near RM 209, the river crosses into California, and enters Copco Reservoir near RM 204. Copco Reservoir is impounded by Copco 1 Dam at RM 198.7, where flow is diverted into the adjacent Copco 1 Powerhouse. About one-half mile below this powerhouse, Copco 2 Dam diverts almost the entire flow from Copco 2 Reservoir into a penstock around the 1.4-mile Copco Bypassed River Reach to Copco 2 Powerhouse at RM 196.8.
- Below Copco 2 Powerhouse, the river flows into Iron Gate Reservoir, impounded by Iron Gate Dam at RM 190. This is the furthest downstream of the Project facilities. Here the flow passes through the Iron Gate Powerhouse, and then the Klamath River continues for 190 miles to the Pacific Ocean.
- The Fall Creek development is the smallest in terms of generation, the oldest, and the only development not on the mainstem Klamath River. Flow from Spring Creek (in the Jenny Creek watershed) is diverted into Fall Creek in Oregon, and these waters flow

through the Fall Creek Powerhouse about one mile above Fall Creek's juncture with the upper end of Iron Gate Reservoir.

4. Proposed Klamath Hydroelectric Project Boundary

The proposed Project boundary included in the FLA would reduce the Project footprint and decrease the amount of United States-owned land within the Project boundary. The proposed boundary would affect resources administered by BLM and Reclamation. For BLM the reduction would be from approximately 219 acres in the current license to 156 acres in the proposed license. The types of facilities that would be removed from the Project include a mainstem dam, roads, trails, campgrounds, boat launch and take out sites, dispersed camping sites and day-use areas. The Department has many concerns about the proposed boundary changes including the exclusion of:

a) Keno Dam;
b) Project roads and facilities operations and maintenance;
c) the JC Boyle Bypassed River Reach and the J.C. Boyle emergency spillway; and
d) Topsy campground.

a) Keno Dam

PacifiCorp has proposed to exclude Keno Dam from the boundary of the Project. The Department opposes this proposed exclusion, as PacifiCorp's Keno development is part of a complete unit of hydroelectric development that benefits from the release of water from Reclamation's Link River Dam and return flow from the Reclamation Project, and it is integral to flows necessary for power generation below Keno Dam. Keno regulates water for power production at JC Boyle Powerplant, and moderates the impacts of peaking at the East Side Powerplant, as seen in the graphs from 2005 water deliveries and power production below (Fig. 2, 3, and 4). The changes in flows at Keno Dam depicted here are strictly for power production, not to meet the needs of Reclamation downstream. Therefore, the Commission should continue to include Keno Dam in the Project boundary.

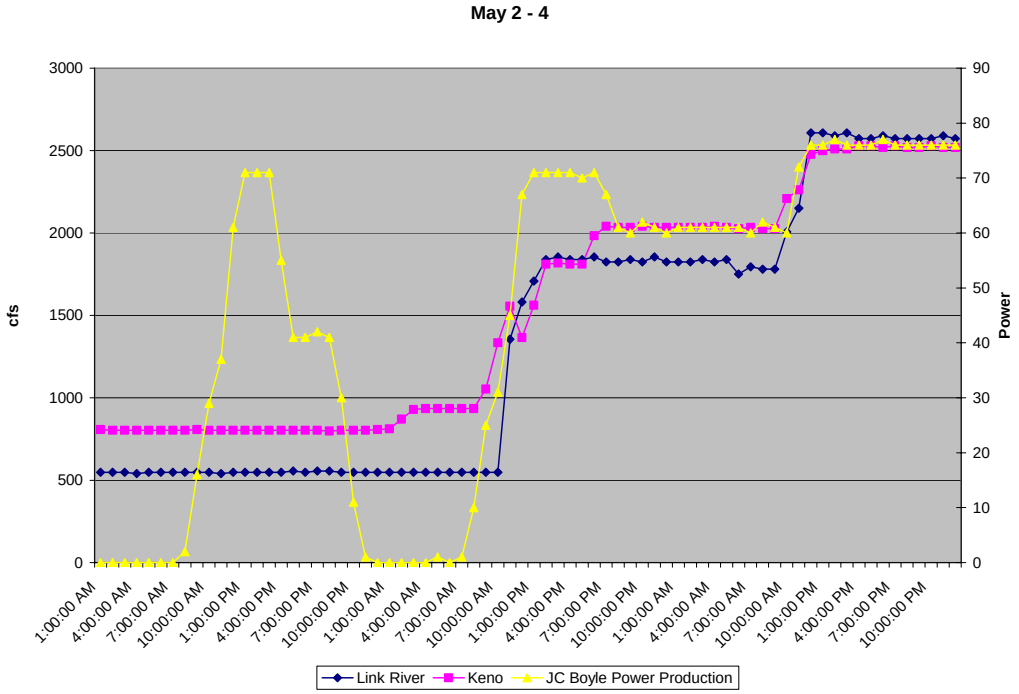


Figure 2: Keno Operations to Benefit Hydropower, May 2-4, 2005

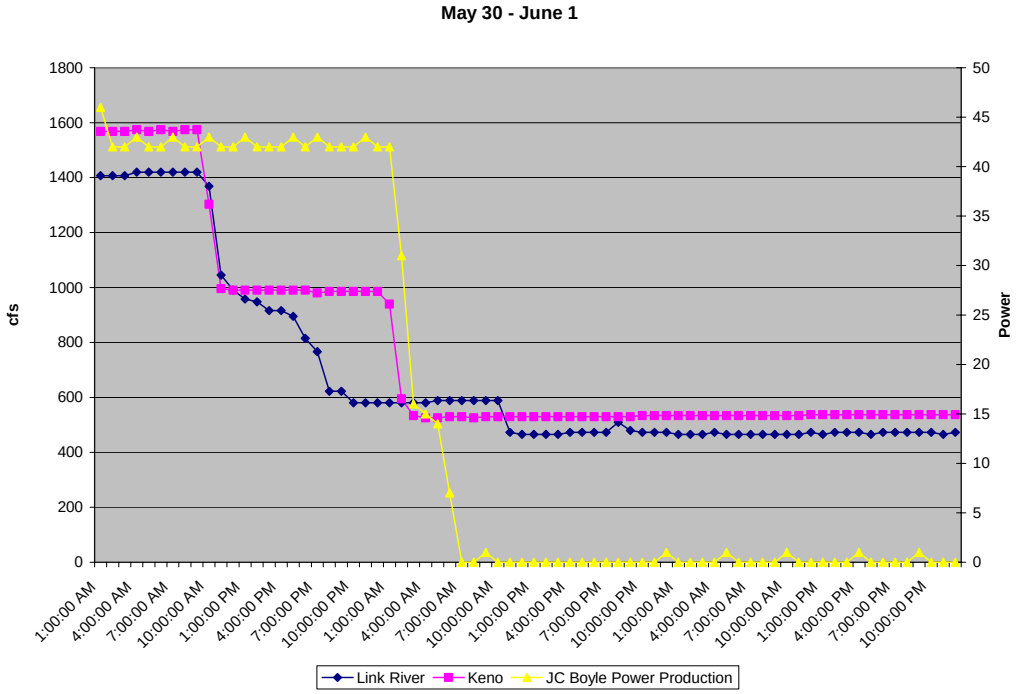


Figure 3: Keno Operations to Benefit Hydropower, May 30-June 1, 2005

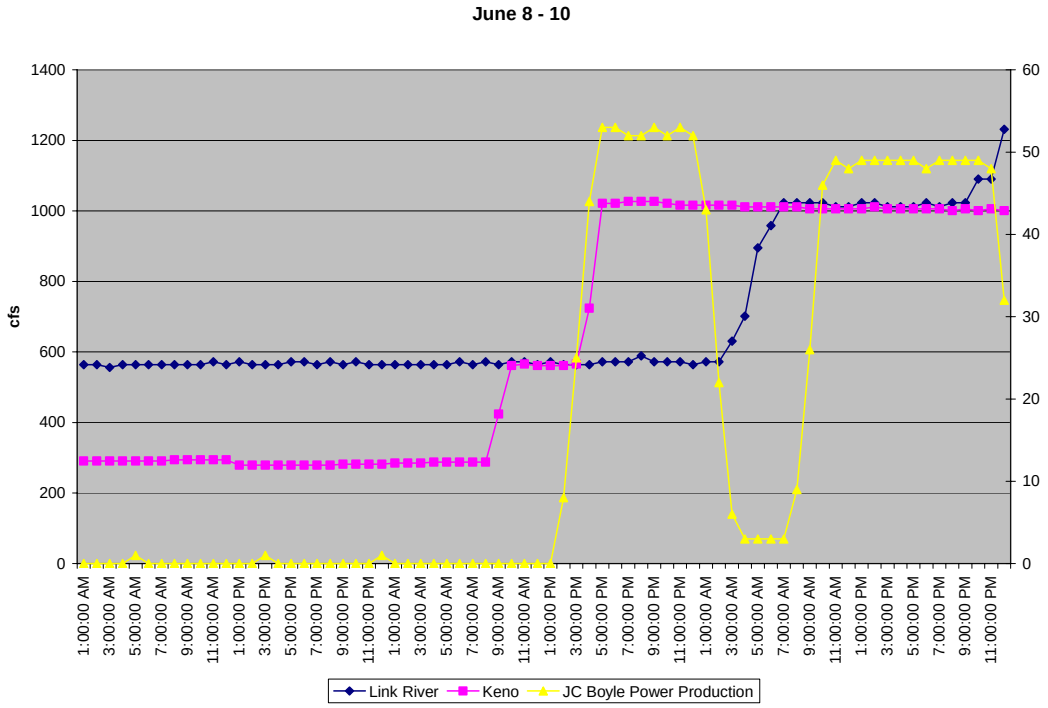


Figure 4: Keno Operations to Benefit Hydropower, June 8-9, 2005

Should the Commission decide not to allow decommissioning of the East Side and West Side Powerhouses, there would be still more evidence that Keno Dam services Project purposes. A representative of PacifiCorp testified in the Oregon PUC hearing that there were times when PacifiCorp used its flexibility to manage Link River Dam.[1] Large daily fluctuations can be directly attributed to the operation of the East Side Powerplant downstream of Link River Dam for peaking operations. A representative peaking operation is evident in gage data from August 3-5, 2005.

The Federal Power Commission found the original Keno Dam to be jurisdictional in 1960. The existing Keno Dam was licensed to be constructed with no generating facilities in 1965. The existing Keno Dam was constructed partially on federal lands subject to the Commission's express provision that the licensee enter into a formal agreement with Reclamation for the purpose of regulating the level of Lake Ewauna between Keno Dam and Link River.[2]

[1] Transcript of Oregon Public Utilities Commission hearing for Rate Case UE 170, dated February 16, 2006

[2] Contract between the United States of America and Pacific Power & Light Company, Contract No. 14-06-200-3579A, dated January 4, 1968.

The Department's position that Keno Dam should remain a part of any new license issued for the Project and that the use of Link River Dam is critical to the Project is supported by the FPA.[3] Section 3(11) of the FPA defines "project" to include ditches, dams, reservoirs, lands or interest in lands the use and occupancy of which are necessary or appropriate in the maintenance and operation of the proposed power development. PacifiCorp admits in the FLA that the operation of Keno Dam serves Project purposes: "In operating Keno Dam, PacifiCorp can more effectively schedule and plan load following operations at the J.C. Boyle powerhouse." (FLA, Exhibit B, Page 8-2). Moreover, PacifiCorp recognizes that Keno operates as a re-regulation facility (Comments of PacifiCorp Regarding Proposed Readjustment of Annual Charges, Feb 21, 2006 at 4, 13.)

Keno Dam is used by the Applicant as an upstream regulating reservoir to provide inflow to its downstream power production facilities. Reclamation currently has an agreement with PacifiCorp that PacifiCorp operate Keno Dam to hold Lake Ewauna / Keno Reservoir within a variance of only 0.5 foot. Because of its large surface area, approximately 5,900 acre feet of water storage are provided by the 0.5 foot variance in reservoir elevation, which equates to approximately 30 days of a flow of 100 cfs. The practice of using reservoir storage to follow short-term peaks in power demand – known as load following – results in rapid and significant changes in river flow and reservoir elevation. The larger storage behind Keno Dam (which is more than at J.C. Boyle Reservoir), with a 0.5 foot daily reservoir fluctuation, has given PacifiCorp more options to maximize peaking at the downstream J.C. Boyle and Copco peaking facilities. PacifiCorp's Keno Reservoir storage is being utilized to provide flow fluctuations in support of hydroelectric peaking operations at J.C. Boyle Dam, downstream.

PacifiCorp states that flows below Keno Dam, in the Keno Reach, are dependent entirely on what is delivered to the Link River to Keno reach by Reclamation and other irrigation operations and that PacifiCorp has no discretion or control over flows in the Keno Reach. However, there is great discretion on when those accumulated flows are delivered to the reach below Keno Dam, as can be seen in the previous graphs. This claimed lack of control is also contradicted by the fact that 80 percent of the inflow to Lake Ewauna is from Link River while approximately 20 percent is from agricultural returns with a very small amount from municipal and industrial inputs (PacifiCorp 2004, FLA WTR). PacifiCorp can and does alter flows in the Link River and Keno Reach for hydroelectric Project purposes, including maintenance actions, and to maximize peaking at downstream Project peaking facilities.

[3] As to Keno Dam, PacifiCorp is still under contract to Reclamation as part of Project No. 2082 to operate Keno Dam. See Article 55 of PacifiCorp's FERC license issued in Order dated 11/29/1965, 34 F.P.C. 1387 (requiring "formal agreement" or the Commission will prescribe terms for regulation of Lake Ewauna). The 1968 contract between PacifiCorp and Reclamation for Keno Dam references the FPC order, Article 55. See also Order dated 6/20/1969, 41 F.P.C. 824. Even if PacifiCorp "excludes" Keno Dam from its Project, PacifiCorp is still required to operate Keno Dam under its contract with Reclamation. Thus, PacifiCorp is contractually required to operate and maintain Keno Dam as long as PacifiCorp operates the Project. Thus, Keno Dam must remain a part of the Project.

The relationship of Link River and Keno Dams to the Project confirms that Keno Dam is necessary to the operation of the Project. The Link River Dam is a Reclamation facility currently operated by PacifiCorp under contract with Reclamation. Water released from Upper Klamath Lake via Link River Dam, continues downstream through the power project. This water is essential for the operation of the Project. In addition to the water released from Link River Dam that is delivered through the power project, Keno Dam captures and re-regulates additional surplus water from the Klamath Reclamation Project that is delivered to the river through pumping at three large federal pumping plants. This pumped surplus water is accrued through recirculation of drainage water that is pumped into the system by private and water district pumps, in addition to the federal pumping. In the period 1997 through 2004, a period significantly drier than the period 1956 through 1996 (an average of 291,180 acre-feet less annual inflow into Upper Klamath Lake), deliveries of that available water actually increased by 5.5% of the average annual inflow, providing relatively more water for generation by PacifiCorp that was provided in the previous period, as shown in the Table 1.

Table 1. Klamath River Flow Measured at Keno Oregon (All quantities are in thousands of acre-feet)

Wtr Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	UKL Inflow	% of UKL Inflow Past Keno
Avg 56-96	90.8	113.4	143.2	145.4	138.9	191.2	148.2	100.1	46.7	32.0	46.3	65.3	1261.6	1421.2	88.8%
Avg 97-04	61.8	67.7	90.5	149.8	141.8	163.7	139.1	117.9	71.3	38.6	39.2	44.4	1065.8	1130.0	94.3%
Avg Diff	29.0	45.6	52.7	-4.5	-2.9	27.5	9.2	-17.8	-24.6	-6.6	7.1	20.9	195.8	291.2	

If FERC concludes that Keno is not part of the Project, it must commence a decommissioning proceeding, subject to FERC regulations and its Decommissioning Policy.[4] The manner in which the Keno dam is to be operated must be described, and the effects of those operations must be analyzed, including the contractual obligations PacifiCorp has to Reclamation to operate Keno Dam.

[4] 69 FERC ¶ 61,336 (1994): "In those instances where it has been determined that a project will no longer be licensed, because the licensee either decides not to seek a new license, rejects the license issued, or is denied a new license, the project must be decommissioned."… "The Commission is of the opinion that implicit in the section 6 surrender provision is the view that a licensee ought not to be able simply to walk away from a Commission-licensed project without any Commission consideration of the various public interests that might be implicated by that step. Rather, the Commission should be able to take appropriate steps that will satisfactorily protect the public interests involved."…"Absent specific authority by the Federal agency involved for continued use of Federal lands at the termination of Commission licensing, it is eminently reasonable that the licensee must restore the lands to that agency's satisfaction, at the licensee's expense." See 18 CFR Sec 6.2 (on surrender a licensee is required to restore lands of the United States to a condition satisfactory to the Department administering those lands).

b) Roads and Facilities

Impacts to BLM-administered resources from construction and operation of facilities include erosion, impacts to hydrologic function, the spread of noxious weeds, fragmentation of wildlife habitat, and increased mortality of wildlife. Per 18CFR § 4.41(h)(2):

"The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of the environmental resources."

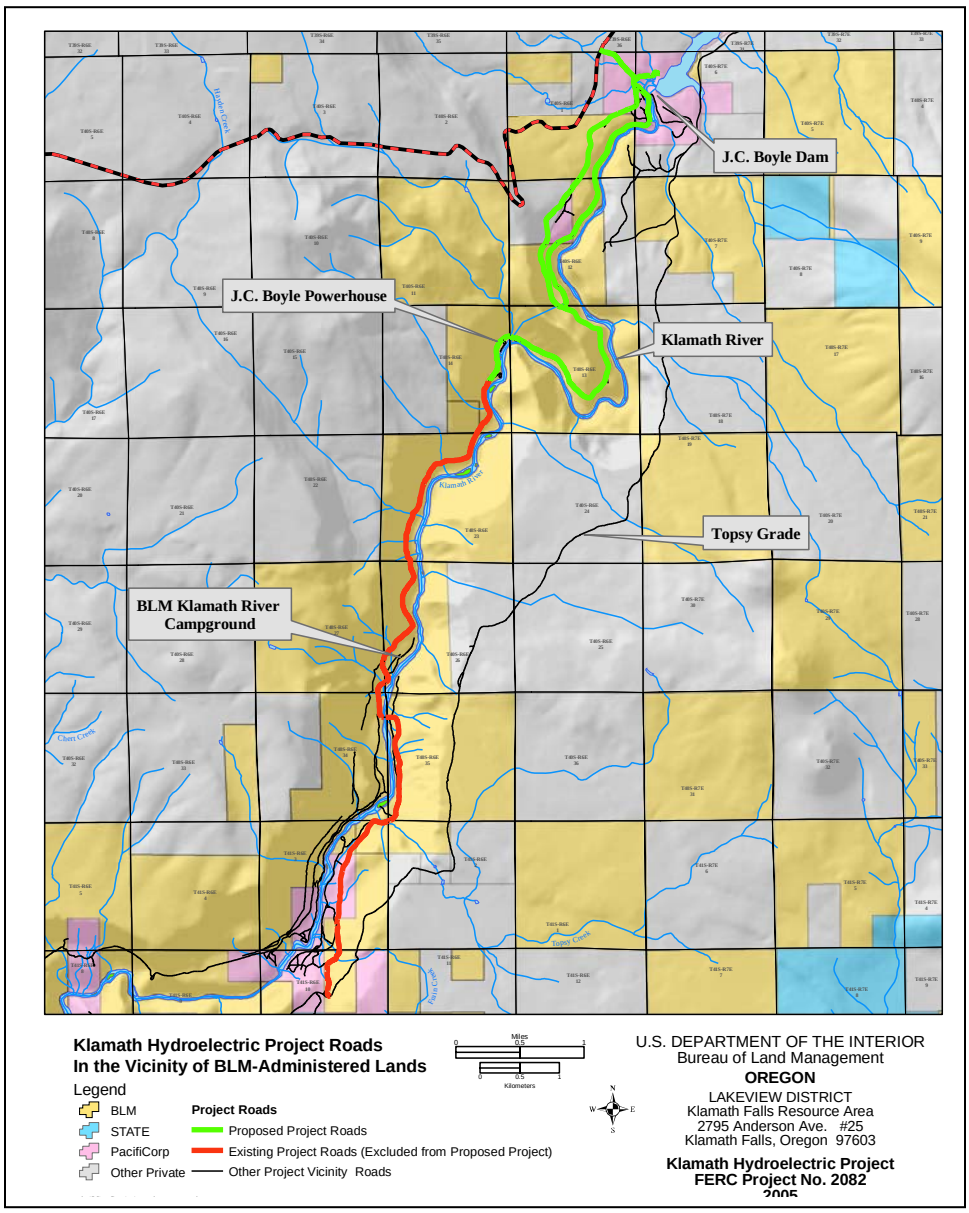
The proposed boundary adjustment excludes roads that were constructed and are currently utilized by PacifiCorp for Project operation and maintenance. Some of these roads have subsequently been used to access recreation facilities maintained by BLM for recreation uses that were enhanced as a function of the Project. Per 18 CFR § 4.41 (h) (2) (ii):

"The boundary around linear (*continuous*) project features such as access roads, transmission lines, and conduits may be described by specified distances from center lines or offset lines of survey. The width of such corridors must not exceed 200 feet unless good cause is shown for a greater width."

The proposed Project boundary excludes 5.6 miles of the Powerhouse Road (Figure 5, Klamath Hydroelectric Project Roads Map). The southern portion of the Powerhouse road between the Spring Island boat launch and the junction with Topsy Grade should be included in the new license for the following reasons:

- This Powerhouse road is adjacent to the Klamath River. The entire length of this road was withdrawn in 1959 for FERC Power Project #2082, Klamath Hydroelectric Project.
- This road continues to provide needed access for the operation and maintenance of PacifiCorp's transmission lines covered by 1970 and 1980 Rights-of-Ways.
- Regular maintenance of this road is required to prevent resource degradation and provide access to recreation sites associated with the Project.

Figure 5. Klamath Hydroelectric Project Roads



c) J.C. Boyle Bypassed River Reach

The J.C. Boyle Bypassed River Reach of the Klamath River (Bypassed Reach) is necessary for the operation of the Project. Per 18CFR § 4.41(h)(2):

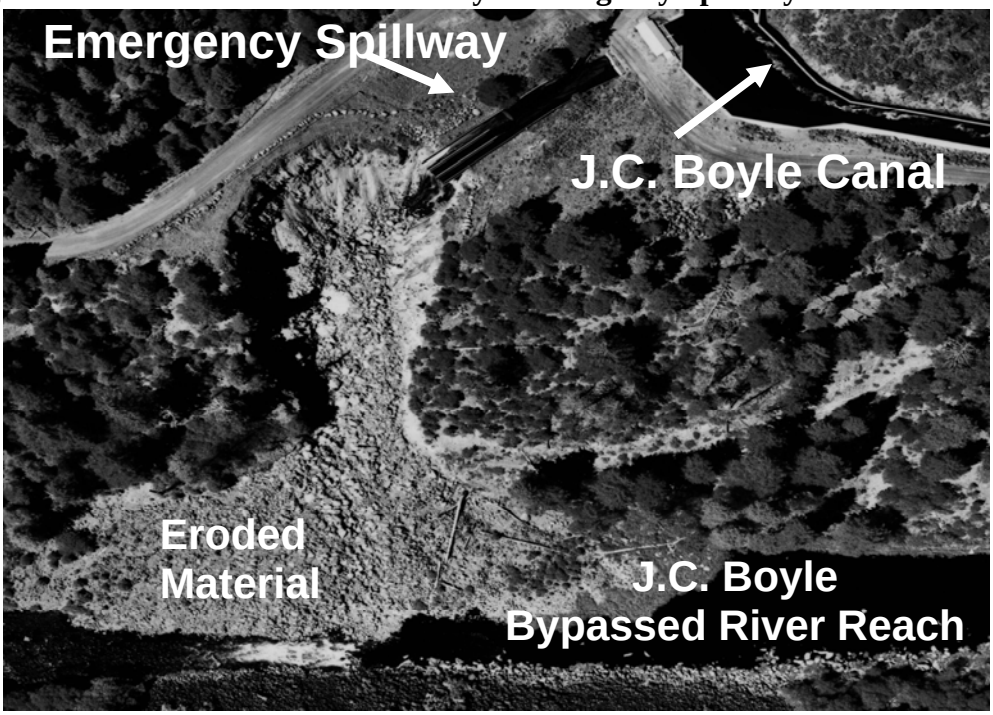
"The boundary must enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of the environmental resources."

The J.C. Boyle Bypass Canal (Canal) has direct impacts on the Bypassed River Reach through at least two mechanisms: the J.C. Boyle Canal Emergency Spillway (Emergency Spillway) and breach of the Canal. These impacts make it necessary for PacifiCorp to manage the Bypassed River Reach for bank and floodplain stability and to reduce channel constriction. Both the Canal and Emergency Spillway have eroded hillslope material into the Bypassed Reach during the course of the current license.

Emergency Spillway: The proposed boundary excludes the area below the Emergency Spillway located near the downstream end of the Canal. Project operations have caused overflow from the spillway to surge onto steep, unprotected slopes and created hillslope erosion which has entered the J.C. Boyle Bypassed River Reach. The attached aerial photograph shows the extent of hillslope erosion as of August 6, 2001 (Figure 6). BLM estimates that over 80,000 cubic yards of material has been eroded from the hillside and a substantial portion of that material has entered the Bypassed River Reach. This equates to an average of nearly 2,000 cubic yards per year. Although modifications have been proposed to prevent recurring overflow of the J.C. Boyle Canal, the existing resource degradation is a direct result of PacifiCorp's operation of the facility.

The deposition of the eroded hillslope material below and downstream of the Emergency Spillway has diverted the direction of the water flow toward the opposite bank causing bank erosion. The hillslope erosion has also added large amounts of sediment that have been deposited in the middle of the channel. Consequently, use of the Emergency Spillway during the course of Project operations has had direct effects on aquatic and riparian habitat.

Figure 6. Erosion from use of J. C. Boyle Emergency Spillway



J.C. Boyle Bypass Canal Failure: In December of 2005,a rockslide damaged the J. C. Boyle Bypass Canal (Canal). The rockslide originated above the Canal and was likely the result of heavy precipitation and freeze-and-thaw conditions. Debris and a large rock traveled downslope creating a hole in the Canal. Water flowed from the hole and eroded the lower Canal road fill and adjacent hillslope depositing the material on the floodplain and in the Bypassed River Reach. Consequently, the Canal had direct impacts on the J.C. Boyle Bypassed River Reach when this breach in the Canal caused water to surge onto steep, unprotected slopes and created hillslope erosion contributing substantial amounts of sediment (approximately 75,000 to 100,000 cubic yards) to the Bypassed Reach (Figure 7).

In response to this event, PacifiCorp proposed and implemented emergency repair and mitigation in consideration of the BLM resources. The BLM and PacifiCorp evaluation of this site determined that the rock slide, subsequent canal leakage and hillslope erosion required remedial action to mitigate and prevent further damage to BLM administered resources. Mitigation included excavation of eroded material on the alluvial fan, surface stabilization measures (seeding, mulching) and removal of eroded material on floodplain. PacifiCorp plans to begin follow-up actions at the site in the spring of 2006 (PacifiCorp letter to BLM Field Manager, Klamath Falls Resource Area, dated February 28, 2006).

The potential for Canal failure due to a breach caused by a rockslide will continue to be present due to the steepness of the hillslope and natural climate driven processes such as heavy precipitation and freeze-and-thaw of the hillslope materials.

Figure 7: Erosion from December 2005 J.C. Boyle Canal Breach

The J.C. Boyle Bypassed River Reach should be included as part of the Project boundary. The Bypassed Reach will continue to be necessary for operation and maintenance of the Project under the new license. The J.C. Boyle power canal and the Emergency Spillway are both located upslope from the Bypassed River Reach. Project related operations occur in the Bypassed River Reach whenever there is a canal failure, when the emergency spillway is used or when spill occurs. The Bypassed River Reach lies between two of PacifiCorp's facilities and is affected by the diversion of water essential for Project operations. The Project, as proposed in the FLA, includes enhancement flows and ramping rates for the reach to mitigate impacts on fisheries. In addition, under the BLM's preliminary conditions, the Licensee will perform a number or ongoing activities in the Bypassed River Reach, including gravel augmentation and evaluation and monitoring activities. Therefore, the J.C. Boyle Bypassed River Reach should be included in the Project boundary since it is used during Project operations of the J.C. Boyle Canal and the Emergency Spillway; and is necessary for the protection of the environmental resources.

d. Topsy Campground

The Topsy Campground is located on J.C. Boyle Reservoir within Powersite Withdrawal #258 authorized by Executive Order #6910, and is included in the license for Project No. 2082 (Commission letter to BLM State Director, Oregon, dated March 1, 1963). The proposed boundary change would exclude the Topsy Campground. The Topsy Campground is the only developed and staffed camping facility on the J.C. Boyle Reservoir. Demand for camping at Topsy Campground is high on most weekends during summer months; however, the number of campsites (16), group sites, and improved day-use sites are limited.

The Topsy Campground was established due to the creation of the J.C. Boyle Reservoir, and should be included in the Project boundary as part of Project-related public recreation. Per 18 CFR § 4.41 (h) (2) (iii) (B):

"The boundary must enclose only those lands that are necessary for safe and efficient operation and maintenance of the project or for other specified project purposes, such as public recreation or protection of environmental resources."

RESOURCES AFFECTED BY THE PROJECT

This section summarizes information on the presence and status of several high priority fish and wildlife species within and near the Project area. More detail on these and other species is found in the discussion of impacts within the section 18 prescriptions and the section 10 recommendations.

AQUATIC RESOURCES

A. Threatened and Endangered Species

1. Lost River and Shortnose Suckers

The Lost River sucker and shortnose sucker are large, long-lived suckers endemic to the upper Klamath Basin of Oregon and California upstream of Keno. Both species are typically lake-dwelling for most of the year, but migrate to tributaries or shoreline springs to spawn during spring months (Scoppettone and Vinyard 1991). Once extremely abundant and important for subsistence by the Klamath Tribes, both species have experienced severe population declines in the upper basin and were federally listed as endangered in 1988 (USDI Fish and Wildlife Service 1988). Historically, Lost River and shortnose suckers passing downstream past the current site of Keno Dam were probably lost to the population, because suitable habitat did not exist downstream and they are not capable of swimming upstream in high gradient currents.

The creation of reservoirs at the four lower Klamath River hydroelectric facilities (J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate) provided a minor expansion of the range of these two sucker species (Buettner and Scoppettone 1991; Moyle 2002). Apparently suckers pass downstream from UKL through Link River and Keno Reservoir, and those that survive passage through the hydro dams may be retained in the Project reservoirs (National Research Council 2003). The reservoirs do not provide habitat for sucker spawning, and spawning has not been documented in the flowing reaches immediately upstream of Keno, J.C. Boyle, and Iron Gate reservoirs (Desjardins and Markle 2000; USDI Fish and Wildlife Service 2001a). Some shortnose sucker spawning occurs in the Klamath River above Copco Reservoir, but larval and juvenile survival appears low (Beak Consultants Inc. 1988). Several age classes exist in J.C. Boyle Reservoir, but it is believed that all of these fish arrived from upstream.

Upstream sucker passage is blocked at Iron Gate, Copco 1, and Copco 2 dams. Upstream passage facilities at J.C. Boyle and Keno dams are ineffective or do not comply with criteria for sucker passage (USDI Fish and Wildlife Service 2005). Reclamation completed a new fish ladder on Link River Dam in December 2004 designed for sucker passage.

Sucker populations in the Project reservoirs generally do not have a high potential for contribution to recovery because they are not part of the original habitat complex of the suckers, and the reservoirs probably are unsuitable for completion of life cycles by the suckers (National Research Council 2003). However, maintenance of adults in these locations does provide some insurance against loss of other subpopulations. As such, Service conditions and recommendations are generally limited to minimization of take in the facilities in the upper portion of the Project, and the provision of capacity to capture suckers below Keno Dam for possible use in recovery actions elsewhere.

2. Bull Trout

Bull trout once ranged widely in the Upper Klamath Basin, with stream-resident fish and juveniles in the headwaters, and large fluvial fish in the rivers and adfluvial fish in Upper Klamath Lake (Light et al. 1996). Klamath River bull trout were listed under the ESA as a distinct population segment in 1998 (USDI Fish and Wildlife Service 1998) because they are physically isolated from other bull trout by the Pacific Ocean and several small mountain ranges in central Oregon. Currently, bull trout are found in three core areas and nine currently identified local populations in the small headwater streams above Upper Klamath Lake well above the Project area. Water temperatures above 15°C are believed to limit their distribution (Rieman and McIntyre 1995). Because of this limitation, bull trout are unlikely to occur in the Klamath River below Upper Klamath Lake and are not directly affected by the Project. However, return of anadromous fish to streams occupied by bull trout would provide greatly increased forage resources for this species.

3. Coho Salmon

The historic distribution of coho salmon in North America included coastal streams from Alaska to central California (Moyle 2002; Weitkamp et al. 1995). Historically, coho occurred in the Klamath River as far up as Spencer Creek, but there is no evidence of occurrence above Keno (Hamilton et al. 2005) Presently, coho are known to spawn in several tributaries below Iron Gate Dam, including Bogus Creek and the Shasta and Scott Rivers. Limited information exists regarding coho numbers, because counts are typically only made incidentally to determining fall Chinook salmon escapement. Also, most counting weirs are removed prior to high winter flows and therefore counting efforts may not include a portion of the coho salmon migration.

The SONCC coho salmon Evolutionarily Significant Unit (ESU) was originally listed as threatened under the ESA on May 6, 1997 (National Marine Fisheries Service 1997). In June, 2005, the species was again listed following a review. Coho salmon in California were officially added to the State's threatened and endangered species list effective March 30, 2005.

In contrast to the life history patterns of other anadromous salmonids, coho salmon in California generally exhibit a relatively simple 3-year life cycle. Coho begin the freshwater migration from the ocean to their natal streams after heavy late-fall or winter rains breach the sand bars at the mouths of coastal streams ((Sandercock 1991) in (Groot and Margolis 1991)). Migration continues to March, generally peaking in December and January, with spawning occurring shortly after returning to the spawning ground (Shapovalov and Taft 1954). Water temperatures for good survival and growth of juvenile coho salmon range from 10-15°C (Bell 1986). (Shapovalov and Taft 1954). Coho require clear, well-oxygenated water and low temperatures. Preferred temperatures are 12-14°C, although juveniles can under some conditions live at 18-29°C for short periods (McCullough 1999 and Boyle 2002 in (National Research Council 2003)).

If suitable habitat is available, coho juveniles spend their first summer in natal streams. Outmigration of yearlings occurs in the second spring, but first-year coho fry are observed along with coho yearlings in the mainstem Klamath River during trapping of outmigrant Chinook salmon during spring and summer months (Shaw et al. 1997).

B. Resident Species

1. Redband Trout

Redband trout are a unique resident rainbow trout whose ancestors entered the upper Klamath Basin when it was connected to the Columbia Basin via the Snake River (Behnke 1992). Coastal rainbow trout (steelhead) later entered the Upper Basin, but the redband trout derived from the Columbia Basin maintained its identity and is recognizable by its morphology and color. Redband trout can survive at higher temperatures than most other western trout. Native stocks of redband trout in the Klamath watershed have also evolved resistance to an endemic protozoa disease, *Ceratomyxa shasta*, which is highly lethal to nonnative trout (Oregon Department of Fish and Wildlife 1997). The Oregon Basin redband trout, which includes the Klamath Basin populations, is listed as a state sensitive species (Oregon Department of Fish and Wildlife 1997).

Redband trout that rear in Upper Klamath Lake and the Klamath River migrate to tributaries to spawn in good quality flowing water, with appropriate depth and velocity, over a gravel substrate in which fish dig redds and deposit their eggs. The primary spawning streams within the Project are Spencer Creek and Shovel Creek.

Adult redband trout in Upper Klamath Lake and the Klamath River can reach 18-28 inches in fork length, and are a prized game species. Restrictive fishing regulations are in place in both Oregon and California. The whole river is restricted to the use of barbless flies and lures only.

Prior to construction of J.C. Boyle Dam in the late 1950s, the Klamath River wild trout population was noted for its abundance and large fish. Trout migrated freely through all reaches and many spawned in Spencer Creek, a principal tributary to the Klamath River. Redband also migrated upstream to the Williamson-Sprague River systems above Upper Klamath Lake (Fortune et al. 1966). A fish ladder constructed at J.C. Boyle Dam was intended to provide for this passage. However, from 1961 to 1991, the number of fish using the ladder declined by 94 percent, and the average size ascending the ladder diminished from twelve to 7 inches (Hanel and Gerlach 1964; Hemmingsen 1997).

The Project directly impacts redband trout survival through entrainment and stranding during down-ramping and indirectly affects their habitat through changes in hydrology, geomorphology, water quality, and riparian resources. Many of these impacts are discussed in the following sections on the J.C. Boyle peaking reach, bypassed river reach, and dam.

C. Anadromous Fish Species

1. Chinook Salmon

Chinook salmon support a wide variety of valuable commercial, recreational, and Tribal fisheries in California, Oregon, Washington, and Alaska. Currently they spawn in suitable rivers from the Sacramento-San Joaquin river system northward through British Columbia and Alaska, as well in northeast Asia. The National Research Council (National Research Council 1996) reported that Pacific salmon have disappeared from about 40 percent of their historical breeding ranges in Washington, Oregon, Idaho, and California, and that many of the remaining populations are severely depressed.

Historical records indicate that Chinook salmon were distributed throughout the Klamath River Basin, including above the current site of Iron Gate Dam (Hamilton et al. 2005). Chinook salmon historically spawned in the Williamson and Sprague Rivers above Upper Klamath Lake (Fortune et al. 1966; Lane and Lane Associates 1981), but quantitative assessments of anadromous fish distribution are lacking. Major Tribal harvest stations were located well upstream in the Sprague River, and salmon spawning was reported in the North and South Forks of the Sprague River.

Chinook salmon exhibit many life-history strategies, including variation in age at seaward migration, variation in length of freshwater and estuary residence, variation in ocean distribution and migration patterns, and variation in age and season of spawning migration (Healey 1991 in Groot and Margolis 1991). Snyder (1931) reported that spawning Chinook salmon appeared to enter the Klamath River at all seasons, with peak abundances occurring in the spring and the mid-summer to early fall periods. Both spring and fall run Chinook spawned in areas above the current location of the Project, but were cut off from perhaps 40 percent of the available habitat by completion of Copco I Dam in 1918.

The spring and fall runs are the two primary runs known in the Klamath system. Although spring-run Chinook were the dominant run historically (Gatschet 1890; Spier 1930), this run has now been reduced to remnant status, with only a few hundred fish spawning in the wild. The only substantial spring run remaining in the Klamath watershed spawns at Lewiston Hatchery on the Trinity River. In the wild, adult spring run fish hold in deep cool pools during the summer before spawning, and juveniles may also over-summer in riverine habitat. This habitat type has been substantially reduced by human activity in the 19th and 20th centuries (National Research Council 2003).

Fall-run Chinook are now the predominant Chinook run in the basin. This run is confined to the Klamath River and tributaries downstream of Iron Gate Dam, and to the Trinity River and tributaries downstream of Lewiston Dam. Fall run Chinook enter the river in late August, September, and early October. They spawn in the main rivers, in numerous tributaries, and at Iron Gate and Lewiston Hatcheries. Juveniles depart the river in late spring and summer at less than one year of age. Spawning fish return at age 3 and 4. Numbers of fall Chinook salmon

returning to the river in 1978-2003 averaged approximately 125,600 fish per year, and ranged from 34,000 fish in 1991 to 239,000 fish in 1986 (CDFG unpublished data). The coast wide salmon Fishery Management plan (FMP) developed by the Pacific Fishery Management Council includes a conservation goal for Klamath river fall Chinook (measured as fish spawning naturally in streams) of 33-34 percent of potential spawners in each brood while providing a minimum of 35,000 adult spawners to natural spawning areas each year (Myers et al. 1998; Pacific Fishery Management Council 2003).

Providing Chinook salmon access to their historical habitat range could substantially increase Klamath Basin populations, but we cannot determine with certainty how much overall Basin productivity would increase. Developing estimates of the historical anadromous fish production from above Upper Klamath Lake prior to habitat degradation is also difficult. However, the dams block access to more than 340 miles of river (not including areas currently inundated by project reservoirs) which probably produced large numbers of Chinook salmon. Despite the uncertainties associated with estimating potential current or historical production, it is reasonable to expect that substantial runs of anadromous fish can be restored to the areas above Iron Gate Dam.

2. Steelhead

Steelhead are the anadromous form of coastal rainbow trout. Historically, steelhead trout occurred in coastal river systems ranging from Alaska, British Columbia, Washington, Oregon and California, to the Tijuana River in northern Mexico (National Research Council 1996). The current southern limit of steelhead distribution is Malibu Creek in southern California (Busby et al. 1996), but occasional spawning may occur in a few streams farther south. In the Klamath system, steelhead formerly occurred far up into tributaries of Upper Klamath Lake, and were important to the Klamath Tribes.

Unlike other salmon species, steelhead do not typically die after spawning and may spawn several times during their lifespan. Steelhead may migrate into the Klamath River at any time of the year, but peak spawning runs occur in the fall, winter, and summer periods (Barnhart 1994; Busby et al. 1996; USDI 1985; Shaw et al. 1997). In general, summer steelhead migrate into the river from March through June. Fall steelhead typically migrate in August through November, and winter-run steelhead migrate in December through March. Winter-run fish enter the river sexually mature, while summer-run fish enter the river in a sexually immature condition and require several months to mature and spawn. They migrate far up into small streams and use habitats inaccessible to larger salmon species. Fry hatch in March through June and the juvenile fish spend one or two years in the stream prior to moving out into the mainstem river (Shaw et al. 1997).

CDFG (2001) reported that the Klamath River system supported the largest population of steelhead in the state. From 1977-1983 steelhead populations ranged from 87,000-181,410 adults annually, including the Trinity River; however, steelhead have declined dramatically in

the Klamath River, most likely due to high summer water temperatures in the mainstem river (CDFG 2001). Even so, a substantial recreational steelhead fishery remains on the river.

Developing estimates of the historical steelhead production from above UKL prior to habitat degradation is difficult. Currently, abundant populations of redband trout occupy the areas presently considered suitable for anadromous steelhead. Providing access to their historical habitat range could substantially increase Klamath Basin steelhead populations. The dams block access to more than 300 miles of stream habitat which could once again produce substantial numbers of steelhead (Huntington 2006).

3. Pacific Lamprey

Pacific lampreys are the most widely distributed lamprey species on the west coast of the United States. Their distribution includes major river systems such as the Fraser, Columbia, Klamath-Trinity, Eel, and Sacramento-San Joaquin Rivers. Pacific lamprey distribution patterns are similar to anadromous salmonids (Close et al. 1995; Close et al. 2002; Simpson and Wallace 1978). Adult Pacific lampreys parasitize a wide variety of ocean fishes, including Pacific salmon.

Pacific lamprey is an important traditional food source for members of the lower river Tribes. Harvest techniques include hand, dip nets, and, most commonly, hooking. Lampreys do not provide sport or commercial fisheries in the Klamath River.

After spending 1 to 3 years in the marine environment, Pacific lampreys return to freshwater between February and June (Kostow 2002; Moyle 2002). They are thought to overwinter and remain in freshwater habitat for approximately 1 year before spawning. Prior to construction, anadromous Pacific Lamprey were distributed above the site of Iron Gate Dam (Coots 1957; Kroeber and Barrett 1960) and are now blocked from a considerable portion of their historical habitat.

Information on the historical and current distribution and abundance of Pacific lamprey in the Klamath River basin is limited. Anecdotal evidence from early historical accounts and Tribal interviews suggest that Pacific lampreys have undergone substantial declines in the lower Klamath River in recent decades. Preliminary analysis of rotary trap data from the Klamath and Trinity Rivers suggests a declining trend from 1997 to 2004 for all life stages, with a notable decline in adult captures for the Klamath River system (USDI Fish and Wildlife Service 2004b). Limitations of these data for evaluating trends include uncertainty about consistency in reporting lampreys, and a lack of standardized counts at dams over time designed to document lamprey (Close et al. 1995). In addition, data based on ammocoete counts can include the similar-appearing western brook and river lampreys.

In January 2003, the Service received a petition to list the Pacific lamprey and three other lamprey species in Oregon, Washington, Idaho, and California. The Service found that that the petition and additional information in our files did not present substantial scientific or

commercial information indicating that listing these species may be warranted (USDI Fish and Wildlife Service 2004b).

TERRESTRIAL RESOURCES

Threatened and Endangered Species

1. Bald Eagle

In recent decades, bald eagle populations in the continental U.S. have rebounded from low levels of the 1970s. The Service recently reopened the public comment period for a proposal to remove the species from the list of Threatened and Endangered Species (71 Federal Register 8238). Recovery goals for the Pacific Recovery Region, which includes Oregon and California, have been met. Protection will continue under the Bald and Golden Eagle Protection Act, potentially including newly proposed regulations regarding disturbance (71 Federal Register 8265) and new National Bald Eagle Management Guidelines (71 Federal Register 8309). The species remains under the protection of the laws of Oregon and California, as well.

About ten bald eagle nesting areas are known within the Project area. Waters of the Project probably provide the primary fish prey source for this population. It is anticipated that provision of passage for anadromous fish will provide increased forage sources for bald eagles in the region above the Project. Primary management concerns include avoidance of disturbance from recreational activities, and long term maintenance of nesting habitat. Management recommendations provided herein pursuant to Section 10(j) include measures in accordance with per the draft National Bald Eagle Management Guidelines. To the extent that state laws are more restrictive, those authorities will apply.

2. Northern Spotted Owl

The northern spotted owl was listed as threatened in 1990 (55 Federal Register 26114) and a status review was completed in 2005. Ordinary Project operations are not expected to affect this species. Activities related to potential construction of fish passage facilities will be subject to section 7 consultation under ESA; the necessity of protection measures will be evaluated at that time. No further measures are proposed herein.

3. Applegate's Milkvetch

Applegate's Milkvetch is a plant listed as endangered under the ESA in 1993 (58 Federal Register 40547). According to the species' Recovery Plan, this species occurs in alkaline flood basin grassland near Klamath Falls, Oregon. Project operations are not expected to affect this species, and no measures for the species are proposed herein.

KLAMATH HYDROELECTRIC PROJECT IMPACTS

Relicensing of the Klamath Hydroelectric Project would continue the impacts that have affected the Klamath River over the past 90 years. These include the loss and fragmentation of large amounts of habitat for resident and anadromous fish, including important thermal refugial habitats, loss of ecosystem functioning through returning anadromous fish to the Project area and upstream, alteration of the natural hydrologic regime of the Klamath River, the effects of water impoundment by five dams, and the effects of hydroelectric peaking at two dams.

A. Habitat Fragmentation and Loss

The Applicant proposes to continue to inundate a total of 14.1 miles of riverine channel with Project reservoirs over the next license term. Much of this was low gradient river channel which would have supported resident and anadromous fish populations better than habitat in reservoirs. Project reservoirs created lacustrine habitat which contributed to fish community shifts that favor mostly non-native species and impairs native species (Moyle 2002). The non-native species displace native species, compete for forage with native species, prey on native species, and subsequently limit the productive potential of native fish populations in reservoir-affected reaches.

1. *Resident Fish:* Within the project area, resident redband/rainbow trout inhabit the J.C. Boyle peaking, J.C. Boyle bypassed, Keno, and all other Project reaches of the Klamath River. Spawning occurs in the lower portion of the J.C. Boyle Bypassed River Reach and in Spencer and Shovel creeks. The lower 2.7 miles of Shovel Creek continue to provide good salmonid habitat and the reach of the Klamath River between the Oregon/California State line and Copco 1 Reservoir has been designated Wild Trout water and is currently managed under the Wild Trout Program by the California Department of Fish and Game (CDFG 2005). Fish passage among these habitat areas is strongly impaired by the Klamath Hydropower facilities.

2. *Anadromous Fish:* Lack of fish passage at the Klamath Project facilities has blocked access to much of the Klamath River Basin. Within the Project area, 58 miles of habitat are blocked, including six important tributaries and 12 minor tributaries that offer productive areas, cooler waters, and diverse habitats. These include Fall, Jenny, Scotch, and Camp creeks flowing into Iron Gate Reservoir, Shovel Creek flowing into the J.C. Boyle Peaking Reach, and Spencer Creek flowing into J.C. Boyle Reservoir. More than 300 miles of migration, spawning, and rearing habitat for salmon, steelhead, and Pacific lamprey is no longer accessible in the Upper Basin. Much of this historic habitat continues to provide a productive environment for redband trout and, at some locations bull trout, brown trout *(Salmo trutta)*, and brook trout *(Salvelinus fontinalis).* This habitat above the current location of Project dams is still capable of supporting salmon, steelhead, and lamprey.

B. Loss of Ecosystem Function

When anadromous fish are present, they are an important source of energy and nutrients for subsequent generations of salmon and to maintain proper ecological function (Stockner 2003). In the Klamath River above Iron Gate Dam, anadromous fish previously provided nutrient input from the marine environment that is no longer available due to this Project.

C. Alteration of the Natural Hydrologic Regime

The Klamath Hydroelectric Project has significantly altered the natural hydrologic pattern and functioning of the Klamath River within the project reaches and downstream. The ecological structure and functioning of aquatic, wetland, and riparian ecosystems depend largely on the hydrologic regime, or pattern and quantity of water flowing through the system (Gorman and Karr 1978; Junk et al. 1989; Mitsch and Gosselink 1993; National Research Council 1992; Poff et al. 1997; Poff and Ward 1990; Sparks 1992). Intra-annual variation in hydrologic conditions plays an essential role in the dynamics among species within such communities through influences on reproductive success, natural disturbance, and biotic interactions (Poff and Ward 1989). Modifications of hydrologic regimes can indirectly alter the composition, structure, and functioning of aquatic, riparian, and wetland ecosystems (Bain et al. 1988; Dynesius and Nilsson 1994; Lillehammer and Saltveit 1984; Stanford and Ward 1979; Ward and Stanford 1983; Ward and Stanford 1989)). Project alterations to the hydrologic regime include the impacts associated with impounding waters at five dam sites, use of storage to change the timing of flows through hydroelectric dams and river reaches to maximize revenues, diverting the majority of flows from bypassed reaches of the Klamath River to maximize power production, and ramping river water surface elevation rapidly.

D. Impoundment Impacts

1. *Water Temperature:* Project impoundments have caused water temperatures to be warmer in fall and cooler in spring than under without Project conditions.
2. *Dissolved Oxygen:* Project impoundments cause dissolved oxygen (DO) concentrations in water to fall below levels that are needed by fish.
3. *Nutrient Loads*: Project impoundments impair the assimilation of excess nutrients, exacerbating already high biological oxygen demands and low DO concentrations in Klamath River water.
4. *Disease:* Project effects such as the maintenance of high nutrient levels and lack of peak flushing flows may be contributing to increased densities of anadromous fish parasites.
5. *Toxic Algae Blooms:* Toxic algae blooms (*Microsystis* sp.) in Project reservoirs may be impacting fish condition in reservoirs and downstream.
6. *Gravel Depletion:* Project reservoirs block the natural migration of sediments, including gravels used by trout and salmon for spawning.

E. Effects of Hydroelectric Peaking Operations

Hydroelectric peaking operations are used to maximize hydroelectric revenues by maximizing power generation when demand is greatest. Storage at J.C. Boyle and the Copco Reservoirs is used to manipulate flows through the powerhouses to a constant, elevated level during the afternoon and early evening and to minimum levels at night and in the morning. Such operations at the J.C. Boyle Powerhouse result in large, artificial, daily fluctuations in flows in the J.C. Boyle peaking reach, but flows exiting the Copco Powerhouse enter Iron Gate Reservoir directly, avoiding river reach flow fluctuations. Such large flow fluctuations result in high mortalities of many aquatic populations from physiological stress, wash-out during high flows, and stranding during rapid dewatering (Cushman 1985; Petts 1984). Frequent dewatering can result in massive mortality of bottom-dwelling organisms and subsequent severe reductions in biological productivity (Weisberg et al. 1990). Frequent flow fluctuations severely impair the rearing and refuge functions of shallow shoreline or backwater areas for small fish species or young life stages of larger fish (Bain et al. 1988; Stanford 1994).

1. *Reduced Flows in Bypassed River Reaches:* Most of the water that would enter the J.C. Boyle and Copco 2 Bypassed Reaches of the Klamath River is diverted for power generation. Only 100 cfs normally is released in the J.C. Boyle bypassed reach and only 5 cfs normally is released in the Copco 2 bypassed reach. The quantity and quality of aquatic habitats have been severely reduced in these reaches due to this great amount of dewatering.
2. *Trout Growth:* Resident Redband/rainbow trout growth is impaired by the adverse effects of artificial flow fluctuations in the Peaking Reach.
3. *Abundance of Macroinvertebrates:* Hydroelectric peaking greatly decreases the abundance of macroinvertebrate prey for redband/rainbow trout in the Peaking Reach.
4. *Fish Movement:* Increased energetic costs of movement due to artificial flow fluctuations in the peaking reach impact the existing resident fish and would impact reintroduced anadromous fish in the Peaking Reach.
5. *Water Quality:* Hydroelectric peaking causes severe fluctuations in temperature that adversely affects fish.
6. *Stranding:* Hydroelectric peaking increases stranding probabilities through increased flow fluctuations.

ENDANGERED SPECIES ACT

Section 7 of the ESA, and its implementing regulations at 50 CFR 402.14, require Federal agencies to review their actions at the earliest possible time to determine whether any action may affect listed species or critical habitat. If such a determination is made, consultation with the Service is required. In the case of the Project, listed species of concern to the Department are present in the Project Area. They include the bald eagle (*Haliaeetus leucocephalus*), northern spotted owl (*Strix occidentalis caurina),* Lost River sucker, and shortnose sucker. Consequently, consultation with the Service under section 7 will be required to comply with the Act. The Department's fish and wildlife recommendations include provisions for incorporating ESA

reopener language in the new license. The Department also seeks to reduce Project impacts to listed species through our section 18 fish passage prescriptions, the FWCA, and section 10(j) recommendations.

The Department recommends that the Commission enter into consultation with the Service to cover adverse effects to listed species associated with the Project relicensing. In addition, as indicated in our comment letter to the Draft License Application dated September 24, 2003, the Department is concerned that take of listed species associated with current operations is not authorized under the ESA. The Department recommends that the Commission request a current list of ESA species in the Project area from the Service. The Commission should prepare a Biological Assessment (BA) to evaluate the potential effects of the Project on listed and proposed species, and determine whether any such species may be adversely affected by the action. Due to the complexity of this project, the BA should be separate from the draft EIS. Pursuant to the Act's implementing regulations at 50 CFR 402.08, the Commission has designated the Licensee as its non-Federal representative to conduct informal consultation or prepare a biological assessment. In order to ensure that the ESA process moves forward in coordination with the Commission's relicensing proceeding, informal consultation should begin soon. If the BA is prepared by the designated non-Federal representative, the Commission must furnish guidance and supervision, and must independently review and evaluate the scope and contents of the BA. The ultimate responsibility for compliance with section 7 remains with the Commission.

CONTINUING IMPACTS OF THE PROPOSED PROJECT

Many of the Department's recommendations, conditions, and prescriptions include requirements to address Project impacts that are occurring in the present and have been ongoing since the original license was issued over 50 years ago. To help assess these impacts and the mitigation needed to address them, the Commission's upcoming NEPA analysis should include information regarding the ongoing impacts of the Project. Inclusion of ongoing impacts in the Commission's NEPA analysis would allow for complete consideration of the Project's impacts, and provide a basis on which to assess the adequacy of proposed mitigation measures.

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Section A: U.S. Department of the Interior Preliminary 4(e) Conditions – BLM Reservation

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Section A: Preliminary Conditions for the Protection and Utilization of the Bureau of Land Management Reservations Pursuant to Section 4(e) of the Federal Power Act

INTRODUCTION

The Department of the Interior (Department) through the Bureau of Land Management (BLM) has developed conditions pursuant to Section 4(e) of the *Federal Power Act* (FPA) for the protection and utilization of BLM-administered reservation affected by the Klamath Hydroelectric project, FERC No. 2082 (Project). Section 4(e) of the FPA provides that "…licenses issued within any reservation…shall be subject to and contain such conditions as the Secretary of the department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservation." The FPA definition of reservation includes lands and interest in lands owned by the United State, and withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws.

The BLM manages federal lands (BLM lands) within and near the Project boundaries that are "reservations" as defined by the FPA. Specifically, the BLM lands are located adjacent to J.C. Boyle Reservoir and along the J.C. Boyle Bypass and Peaking reaches of the Klamath River. The J.C. Boyle Development primarily resides on BLM lands, including the J.C. Boyle Powerhouse, J.C. Boyle Canal, J.C. Boyle Bypass and Peaking reaches and Project roads. (See BLM Map 1 below.)

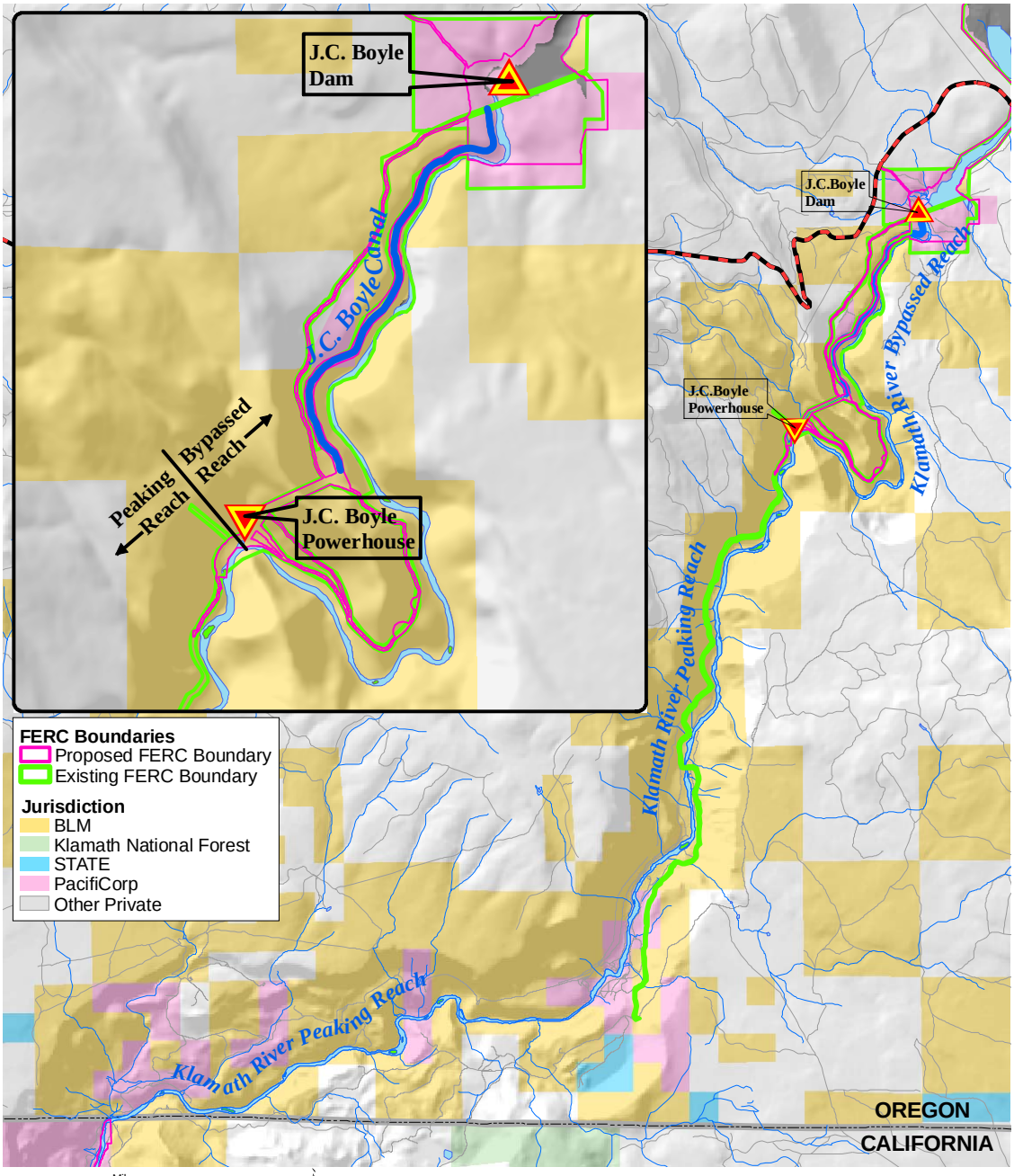
Currently, the BLM lands are withdrawn by either the *Revested Oregon and California Railroad Grant Lands Act* (O&C Act) or Power Site Reserve No. 258 (See BLM Map 2 below):

- The O&C Act (50 Stat 874) provided that these BLM lands were to be "conserved and perpetuated" rather than divested by the United States and be managed as timberlands and power site lands that shall be managed for purposes[1] provided for in BLM resource management plans developed for these areas.
- The Power Site Reserve No. 258 was approved by Executive Order dated April 13, 1912 and reserved BLM lands withdrawing them from "settlement, location, sale, or entry, and reserved for water-power site". These BLM lands were originally reserved under the *Pickett Act of 1910*[2] but subsequently withdrawn by Power Site Reserve No. 258.

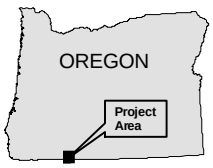
[1] In addition to providing for a permanent source of timber supply according to the principle of sustained yield, the O&C Act requires the Secretary to protect watersheds, regulate stream flow, provide recreation, and contribute to economic stability.

[2] The Pickett Act of 1910 authorized the Executive Department to "temporarily withdraw from settlement, location, sale, or entry any public lands of the United States…and reserve the same for water-power sites, irrigation, classification of lands, or other public purposes to be specific in the orders of withdrawals: "[S]uch withdrawals or reservations shall remain in force until revoked…" "…and therefore in law and in practice Pickett Act withdrawals can continue indefinitely." Opinion of the Solicitor, M-37005 (January19, 2001).

BLM Map 1: **J.C. Boyle Development and Lands under BLM Jurisdiction**



Klamath Hydroelectric Project
J.C.Boyle Development
FERC No. 2082
2006



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Klamath Falls Resource Area
Lakeview District
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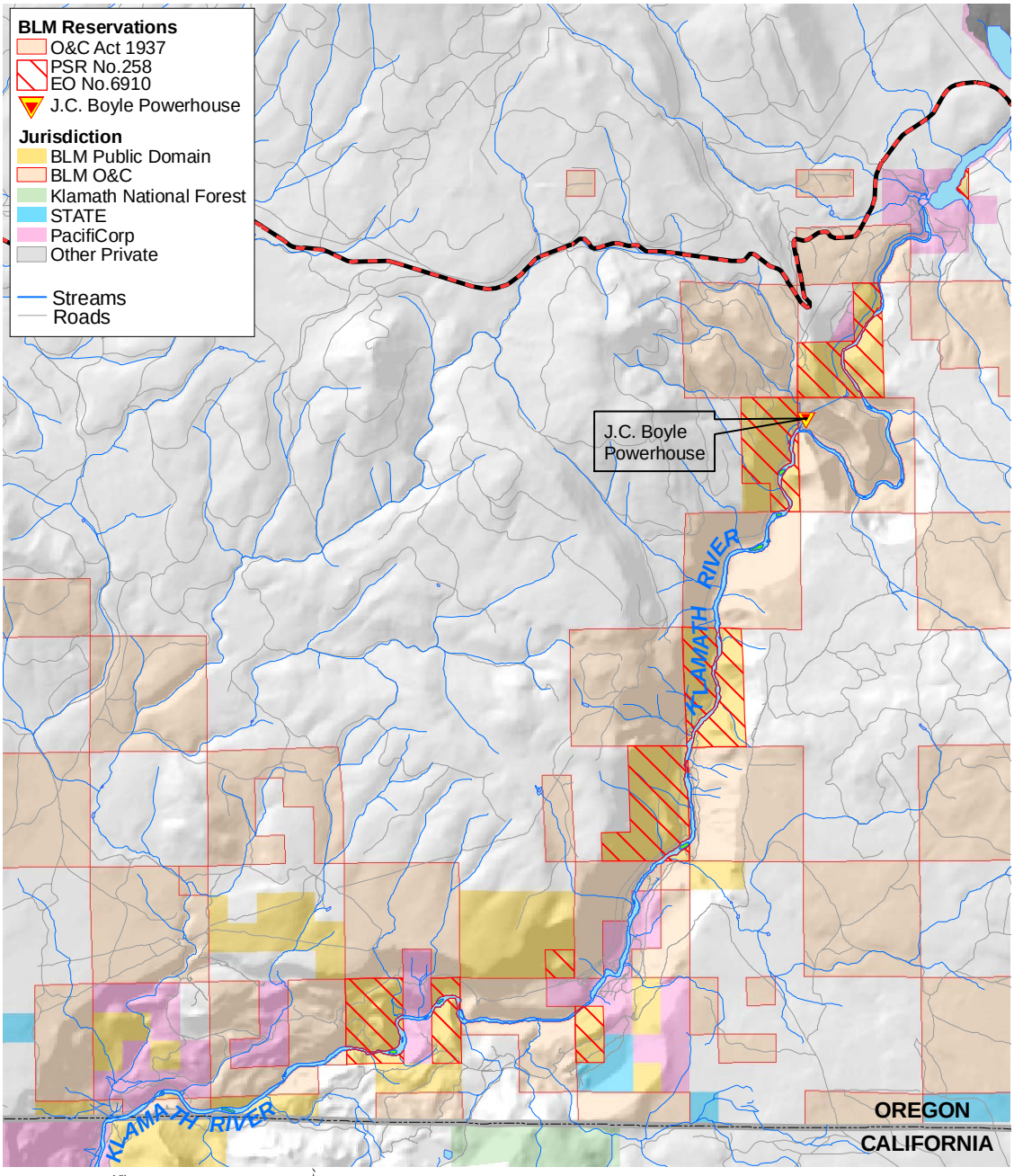
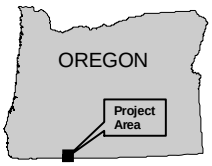
Klamath Falls, Oregon 97603

BLM Map 2: BLM Reservation Lands Map



BLM Reserved Lands
Klamath Hydroelectric Project
FERC No. 2082
2006



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RESOURCE MANAGEMENT PLAN GOALS AND OBJECTIVES

The continued protection and utilization of the BLM reservation requires management on the basis of multiple use and sustained yield according to provisions of the *Federal Land Policy Management Act* (FLPMA). This act directs BLM to develop and maintain management plans, by specific areas, for public use and requires an interdisciplinary approach to achieve an integrated consideration of the physical, biological, economic and other sciences (FLPMA, 1976).

FPLMA also defines the term multiple use to mean:

> "…the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; the use of some land for less then all of the resources; a combination of balanced and diverse resource use that takes into account the long-term needs of future generations for renewable and non-renewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output."

The Klamath Falls Resource Area Resource Management Plan (RMP), Rangeland Program Summary, and Record of Decision (ROD) (USDI BLM 1995a); the Medford District RMP and ROD (USDI BLM 1995b); and the Redding Field Office RMP and ROD (USDI BLM 1993) were developed in accordance with FLPMA. The Klamath Falls Resource Area and Medford District RODs and RMPs are also consistent with and incorporate provisions of the 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (Northwest Forest Plan).

The Klamath Falls Resource Area RMP responds to the need for healthy forest ecosystems and habitat to support native species, including protection of riparian areas and waters as well as the need for a sustainable supply of timber and other forest products necessary to maintain local and regional economies (USDI BLM 1995a). The Klamath Falls Resource Area encompasses 212,000 acres including 19,450 acres of "Riparian Reserves" in Klamath County, Oregon. The Klamath River occurs in the Northwest Forest Plan area and is administered as a riparian reserve.[3] According to the Klamath Falls Resource Area RMP the riparian reserve for the Klamath River includes "the stream and the area on each side of the stream extending from the edges of the active stream channel to the outer edges of the 100 year floodplain or 320 feet on each side of the river, whichever is greater" (USDI BLM 1995a). As a general rule, management of riparian reserves prohibits or regulates activities that retard or prevent attainment of objectives of the Aquatic Conservation Strategy (ACS).

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[3] Riparian reserves are designed to restore and maintain aquatic ecosystem functions and together with the Aquatic Conservation Strategy (ACS) provide substantial watershed protection benefits including attaining and maintaining water quality standards and moderating peak stream flows.

The ACS seeks to prevent degradation and restore habitat and ecosystem health by maintaining and restoring aquatic habitat, restoring habitat connectivity, and maintaining flows sufficient to sustain component elements of aquatic systems.[4] Among specific provisions of the ACS are provisions for managing roads, energy production, recreation, lands, riparian areas, fish and wildlife, and watershed and habitat restoration. Specific provisions for land management as it relates to hydroelectric projects under the jurisdiction of the Federal Energy Regulatory Commission (Commission) are provisions requiring BLM input on the maintenance of instream flows and habitat conditions and maintenance/restoration of riparian resources and stream channel integrity necessary to ensure that ACS objectives are met (USDI BLM 1995a).

The BLM reservation is located within the Project boundaries and therefore subject to conditions that the Secretary of the Interior, acting through the BLM, deems "… necessary for the adequate protection and utilization of [these] reservation[s]." (FPA). As explained in greater detail below, the Project affects water resources, recreation, wild and scenic river values, travel and access management, cultural resources, terrestrial and riparian resources, special status species and fish and wildlife resources within these BLM lands. The BLM has developed conditions for the license that are designed to provide for the adequate protection and utilization of the BLM reservation based on multiple use objectives. Where project impacts affect BLM resources that lie outside of these reservations, the BLM has included measures as recommendations pursuant to FPA § 10(a).

The following conditions are necessary for the adequate protection and utilization of these reservations and the multiple use resource values for which the reservations are managed. These conditions are based on resources identified for management pursuant to FLPMA and approved RMPs for the Lakeview District, Klamath Falls Resource Area; Medford District and Redding Field Office. Therefore, the following conditions covering specific requirements for protection and utilization of the public lands shall also be included in any license issued for the Project.

BLM PRELIMINARY 4(e) CONDITIONS

Condition No. 1 - Activities On or Affecting Bureau of Land Management-Administered Lands

A. The Licensee shall consult with the Bureau of Land Management (BLM) to identify and resolve potential conflicts with BLM policy and direction prior to initiating activities on BLM-administered lands, which are beyond the scope of the license or for which the Licensee has not obtained BLM approval.

[4] The ACS Standards and Guidelines specific to hydropower relicensing require the BLM to "identify instream flows necessary to maintain and restore riparian resources, fish passage, and channel integrity" (USDA; USDI 1994). Lands allocated as Riparian Reserves require further evaluation to assess whether occupancy and use is acceptable and will not detract from or can be mitigated so that ACS objectives can continue to be met (USDA; USDI 1994).

B. The Licensee shall cooperate with the BLM to obtain the appropriate authorizations for use or access to BLM-administered lands prior to engaging in any activity that has the potential to affect other federally authorized rights-of-way (ROW) on those lands.

C. The Licensee shall obtain written approval from BLM prior to changing the location of any Project feature or facility on BLM-administered lands. The Licensee shall also obtain written approval for any actions that are inconsistent with authorizations for use or occupancy of BLM-administered lands according the new license. Following BLM approval and at least 90 days prior to any change in location or departure from an authorized activity, the Licensee shall file a report with the Federal Energy Regulatory Commission (Commission) and with the BLM, describing the change, the reasons for the change, and documenting BLM approval of the change.

D. The Licensee shall prepare site-specific plans for approval by the BLM for activities required by the license that have the potential to impact BLM-administered lands or resources. Prior to implementing any action that is not analyzed on a site-specific basis, the Licensee shall work with the BLM to evaluate whether the action could impact BLM-administered lands or resources. The analysis shall be sufficient to meet requirements of the National Environmental Policy Act (NEPA). The site-specific details shall include:

1. a map depicting the location of the proposed activity;
2. the land use allocation and management designation including standards and guidelines for the area of the proposed activity;
3. alternative locations, designs, mitigations, and implementation and effectiveness monitoring necessary to meet standards and guidelines; and
4. data from surveys, biological evaluations, or consultation required by regulation and as applicable to activities on BLM-administered lands.
   (a) When surveys indicate that activities may affect an Endangered Species Act (ESA) listed or proposed listed species or their habitat, the Licensee shall evaluate the impacts of the action on the species or habitat and submit this evaluation to the BLM.
   (b) When surveys indicate an activity may affect a BLM sensitive species or their habitat, based on the list of BLM sensitive species that BLM will provide to the Licensee annually, the Licensee shall evaluate the potential impact of the action and submit conclusions to the BLM for review and approval. BLM reserves the authority to require mitigation for the protection of these species.

E. Upon BLM approval, the Licensee shall conduct necessary environmental analysis according to NEPA standards and sufficient for formal consultation for federally administered resources subject to regulation pursuant to the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), the Native American Grave Protection Act (NAGPRA), the Clean Air Act, the Clean Water Act, and the Endangered Species Act (ESA). The environmental analysis documentation shall be sufficient to comply with BLM direction in the National Environmental Policy Act Handbook 1790-1 (USDI BLM 1988), or as amended.

F. The Licensee shall file a Safety During Construction Plan with the Commission 60 days prior to initiating any ground-disturbing activity on BLM-administered lands. This plan will identify potential hazard areas and measures necessary to protect public safety. Areas to

consider include construction activities near public roads, trails, recreation areas, and facilities.

G. The Licensee shall perform daily (or on a schedule otherwise agreed to by the BLM) inspections of Licensee's construction operations on BLM-administered lands and adjoining fee title property while construction is in progress. The Licensee shall document these inspections and deliver this documentation to BLM. Inspections must evaluate fire plan compliance, public safety, and environmental protection. The Licensee shall act immediately to address any necessary corrections.

H. The Licensee shall consult with BLM to prepare a Spoils Disposal Plan prior to initiating any ground disturbing activity on BLM-administered lands. Upon BLM approval, the plan shall be filed with the Commission. The plan shall address disposal and/or storage of waste soil and/or rock materials (spoils) generated by road maintenance, slope failures, and construction projects. The plan shall include provisions for:

1. identifying and characterizing the nature of the spoils in accordance with applicable BLM regulations;
2. identifying sites for the disposal and/or storage of spoils that prevent contamination of water by leachate and surface water runoff; and
3. developing and implementing stabilization, slope reconfiguration, erosion control, reclamation, and rehabilitation measures.

I. The Licensee shall file a Hazardous Substances Plan for oil and hazardous substance storage, spill prevention, and clean up with the Commission prior to planning, construction, or maintenance that may affect BLM-administered lands. At least 90 days prior to submission, the Licensee shall provide a copy of the plan to the BLM for its review and approval. At a minimum, the plan shall:

1. outline procedures for reporting and responding to releases of hazardous substances, including names and phone numbers of all emergency response personnel and their responsibilities; and
2. maintain emergency response and HAZMAT cleanup equipment sufficient to contain any spill from the Project.

J. On a semi-annual basis, the Licensee shall provide the BLM information on the location of spill cleanup equipment on BLM-administered lands and the location, type, and quantity of oil and hazardous substances stored in the Project area. The Licensee shall inform BLM immediately as to the nature, time, date, location, and action taken for any spill affecting BLM-administered lands.

K. The Licensee shall avoid disturbance to all public land survey monuments, private property corners, and BLM boundary markers. In the event that any markers or monuments are destroyed by an act or omission of the Licensee, in connection with the use and/or occupancy authorized by the license, depending on the type of monument destroyed, the Licensee shall reestablish or reference same in accordance with (1) the procedures outlined in the "Manual of Instructions for the Survey of the Public Land of the United States," (2) the specifications of the County Surveyor, or (3) the specifications of the BLM. The Licensee shall ensure that any such official survey records affected are amended as provided for by law.

L. The Licensee shall maintain Project-related improvements and facilities located on BLM-administered lands to standards of repair, orderliness, neatness, sanitation, and safety acceptable to the agency. The Licensee shall comply with all applicable Federal, State, and local laws, regulations, including but not limited to, the Federal Water Pollution Control Act, 33 U.S.C. § 1251 et seq., the Resources Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 et seq., the Comprehensive Environmental Response, Control, and Liability Act (CERCLA), 42 U.S.C. § 9601 et seq., and other relevant environmental laws, as well as public health and safety laws and other laws relating to the siting, construction, operation, and maintenance of any facility, improvement, or equipment.

M. The Licensee shall restore BLM-administered lands to a condition satisfactory to BLM prior to any surrender of the Project license or abandonment of Project facilities. At least one year in advance of license surrender, facility abandonment, or Project boundary change, the Licensee shall file with the Commission a restoration or maintenance plan approved by the BLM. The plan shall identify any capital improvements that will be removed, restoration measures; maintenance of facilities abandoned but not removed, time frames, and costs. In addition, the Licensee shall commission an audit to assist the BLM in determining whether the Licensee has the financial ability to fund the decommissioning and restoration work specified in the plan.

1. As a condition of any transfer of the license or sale of the project, the Licensee shall guarantee or assure, in a manner satisfactory to the BLM, that the Licensee or transferee will provide for the costs of surrender and restoration.
2. Any license amendment that authorizes use of BLM-administered lands shall be subject to such conditions the BLM deems necessary to protect and utilize affected BLM reservations.

N. The Licensee shall indemnify, defend, and hold the United States harmless for any costs, damages, claims, liabilities, and judgments arising from past, present, and future acts or omissions of the Licensee in connection with the use and/or occupancy authorized by the license. This indemnification and hold harmless provision applies to any acts and omissions of the Licensee or the Licensee's heirs, assigns, agents, employees, affiliates, subsidiaries, fiduciaries, contractors, or lessees in connection with the use and/or occupancy authorized by this license which result in: (1) violations of any laws and regulations which are now or which may in the future become applicable, and including but not limited to environmental laws such as the CERCLA, RCRA, Oil Pollution Act, Clean Water Act, Clean Air Act; (2) judgments, claims, demands, penalties, or fees assessed against the United States; (3) costs, expenses, and damages incurred by the United States; or (4) the release or threatened release of any solid waste, hazardous substances, pollutant, contaminant, or oil in any form in the environment.

O. The Licensee shall, within one year of the license issuance, develop a standard operating procedures plan for emergencies to address procedures, environmental permits, and subsequent mitigation measures for any Project-related impacts to BLM lands including, but not limited to, the emergency spillway and canal and slope failures. This plan shall be developed with consultation and approval by BLM. The plan shall include implementation strategies for agency coordination, restoration actions, monitoring and evaluation, and potential mitigation measures.

P. The Licensee shall exercise diligence in protecting from damage the land and property of the United States covered by and used in connection with this license, including any buildings, bridges, roads, trails, lands or other property of the United States; and shall restore, reconstruct or compensate the United States for any damage resulting from negligence or from the violation of the terms of this license or any law or regulation applicable to the BLM by the Licensee, or by any agents or employees of the Licensee acting with in the scope of their agency or employment. Arrangements to restore, reconstruct, or compensate for damages shall be made with the BLM.

Rationale

BLM administers approximately 197 acres within the current Project boundary (PacifiCorp 2003a, Exhibit A, page 2-17) for recreation use, fish and wildlife habitat, terrestrial and riparian resources, cultural resource protection, and road and facilities maintenance. Project operation and/or mitigation for impacts of the Project on BLM-administered resources must insure actions are in compliance with laws, regulations, policies and land use plan decisions which the BLM is bound or is responsible for upholding or implementing. This will necessitate consultation with the BLM prior to implementation of any action on federal lands to ensure the continued protection and utilization of BLM-administered resources and for consistency with BLM management objectives for these lands.

BLM has the authority to address planning issues through direction within the *Federal Land Policy and Management Act* (FLPMA). Specifically, according to:

- Sec. 103(c) (7) "…the public lands [shall] be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use. . . ."
- Sec. 302(b) "In managing the public lands, the Secretary shall, subject to this Act and other applicable law and under such terms and conditions as are consistent with such law, regulate, through easement, permits, leases, licenses, published rules, or other instruments as the Secretary deems appropriate, the use, occupancy, and development of the public lands, including, but not limited to, long-term leases to permit individuals to utilize public lands for habitation. . . ."
- Sec. 302(d) (2) "Use of public lands pursuant to a general authorization under this subsection shall be limited to areas where such use would not be inconsistent with the plans prepared pursuant to section 202. Each such use shall be subject to a requirement that the using department shall be responsible for any necessary cleanup and decontamination of the lands used. . . ."
- Sec. 302(d) (2) (A) "…minimize adverse impacts on the natural environment, scientific, cultural, and other resources and values (including fish and wildlife habitat) of the public lands involved."
- Sec. 302(d) (5) "To the extent that public safety may require closure to public use of any portion of the public lands covered by an authorization issued pursuant to this subsection, . . . [the Secretary] shall take appropriate steps to notify the pubic concerning such closure and to provide appropriate warnings of risks to public safety."

The BLM RMPs provide direction for issuing, renewing, or granting authorizations to occupy, use or traverse BLM-administered lands for power generation, transmission, and distribution. If such actions have the potential to affect BLM-administered resources, they must be evaluated for consistency with BLM RMPs developed pursuant to FLPMA and according to the NEPA that addresses whether any irretrievable or irreversible commitment of Federal resources will result as a consequence of actions implemented on federal lands or reliant on federal funding.

Condition No. 2 – Consultation with the Bureau of Land Management

A. The Licensee shall consult with the Bureau of Land Management (BLM) between September 1 and November 31 each year and prepare a report on the status implementing conditions of the license that could affect BLM-administered resources. The report shall include:

1. Results of any monitoring preformed over the previous year for reporting effectiveness of mitigations included as license articles;
2. Review of any non-routine maintenance;
3. Discussion of any foreseeable changes to Project facilities or operations;
4. Discussion of any necessary revisions or modification to plans approved as part of this license; and
5. Discussion of elements of current year maintenance plans, e.g. road maintenance.

B. A copy of the records, plan reports, monitoring reports, and other pertinent records shall be provided to the BLM at least 10 days prior to the annual meeting, unless otherwise agreed.

C. Copies of other reports related to Project safety and non-compliance shall be submitted to the BLM concurrently with submittal to the Commission. These include, but are not limited to, any non-compliance report filed by the Licensee for facilities or operations on or affecting BLM-administered lands.

D. Within 60-days of issuance of the report to BLM, the Licensee shall file the record of consultation and any BLM comments and recommendations with the Commission. The BLM reserves the right, after notice, comment, and administrative review, to require changes to Project operation through revision of 4(e) conditions.

Rationale

The *Federal Land Policy Management Act* (FLPMA) requires the BLM to consult with other entities regarding the management of public resources. The Licensee's obligation to operate the Project in accordance with license conditions intended to mitigate for impacts to BLM determines necessary for the continued protection and utilization of federally administered resources, necessitates this consultation requirement for the Klamath Hydroelectric Project operation and would require federal action and notice and comment to rectify or mitigate.

Section 307(a) of FLPMA requires the Secretary of Interior (Secretary) through the Interior Bureaus "… to conduct investigations, studies, and experiments, [based] on [the Secretary's]

initiative or in cooperation with others, involving the management, protection, development, acquisition, and conveying of the public lands."

Condition No. 3 - Roads Inventory Analysis and Roads Management

A. Within six months of license issuance, the Licensee shall file with the Federal Energy Regulatory Commission (Commission) for approval a Project Roads Inventory Analysis and Roads Management Plan (Roads Plan) for Project-related roads that cross Bureau of Land Management (BLM)-administered lands (BLM roads). The purpose of the Roads Plan is to facilitate coordination of transportation maintenance and management; continue to provide for public safety; minimize potential damage to big game winter range; manage transportation access consistent with BLM management objectives; coordinate off-highway vehicle (OHV) management; minimize the potential for spread of noxious and invasive plants; restore hydrologic function in areas that have been impacted by use of BLM roads for Project purposes: and continue to protect cultural resources.

1. At a minimum, the Roads Plan shall include the items specified in the Final License Application (PacifiCorp 2004a, Executive Summary, page 8-5; Land Use, Visual, and Aesthetic Resources Final Technical Report, page 3-7; and Appendix 3C) and shall:
   - (a) Specify the Licensee's goals and objectives for transportation management so the BLM can determine whether these are consistent BLM transportation management goals;
   - (b) Identify BLM roads necessary to operate and maintain the Project;
   - (c) Monitor use of roads for recreation access;
   - (d) Identify responsible parties for management and maintenance of BLM roads affected by the Project;
   - (e) Identify BLM roads previously used but which are no longer necessary to operate and maintain the Project;
   - (f) Identify levels of use and projected future use of BLM roads;
   - (g) Identify impacts associated with all Project-related BLM road use;
   - (h) Develop mitigation measures for Project-related impacts to BLM roads;
     - (1) Mitigate for soil erosion;
     - (2) Identify and implement road closures; and
     - (3) Identify and implement BMPs for maintaining and protecting cultural resources; controlling the spread of noxious weeds; protecting sensitive plants and threatened and endangered species; minimizing soil erosion; and protecting aquatic resources.
   - (i) Identify instruments (agreements) necessary to implement the Roads Plan.

2. The Roads Plan shall accommodate unrestricted access by the BLM necessary to manage and administer BLM lands and resources that are affected by Project operations. The plan shall include provisions for the maintenance of crossings and rights-of-way (ROW) required by and consistent with permit requirements for powerlines, penstocks, ditches, and pipelines.

B. The Licensee shall consult with the BLM prior to erecting any signs on BLM-administered lands that are necessary for operation or maintenance of Project operations or facilities. The Licensee must obtain approval from the BLM specific to the location, design, size, color, and

content of signs. The Licensee shall be responsible for maintaining all Licensee-erected signs to neat and presentable standards.

C. The Licensee shall prepare a draft Roads Plan after consultation with the BLM. The Licensee shall allow a minimum of 30 days for the BLM to comment and to make recommendations on the draft plan before finalizing the plan and filing it with the Commission. The Licensee shall include with the plan: documentation of consultation, BLM comments and recommendations, and a description of how recommendations are accommodated by the plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information. At the time it files the plan with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM.

D. The BLM reserves the right to require changes to the plan by filing modifications to the plan within 30 days of service. Upon Commission approval, the Licensee shall implement the plan, including any changes required by the BLM.

Rationale

Section 302(b) of the Federal Land Policy Management Act (FLPMA) requires BLM to address road maintenance and management, and specifically authorizes the Secretary of Interior (Secretary) to "regulate, through easement, permits, leases, licenses, published rules, or other instruments as the Secretary deems appropriate, the use, occupancy, and development of the public lands, including, but not limited to, long-term leases to permit individuals to utilize public lands for habitation, …".

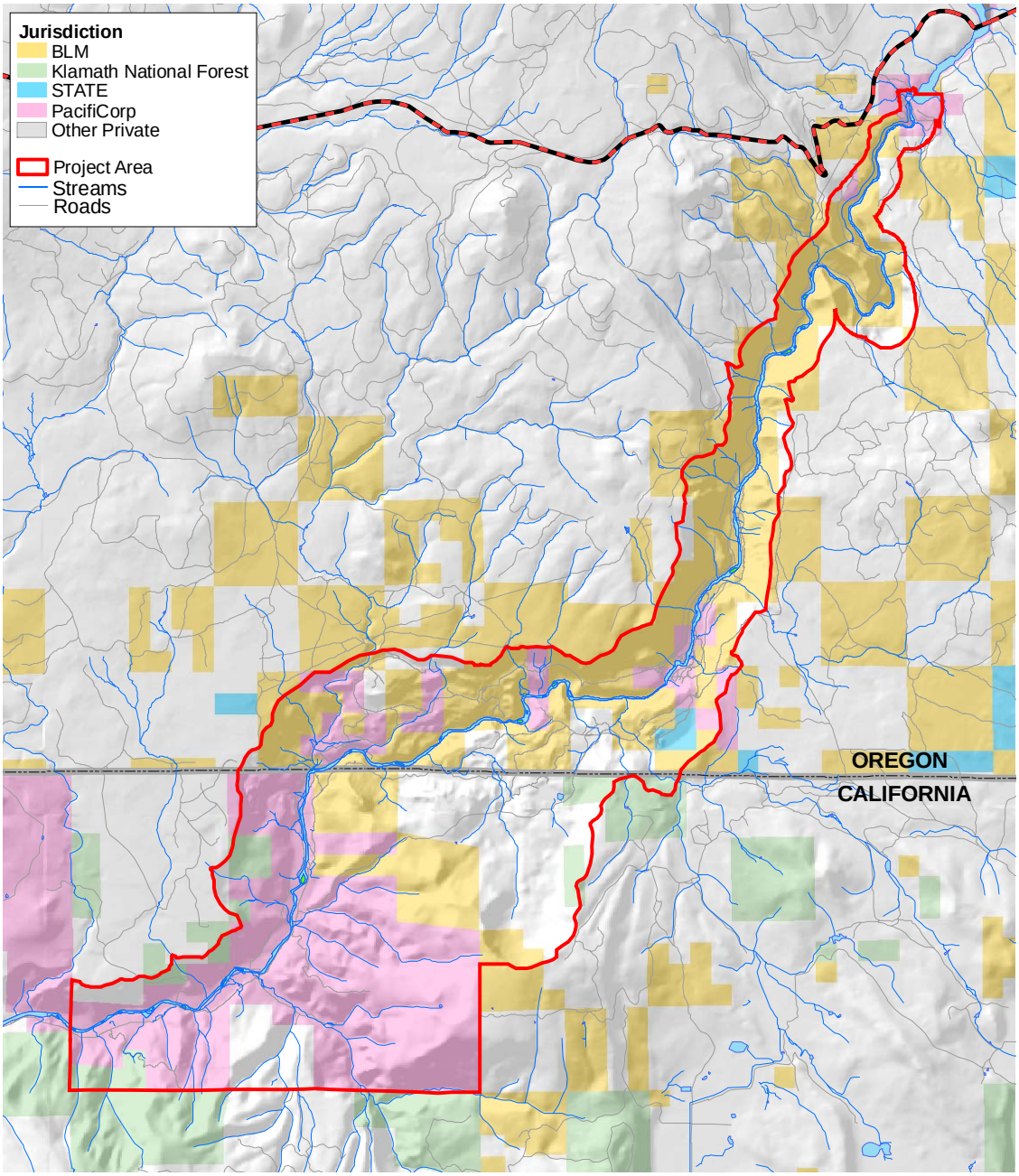
The BLM manages travel and access on roads through a road management plan (USDI BLM 1995a, page 71). Although BLM participated with the Licensee in an analysis of road conditions for roads on BLM-administered lands and PacifiCorp lands (PacifiCorp 2004h), no inventory results and analysis have been provided to BLM. In order to accurately develop travel management objectives, the Licensee needs to provide the analysis and develop a plan for management of roads in the Project area of influence. (See BLM Figure 3-1: Road Inventory Map.) PacifiCorp stated in the Land Use, Visual, and Aesthetic Resources Final Technical Report (PacifiCorp 2004h) "When completed as a post-Final License Application submittal, the inventory and analysis is intended to meet the objectives of FERC, PacifiCorp, and BLM for the management and cost-sharing responsibilities of Project-related transportation facilities."

PacifiCorp stated in the FTR (PacifiCorp 2004h) that "the data are currently being reviewed and analyzed. The analysis and management components of this study will be completed as a post-Final License Application submittal during the first half of 2004." Further, Exhibit E Land Management and Aesthetics (PacifiCorp 2004i) stated that "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", and that "The results of the roadway inventory analysis and proposed roadway management actions and responsibilities will be reviewed in consultation with BLM." To date the BLM has not been consulted on the proposed management actions.

The BLM analyzed agency data compiled for the cooperative road study. Project-specific data including analysis of the Licensee's road inventory is necessary to develop a comprehensive Roads Plan and maintenance schedule. Road damage can be related to number and type of vehicles and/or frequency of trips. Data specific to PacifiCorp use of BLM roads are not available.

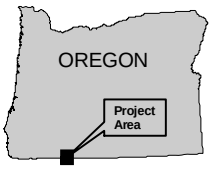
Project construction, maintenance, and operation necessitated the development of roads within and adjacent to the Klamath River canyon. Of these historic roads, approximately 14 miles adjacent to the J.C. Boyle Bypass and Peaking Reaches remain necessary for the operation and maintenance of the Project (PacifiCorp 2004h, Road Inventory Figure 3.7-1, 6 of 9 and 7 of 9). About 3.4 miles of these roads traverse PacifiCorp land and the remaining 10.6 miles are BLM roads. Because the Road Inventory Analysis and Road Management Plan are not complete, the level of Project use of BLM roads is not well defined. Compounding the difficulty in analyzing the affect of the Project on BLM roads is the Licensee's proposed Project boundary revision (PacifiCorp 2004a, Executive Summary, Figure ES1.1-1) that excludes numerous miles of road that the Licensee was previously required to manage and maintain. (See BLM Figure 3-2: Klamath Hydroelectric Project Roads Map.) The Roads Plan must include recommendations on how those roads should be managed including options for maintenance, improvement or closure if necessary. The BLM condition is intended to more precisely define the miles, levels of use, and projected future use of roads necessary to operate and maintain the Project in order to develop a cooperative Roads Plan. A Plan is necessary to meet the direction in the KFRA RMP, to manage travel and access on roads through a road management plan, (USDI BLM 1995a, page 71) and Section 302(b) of the Federal Land Policy Management Act (FLPMA) requiring road maintenance and management be addressed and necessary to mitigate for impacts to roads that are resultant of the Project.

BLM Figure 3-1: Road Inventory Map



Miles

2001 Road Inventory Project Area
Klamath Hydroelectric Project
FERC No. 2082
2006



U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Klamath Falls Resource Area
Lakeview District
2795 Anderson Ave. #25
Klamath Falls, Oregon 97603

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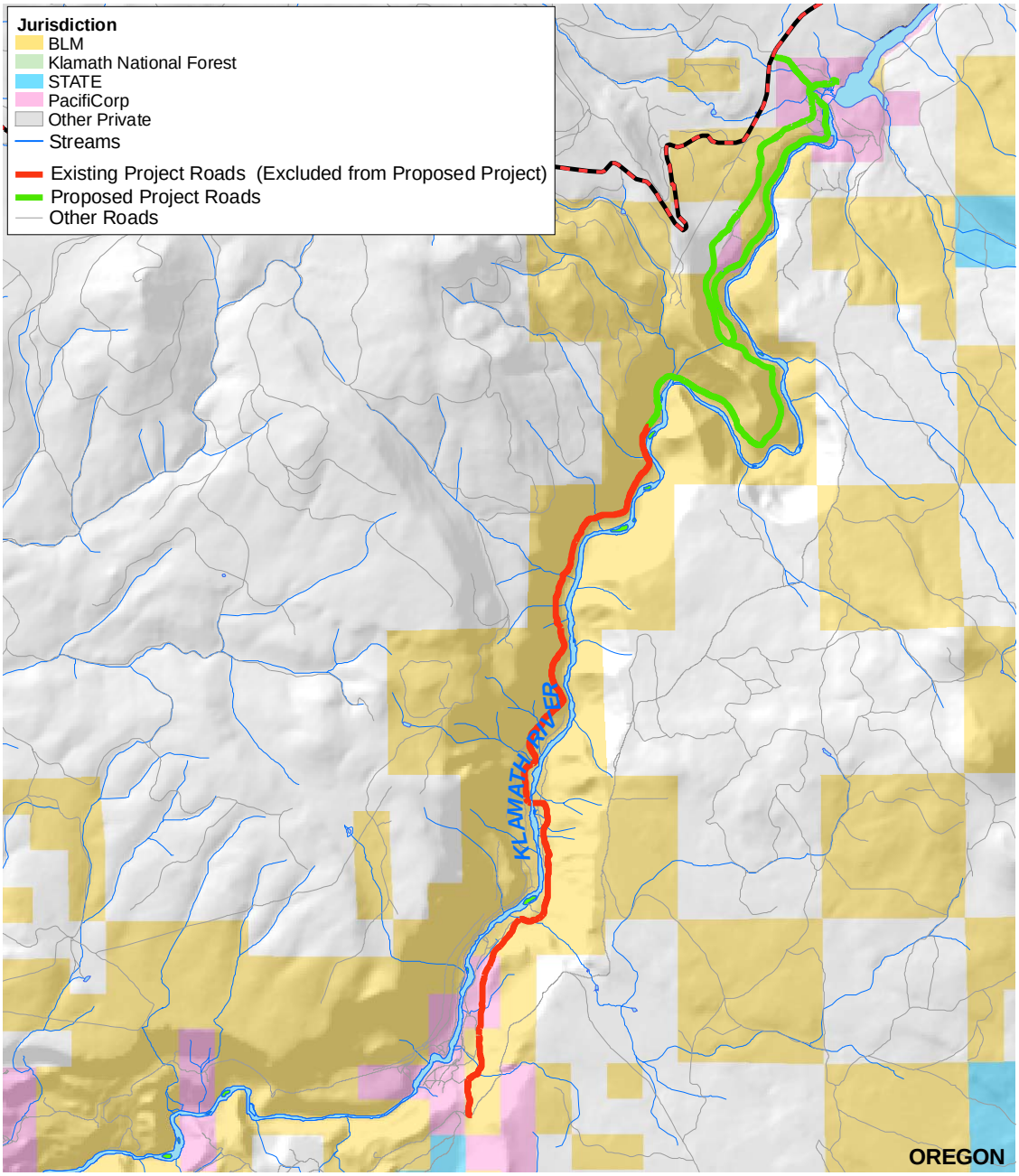
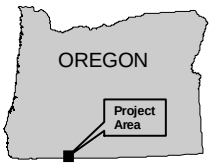
BLM Figure 3-2: Klamath Hydroelectric Project Roads



Project Roads / BLM Lands
Klamath Hydroelectric Project
FERC No. 2082
2006



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Condition No. 4 – River Corridor Management

A. J.C. Boyle Bypassed River Reach

1. Required Minimum Streamflow – The Licensee shall, within one year after license issuance, maintain minimum streamflows as specified:

(a) Proportional flow requirement: Provide no less than 40% of the inflow to J.C. Boyle Reservoir to the J.C. Boyle Bypassed River Reach, measured below the J.C. Boyle Dam at RM 225. [See Condition 4 – C.1.(a)(2)].

(1) The required proportional instream flows are the average of the previous three days of the combined daily flow, as measured from the Keno gage (#11509500) and Spencer Creek gage (#11510000) combined.

(b) Minimum base flow requirement: When 40% of the inflow is less than 470 cubic feet per second (cfs), no less than 470 cfs shall be provided to the J.C. Boyle Bypassed River Reach, except when the combined flow measured from the Keno gage (#11509500) and Spencer Creek gage (#11510000) is less than 470 cfs, then flow shall be provided to the J.C. Boyle Bypassed River Reach in an amount equal to the average of the previous three days of combined flow, as measured from the Keno gage (#11509500) and Spencer Creek gage (#11510000) combined.

(c) Seasonal High Flow: At a minimum, once annually between February 1st and April 15th diversion to the J.C. Boyle Power Canal shall be suspended when inflow to J.C. Boyle Reservoir first exceeds 3,300 cfs during this time period.

(1) Suspension of diversion shall be maintained for a minimum of seven full days.

(2) The streamflow shall be measured from the Keno gage (#11509500) and Spencer Creek gage (#11510000) combined.

2. Ramping During Controlled Events – The Licensee shall, within one year after license issuance:

(a) Not exceed an up ramp rate or down ramp rate of two inches per hour when conducting controlled flow events (e.g., scheduled maintenance and changes in minimum flow requirements), except during implementation of the seasonal high flow [See Condition 4 - A.1.(c)], measured below the J.C. Boyle Dam at RM 225. [See Condition 4 – C.1.(a)].

B. J.C. Boyle Peaking Reach

1. Streamflow Requirements – The Licensee shall, within one year after license issuance:

(a) From May 1st to October 31st, operate the J.C. Boyle development to provide a streamflow of 1,500 cfs to 3,000 cfs a maximum of once a week, with a priority set for Saturday, Sunday, then Friday.

(b) Proportional and minimum base flows as prescribed in the J.C. Boyle Bypassed River Reach will provide the inflows for the J.C. Boyle Peaking Reach. [See Condition 4 – A.1.].

2. Ramping During Controlled Events – The Licensee shall, within one year after license issuance:

(a) Not exceed an up ramp rate or down ramp rate of two inches per hour when conducting controlled flow events (e.g. scheduled maintenance, power generation, changes in minimum flow requirements), except during implementation of the seasonal high flow [See Condition 4 - A.1.(c)], measured at the gage below the J.C. Boyle Powerhouse at RM 220.5 (USGS #11510700).

C. Streamflow Measurement and Reporting: J.C. Boyle Bypassed River and Peaking Reaches

1. Instream Flow Measurement – The Licensee shall, within one year after license issuance:

(a) Continuously measure the stage of water at a minimum of four gage sites. Three sites are currently gaged. The Licensee shall establish one additional site, using the most current USGS protocol for gage station installation, maintenance, and data collection (USGS 1982 - Measurement and Computation of Streamflow: Volumes 1 and 2, Geological Survey Water-Supply Paper 2175).

(2) Existing gage stations shall include the Klamath River below Keno Dam (#11509500), Spencer Creek above the confluence with the J.C. Boyle Reservoir (#11510000), and Klamath River below the J.C. Boyle Powerhouse (#11510700). The Licensee shall operate and maintain the gages at these sites if the gages are no longer served by the current operators.

(3) The Licensee shall install a new gage on the Klamath River J.C. Boyle Bypassed River Reach below all outlets from the J.C. Boyle Dam and above the springs at RM 225. The location for the gage shall be approved by the BLM prior to installation.

2. Instream Flow Reporting - The Licensee shall, within one year after license issuance:

(a) Provide instantaneous 30-minute real time streamflow data in cfs via remote access that is readily available and accessible to the public.

(b) Design and maintain a database, similar to the most current version of the USGS National Water Information System (NWIS) for reporting on surface water. The database shall store gage network data and streamflow tracking procedures. BLM shall review and approve the database.

(c) The Licensee shall, within two years after license issuance, submit a report for each water year (i.e. October 1st through September 30th) of streamflow data reported in cfs to the BLM. The report shall be filed with the BLM within six months of the end of each water year.

D. River Gravel Management Plan

The Licensee shall, within one year after License issuance, file to the Federal Energy Regulatory Commission (Commission) a River Gravel Management Plan (RGMP), for the J.C. Boyle Bypassed River and Peaking Reaches as specified.

The Licensee shall prepare a draft RGMP after consultation with the BLM. The Licensee shall allow a minimum of 30 days for the BLM to comment and to make recommendations on the draft RGMP before finalizing the RGMP and filing it with the Commission. The Licensee shall include with the RGMP documentation of consultation with the BLM and copies of comments and recommendations that are accommodated by the RGMP. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information. At the time the Licensee files the RGMP with the Commission, the Licensee shall submit a copy of the filed documents to the BLM.

The BLM reserves the right to require changes to the RGMP by filing modifications to the RGMP within 30 days of receipt. Upon Commission approval, the Licensee shall implement the RGMP, including any changes required by the BLM.

1. River Gravel Management Plan (RGMP) - Implementation, Monitoring, and Adaptation.

(a) At a minimum the RGMP shall include a river gravel management program to increase channel complexity and availability of spawning habitat for resident and anadromous fish. The river gravel management program will continue for the life of the License. The RGMP shall include the following components as specified:

(1) A description of how channel complexity will be provided, such that variation in channel depth, velocity, substrate, cover, and temperature at all flows is restored.

(2) Quantity of gravel to be added, such that the minimum amount to be added is 1,226 tons/year (20% of the maximum) and the maximum amount to be added is equivalent to the estimated average annual deficit of 6,134 tons/year. Quantity of gravel shall be based on estimates of ongoing reductions in sediment supply due to J.C. Boyle Dam and on the improvements in channel complexity and spawning habitat over time.

(3) Timing of gravel to be added, based on estimates of ongoing reductions in sediment supply due to J.C. Boyle Dam and on the improvements in channel complexity and spawning habitat over time.

(4) Method(s) of gravel augmentation, including, but not limited to, the following approaches:

a. Passive gravel augmentation at a logistically convenient location, allowing high flows to distribute over time;

b. Placement of discrete quantities of gravels in locations, usually riffles, where they are expected to be of most benefit, based on hydrologic and biologic considerations; and

c. Modeling of reach characteristics to determine gravel augmentation.

(5) Objectives describing how the RGMP will satisfy Klamath Falls Resource Area Resource Management Plan direction (USDI BLM 1995a), such as "Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate and character of sediment input, storage and transport." (USDI BLM 1995a, pages 7-9).

(6) Evaluation procedures, such as performance measures, that describe how monitoring results will be used for adaptation of the RGMP over the term of the License.

(b) The RGMP shall be accomplished in three phases (implementation, monitoring, and adaptation.)

(1) Implementation (Years 1 though 3): Implement the RGMP immediately upon approval by the Commission and the BLM, including any changes required by the Commission. Employ the gravel management program in accordance with permit approvals and biologically appropriate timing. In the RGMP the Licensee shall:

a. Identify specific goals of the RGMP, based on review of available habitat unit mapping and geomorphic and hydraulic studies to determine where specific riffles, glides, side channels, point bars, and floodplains will benefit from gravel augmentation. Identify numeric goals for quantifying success of: diversity in alluvial features, area of spawning and rearing habitat for different species, length of side channels, and area of potentially improved floodplain.

b. Identify the flows needed to move the size of material supplied at different sites, based on review hydraulic and geomorphic information, including slope, width, and depth of the channel.

c. Identify potential access points. Existing road access points are: 1) below the dam; 2) near the powerhouse; and 3) at the Klamath River Campground. Additional access points may be constructed or available, subject to approval by BLM.

d. Describe the location and timing of gravel augmentation, considering logistical and access constraints and legal requirements necessary to maintain water quality and aquatic and riparian habitats.

e. Identify methods for surveying for the surface area and volume of material added after gravel augmentation.

f. Develop a system for maintaining survey data including, but not limited to, timing and location of treatments.

(2) Monitoring and Evaluation (Years 1 though 7): Initiate monitoring at the time of gravel placement and continue through the life of the RGMP. Conduct monitoring to determine the effectiveness of implementation in meeting objectives of gravel augmentation, and to provide information to adapt the program. Monitoring shall include full reach monitoring and intensive site monitoring as specified:

a. Full Reach Monitoring (BLM-administered lands in the J.C. Boyle Bypassed River and Peaking Reaches):

- In the 7th year of implementation, after all gravel is placed, but before the Comprehensive Report is compiled: (1) map all locations where materials up to 250 mm are the dominant or subdominant substrate; and (2) re-map habitat unit types at similar flows, and with criteria similar to that used in preparation of the Final License Application (PacifiCorp 2004a).
- Before implementation, and in the 7th year of implementation, after all gravel is placed but before the Comprehensive Report is compiled, map point bars, side channels and floodplains, up to the estimated 100-year flood flow level.
- Annually measure and record spawning use identified within each habitat unit. Measure physical extent of spawning habitat areas used annually and any suitably sized gravel patches which are not used for spawning. Use the same methods in all years.

b. Intensive Site Monitoring (BLM-administered lands in the J.C. Boyle Bypassed River and Peaking Reaches): Select and monitor at least 20% of the length of riffle and run units. These units should be areas which are known to, or may be influenced by, gravel augmentation.

- Monitor these sites every three years or if flows exceed the five-year return frequency.
- Survey to record changes in topography and channel features based on ground surveys.
- Conduct Wolman Pebble counts, and bulk sediment sampling at each sampling period to adequately characterize the habitat unit.
- Sample invertebrate populations to identify changes in production.

(3) Adaptation (Years 7 through 9): During the seventh year of implementation, evaluate monitoring data and adapt the RGMP for the next 10-year gravel management cycle. In cooperation with the BLM, determine the effectiveness of the RGMP and determine the need for future augmentation and additional monitoring and evaluation over the following 10 years. Continue implementation, monitoring, and revision on 10-year cycles throughout the term of the license.

(c) RGMP Reporting - The Licensee shall:

(1) Submit to the BLM and the Commission, within six months after the end of each implementation and monitoring year, an annual report on the activities of the gravel management program during the previous year. The report shall include a description of the quantities of gravel added, methods used, and any monitoring data.

a. The BLM and the Commission shall have 60 days to comment on the adequacy of the RGMP, following submission of the report to the BLM and the Commission. The Licensee shall consult with the BLM on any necessary changes to the implementation and monitoring. Upon Commission approval, the Licensee shall implement the revisions.

(2) Submit to the BLM and the Commission, in the 7th year, a Comprehensive Monitoring Report of the gravel monitoring data from the previous six years.

a. The BLM shall have 90 days to comment on the adequacy of the Comprehensive Monitoring Report, following submission of the report to BLM and the Commission. The Licensee shall consult with the BLM on any necessary changes to the RGMP, as described in the adaptation phase of the RGMP. Upon Commission approval, the Licensee shall implement modifications to the RGMP from comments on the results in the report and consultation with the BLM.

E. Adaptive Management Plan (AMP)

The Licensee shall, within one year after License issuance, file to the Commission, an Adaptive Management Plan (AMP) for the J.C. Boyle Bypassed River and Peaking Reaches as specified.

The Licensee shall prepare a draft AMP after consultation with the BLM. The Licensee shall allow a minimum of 30 days for the BLM to comment and to make recommendations on the draft AMP before finalizing the AMP and filing it with the Commission. The Licensee shall include with the AMP documentation of consultation with the BLM and explanation of how BLM comments and recommendations are accommodated by the AMP. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information. At the time the Licensee files the AMP with the Commission, the Licensee shall submit a copy of the filed documents to the BLM.

The BLM reserves the right to require changes to the AMP by filing modifications to the AMP within 30 days of receipt. Upon Commission approval, the Licensee shall implement the AMP, including any changes required by the BLM.

1. The AMP shall be designed to monitor how implementation of the River Corridor Management Condition is effective in improving fish habitat quantity and quality for resident, migratory, and anadromous fish.

2. The Licensee shall report the monitoring results, and an evaluation of these results, annually to the BLM. The Licensee shall coordinate with the BLM, and the monitoring shall be consistent with other monitoring efforts (e.g., the RGMP.)

(a) The evaluation reports shall include at a minimum all relevant data collected and the Licensee's conclusions regarding the state of aquatic habitat (spawning, holding, feeding, juvenile rearing, riparian, and migratory).
(b) The report shall review the adequacy of flows for providing migration, rearing, and spawning habitat for native aquatic species; flow necessary to move spawning gravel; flow necessary achieve riparian habitat management objectives; flow to support power generation; and flows necessary to provide opportunities for recreation.

3. Within 60 days of issuance of the reports to BLM, the Licensee shall file the record of consultation and any BLM comments and recommendations with the Commission. The BLM reserves the right, after notice, comment, and administrative review, to require changes to Project operation through revision of 4(e) conditions.

Rationale

Introduction

In the J.C. Boyle Bypassed River Reach (4.3 miles from J.C. Boyle Dam to the J.C. Boyle Powerhouse), the Klamath Hydroelectric Project (Project) operations have altered the hydrologic regime. The Project has reduced flows, truncated flood flows, and reduced the seasonal flow variability. These changes have reduced scour and deposition, modified channel shape, and reduced the quality and quantity of riparian and aquatic habitat. The minimum base flow of 6 % of the mean annual flow (1560 cfs) has facilitated the encroachment of undesirable riparian vegetation species (e.g., reed canary grass), reduced recreation opportunities (e.g., whitewater boating), and transformed a major river into a small stream. The 100 cfs minimum base flow occurs about 89% of the time. Conversely, in the J.C Boyle Peaking Reach (16 miles from the J.C. Boyle Powerhouse to the slackwater of Copco I Reservoir) flows are currently hyper-variable, and change daily just below the J.C. Boyle Powerhouse from a low flow of approximately 320 cfs to either a high flow of 1,500 cfs (one turbine) or about 3,000 cfs (two turbines.) These current Project operations manage the Klamath River primarily for power production, while creating a summer whitewater boating industry. Current Project operations have also altered the Klamath River corridor including riparian and aquatic habitat.

The sections below, describe BLM management direction, the current and proposed operations, and the impacts of those operations on natural resources, recreation, and power production. There is also a description the development of the Condition and an assessment of the effects of the Condition on natural resources, recreation, and power production.

Purposes of the Reservation

The River Corridor Management Condition (Condition) addresses impacts of the Project operations on stream channel integrity, riparian habitat, and fish habitat to ensure adequate protection of natural resource values and utilization for recreation and power production. The Condition reflects multiple use and sustained yield management objectives of the BLM for the J.C. Boyle Bypassed River and Peaking Reaches on the Klamath River. The objective of the Condition is based on the Klamath Falls Resource Area Resource Management Plan (KFRA RMP) and the *Federal Lands Policy Management Act* (FLPMA 1976). According to policy

direction in FLPMA (1976), the BLM manages BLM-administered lands for multiple use and sustained yield. FLPMA states:

> "…management be on the basis of multiple use and sustained yield…"
>
> "The term "multiple use" means the management of public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; …a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources, …and harmonious and coordinated management of the various resources without permanent impairment of the land and the quality of the environment with consideration being given to the relative value of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output."
>
> "The term "sustained yield" means the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple use."

1. Natural Resources

The BLM reservations within the KFRA are administered according to the KFRA RMP Record of Decision (ROD). The KRFA RMP provides direction for the BLM to engage in the relicensing process: "For proposed hydroelectric projects under the jurisdiction of the Federal Energy Regulatory Commission, provide timely, written comments regarding maintenance of instream flows and habitat conditions and maintenance/restoration of riparian resources and stream channel integrity" (USDI BLM 1995a, page 16). Further direction specific to hydroelectric projects in the KFRA RMP states that a priority emphasis should be provided for: "…maintenance of instream flows and habitat conditions and maintenance/restoration of riparian resources and stream channel integrity..." (USDI BLM 1995a, page 67).

The KFRA RMP includes provisions of the 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl that is commonly referred to as the Northwest Forest Plan. Central to the Northwest Forest Plan is the Aquatic Conservation Strategy (ACS), which seeks to restore habitat and ecosystem health by maintaining and restoring aquatic habitat, restoring habitat connectivity, and maintaining flows sufficient to sustain elements of aquatic systems. The KFRA RMP states that existing hydroelectric project support facilities in Riparian Reserves should be operated "with an emphasis to eliminate adverse effects that retard or prevent attainment of ACS objectives" (USDI BLM 1995a, page 67).

According to the KFRA RMP, the BLM-administered lands along, and including, the Klamath River are a riparian reserve for fish-bearing streams. The riparian reserve for the Klamath River is "…the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of the riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of stream channel), whichever is greatest." (USDI BLM 1995a, page 13)

Table 4-1: Aquatic Resource Objectives from the KFRA RMP

Resource	KFRA RMP (USDI BLM 1995a)
1. Stream Channel Integrity	▪ "Maintain and restore the distribution, diversity and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted." (Pages 7-9) ▪ "Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species." (Pages 7-9) ▪ "Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations." (Pages 7-9) ▪ "Maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical and chemical integrity of the system and benefits survival, growth, reproduction and migration of individuals composing aquatic and riparian communities." (Pages 7-9) ▪ "Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate and character of sediment input, storage and transport." (Pages 7-9) ▪ "Identify instream flows needed to maintain riparian resources, channel conditions, and fish passage." (Page 35)
2. Riparian Habitat	▪ "Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic and wetland habitats and to retain patterns of sediment, nutrient and wood routing. The timing, magnitude, duration and spatial distribution of peak, high and low flows must be protected." (Pages 7-9) ▪ "Maintain and restore the timing, variability and duration of floodplain inundation and water table elevation in meadows and wetlands." (Pages 7-9) ▪ "Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability." (Pages 7-9) ▪ "Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species." (Pages 7-9) ▪ "Protect floodplains and wetlands in accordance with Executive Orders 11988 and 11990" (Page 29) ▪ "Manage riparian-wetland areas to protect, maintain, or improve riparian habitat for wildlife and native plant diversity." (Page 29) ▪ "Achieve riparian-wetland area improvement and maintenance objectives through the management of existing uses, wherever feasible." (Page 29) ▪ "Prescribe management of riparian-wetland values based on site-specific characteristics and settings." (Page 29) ▪ "Include corrective measures, such as construction of erosion control structures…and control or mitigation of activities that may contribute to soil erosion and degradation of watershed condition." (Page 30)
3. Fish Habitat	▪ "Maintain and restore fisheries potential; promote the rehabilitation and protection of at-risk fish stocks and their habitat; and maintain instream flows to support riparian resources, and channel conditions." (Page 35) ▪ "Maintain or enhance the fisheries potential of streams and other waters…" (Page 35).

2. Recreation

In addition to the KFRA RMP direction for natural resources, the RMP includes provisions for managing the Upper Klamath River as a Scenic River in the National Wild and Scenic Rivers system. This 11-mile segment (RM 209.3 to 220.3) of the Klamath River below J.C. Boyle

Powerhouse has special management requirements. The designation of the Wild and Scenic River (WSR) reach of the Klamath River leads the BLM to protect "…their outstandingly remarkable values (ORV)…", to "…maintain and enhance the natural integrity of river-related values in designated and suitable river areas.", and to "…protect the free-flowing values and identified outstandingly remarkable values (recreation, scenic, fish, wildlife, prehistoric, and historic, and it's value as a Native American traditional use area)" (USDI BLM 1995a, page 45).

For the Klamath River Complex Special Recreation Management Area, which includes the WSR segment of the upper Klamath River direction is provided to "emphasize whitewater boating, fishing, and camping along the upper Klamath River" (USDI BLM 1995a, page 50).

Rationale - (A) and (B) J.C. Boyle Bypassed River Reach and Peaking Reach

A. Current and Proposed Project Operations

Current Project operations and Project operations proposed in the FLA (PacifiCorp 2004a, Executive Summary) are similar. The description and analysis below are based on the hydrologic record.

1. J.C. Boyle Bypassed River Reach Current and Proposed Project Operations

Base Flow: Current Project operations deliver approximately 100 cfs to the J.C. Boyle Bypassed River Reach (RM 220.4 TO 224.7) year-round. Large springs a short distance below the dam supply an estimated additional 220 cfs of accretion flow, such that the total streamflow in the lower portion of the bypassed reach is approximately 320 cfs for most of the year (PacifiCorp 2004d, pages 5-38 to 5-39).

Project operations divert the majority of inflow available from the Klamath River above J.C. Boyle Reservoir. The magnitude of diversion from the J.C. Boyle Reservoir ranges from 300 cfs to 2,850 cfs (PacifiCorp 2004d, 5-42). Analysis of published daily USGS flow data, using the basis that flows are 100 cfs unless there is a spill, illustrates a reduction in flow to the J.C. Boyle Bypassed River Reach (USGS gage station #11510700). Flow into the bypassed reach is at or near 100 cfs 89% of the time. In the upstream portion of the J.C. Boyle Bypassed River Reach, when water is diverted for power, current operations provide about 81% of the outflow from J.C. Boyle Reservoir to the J.C. Boyle Canal. That leaves 19% of flow to the J.C. Boyle Bypassed River Reach. By diverting the majority of inflow, the current operations of the Project manage flows primarily for power generation and reduce flows available for sediment transport and hydrologic processes that support riparian, fisheries, and aquatic species habitat in the 4.3 mile long J.C. Boyle Bypassed River Reach.

Spill: The exception to the base flow occurs during infrequent spill events when river flows exceed 2,950 cfs and J.C. Boyle Reservoir is full (PacifiCorp 2004a, Exhibit E 3.1.5.3). Changes to the base flow also occur during emergency shutdowns and emergency spillway releases (PacifiCorp 2004a, Exhibit E 3.1.5.3). As a result of current operation, flows that mimic seasonal high flows occur only when there is a spill. According to analysis of published USGS gage data from the Klamath River below the J.C. Boyle Powerhouse (#11510700) from 1990-2000, a spill occurs two to three times per year in average to wet water years.

Ramping: Ramping typically only occurs during spill events and Project maintenance or during emergency shutdowns and emergency spillway releases. There is no stream gage or flow records available to determine what existing ramp rates are in the J.C. Boyle Bypassed River Reach during spill events. There is no current License requirement for ramp rates in the J.C. Boyle Bypassed River Reach.

Flow Magnitude, Duration, and Frequency: The Klamath River below the J.C. Boyle Powerhouse USGS gage data (#11510700) from the period of record (45 years from 1959 to 2000) was used to estimate the frequency and magnitude of seasonal high flows in the J.C. Boyle Bypassed Reach. Seasonal high flows for the J.C. Boyle Bypassed River Reach are estimated by subtracting the hydraulic capacity of the J.C. Boyle Powerhouse (2,850 cfs) and spring accretions (220 cfs) from the daily streamflow values for the gage location. Flood frequency analysis (Gordon et al 1992) for this gage site reveals that due to Project diversions, the magnitude of the 1.5-year flood event has been reduced by 80%, the two-year flood event has been reduced by 51%, and the five-year flood event had been reduced by 33%. PacifiCorp analysis also shows that Project operations **reduce the magnitude of flood events** (PacifiCorp 2004d, page 5-46).

The frequency of flows at or near the base flow of 100 cfs is 89% for the period of record (45 years from 1959 to 2000). According to USGS gage records, spill events occur approximately two to three times per year in wet and average water year types and not at all in dry years. Spill events were determined by counting the number of times flows exceeded 3,200 cfs. They occur abruptly, are short in duration, and do not reflect a flow regime with seasonal variability. Thus, the **frequency of high flows** (greater than the base flow of 100 cfs) in the J.C. Boyle Bypassed River Reach would be reduced as a consequence of proposed Project operations. This conclusion is supported by the IHA analysis by Huntington, which demonstrates that the high flows of the greatest magnitude have been eliminated when compared to the without Project scenario (Huntington 2004).

The BLM review of PacifiCorp modeling results illustrate that flows in the J.C. Boyle Bypassed River Reach were only elevated above base flow (i.e. 100 cfs) for one month during an average water year (2000). When flows were increased above 100 cfs they did not exceed 2,000 cfs, even when available flows from the Klamath River above J.C. Boyle Reservoir were greater than 3,000 cfs for approximately two months (PacifiCorp 2004a, Exhibit E 3.1.5.3 and Exhibit 3-24). According to data in the Water Resources Final Technical Report (seven years between 1991-2001), the duration of annual spill periods at the J.C. Boyle Dam was greater than three months in wet and above average water years, while during below average and dry water years the duration was less than one month or did not occur at all (PacifiCorp 2004d, page 5-37). Therefore, the **duration of flood events** has been reduced by the Project operations.

Analysis of USGS gage data was used to compare the flows in the peaking reach to those in the bypassed reach to determine the reduction in **magnitude of high flows** in the bypassed reach. Compared to the J.C. Boyle Peaking Reach, the duration of high flows (greater than the average annual flow) is diminished through the diversion of available inflow to the J.C. Boyle Powerhouse. Analysis of USGS gage data for an average water year type (2000) shows that in the peaking reach, the duration of flows greater than the average annual flow was approximately five months, whereas the duration in the bypassed reach was only three months (USGS gage #11510700). In a below average water year (2001), flows were greater than the average annual

flow in the peaking reach for approximately four months, whereas in the bypassed reach flows did not exceed the base flow condition of 100 cfs at all.

2. J.C. Boyle Peaking Reach Current and Proposed Project Operations

Base Flow: The base flow to the J.C. Boyle Peaking Reach (RM 204 to RM 220.4) is approximately 320 cfs, comprised of approximately 100 cfs released from J.C. Boyle Dam plus spring accretions (PacifiCorp 2004d, pages 5-38 to 5-39). Changes to this base flow occur during peaking operations, spill events, or during emergency shutdowns and emergency spillway releases (PacifiCorp 2004a, Exhibit E 3.1.5.3).

Peaking: The Project controls a daily peaking flow pattern throughout most of the year when river inflows to J.C. Boyle Reservoir are less than the maximum hydraulic capacity (2,850 cfs) of the J.C. Boyle Powerhouse (PacifiCorp 2004d, pages 5-37). During peaking operations, this reach can have up to a ten-fold diurnal variation in flow, as discharge ranges from 320 cfs to about 3,000 cfs. More specifically, during peaking operations, river flows vary between 320 cfs and 1,500 cfs when the J.C. Boyle Powerhouse is running one turbine and about 3,000 cfs when two turbines are used (PacifiCorp 2004d, page 5-42).

When river flows are greater than about 3,000 cfs, constant generation (i.e. “run of the river”) and spill occurs. The project is managed as “run of the river” for limited periods, usually during the spring (PacifiCorp 2004d, page 5-35).

Ramping: Project ramping occurs when operations require an increase or decrease in flow through the turbines for power generation. Ramping also occurs when outflow is reduced to facilitate reservoir refill or when maintenance activities require lowering Project reservoirs to access structures. In addition, there are unplanned outages which are an uncontrollable cause of Project ramping. Project start-up after planned and unplanned outages also involves ramping. Under current operations, ramp rates are restricted at the top of the J.C. Boyle Peaking Reach to nine inches per hour. Ramping occurs at this rate during peaking operations and when spill occurs at the J.C. Boyle Dam (PacifiCorp 2004d, Section 4). According to BLM review of USGS gage data, peaking operations can raise or lower the river stage downstream of the J.C. Boyle Powerhouse by 2.2 feet (river stage change from 30-minute discharge data) in a period of several hours (#11510700), resulting in rapid flow fluctuations in the J.C. Boyle Peaking Reach. Huntington (2004) documented numerous compliance violations with some ramp rates exceeding 1.2 feet per hour for up ramping and 1.3 feet per hour for down ramping.

The Project is managed as a peaking operation with daily flow fluctuations ranging from 1,000 to 2,600 cfs for nine to ten months of the year (PacifiCorp 2004d, page 5-35). Run-of-river operations occur during limited periods in late winter and spring when inflow exceeds the capacity of the two turbines in the J.C. Boyle Powerhouse. Data presented in the Water Resources FTR (PacifiCorp 2004d, 5-37) regarding the length of annual spill periods at J.C. Boyle Dam indicate that run-of-river operations, with a duration greater than three months, occur only in wet and above average water years. During below average and dry years spill is very short or does not occur. Analysis of USGS flow records downstream from J.C Boyle Powerhouse indicates that flows exceeded turbine capacity in 35 out of 45 (77%) of the water years between 1959 and 2003. The average duration of flows in excess of turbine capacity between water years 1993 and 2003 was 48 days (estimated from hydrographs derived from 30-minute streamflow data).

Huntington's IHA analysis determined the Project caused dramatic increases in median daily flow ranges (more than 1000%) and in the frequency and rates of flow change below the J.C. Boyle Powerhouse. Median hourly rates of rise and fall in flow were each increased more than 500%. Maximum rates of rise and fall in flow were increased by more than 300% (Huntington 2004).

B. Impacts of Current and Proposed Project Operations

Interactions among the biotic (e.g., vegetation and fish), hydrologic, and geomorphic components of ecosystems combine to shape the structure and function of riparian and stream systems (Kauffman et al 1997). Further, the ecological structure and function of aquatic and riparian ecosystems depends on the hydrologic regime, or pattern and quantity of water flowing through a river system (Gorman and Karr 1978, Junk et al. 1989, Poff and Ward 1990; Sparks 1992, Poff et al. 1997). Intra- and inter-annual variation in the hydrologic regime affects the dynamics among aquatic and riparian species through influences on habitat, natural disturbance, and biotic interactions (Poff and Ward 1989). Thus, modifications to the hydrologic regime can indirectly alter aquatic and riparian habitat (Ward and Stanford 1983, 1989; Bain et al. 1988).

1. Steam Channel Integrity

Bypassed Reach: According to PacifiCorp analysis of Project impacts, "…significant changes to geomorphology were observed in the J.C. Boyle bypass reach…" (PacifiCorp 2004a, Exhibit E, page 5-25). Reductions in the supply of sediment from lack of gravel recruitment due to J.C. Boyle Dam and low flows have caused changes in the stream channel. If hydrologic patterns, sediment availability, or streamside vegetation are altered, then channel morphology would subsequently adjust to these new conditions (Kauffman et al 1997). The PacifiCorp (2005) fish habitat versus flow relationships [weighted usable area (WUA) curves] indicate a change in stream structure. The WUA relationships show that geomorphic changes caused by current Project operations may have reduced the extent and quality of aquatic habitat and are impairing riparian ecological processes. These WUA curves reflect the loss of gravel point bars, benches, and spawning areas due to the loss of sediment supply; confinement due to side-cast material; more uniform bedforms; and reduced riparian width; and vegetation encroachment on the channel due to largely static flow conditions.

J.C. Boyle Dam has limited the input of sediment into the bypassed reach causing changes in channel morphology and fluvial processes, such as **coarsening of bed material** (PacifiCorp 2004d, page 6-111) and reducing the extent of active alluvial features. These changes have resulted in detrimental effects on aquatic and riparian habitats, including channel narrowing, increased bank erosion, and reduced channel migration. The J.C. Boyle Dam has blocked recruitment of sediment inputs such as gravel and small cobble. As a result, the **river bed has coarsened** as smaller gravels are transported downstream and not replaced, and larger gravels and cobbles dominate the streambed substrate. In general, below dams, with lack of sediment from flushing flows, the bedload composition becomes "armored" with material too coarse to be moved by the river, until in some cases bedrock is exposed (Collier et al 1996). The larger sized substrate that dominates these reaches is unsuitable for use by spawning fish (Kondolf and Wolman 1993).

Reductions in the magnitude and frequency of seasonal high flows have contributed to increasing the recurrence interval of flows necessary to mobilize the streambed material. Under Project operations, 1,450 cfs flows are currently needed to mobilize the streambed in the upper portion of the J.C. Boyle Bypassed River Reach. The recurrence interval of flows greater than 1,450 cfs has increased from less than one year, without the Project, to almost two years with the Project due to water diversion (PacifiCorp 2004d, page 6-134). In the lower portion of the reach, the recurrence interval of bed mobilizing flows has increased from approximately 1.5 years without the Project, to 2.5 years with the Project.

High flows that mobilize the streambed are necessary for **flushing out fine sediments**, redistributing gravel to maintain quality spawning beds (Wilcock et al 1996), providing water and nutrients to riparian areas (Stromberg 2001), and increasing the amount of rearing habitat by inundating the vegetated riparian zone.

Operation of the J.C. Boyle Canal **overflow emergency spillway** has resulted in the release of fines, sands, coarse cobble, and large boulders into the Klamath River. The J.C. Boyle overflow spillway is located approximately half way down the power canal, and has caused impacts to aquatic habitat from this segment to the reach downstream (PacifiCorp 2004a, Exhibit E, pages 5-25 to 5-26). Surveys of the area impacted by use of the emergency spill indicate that approximately 1,856,000 cubic feet of material has eroded into the bypassed reach (PacifiCorp 2004d, page 6-117). In addition, **sidecast material** from the construction of the Project canal and roads has entered the bypassed reach, causing adverse impacts, including channel narrowing (PacifiCorp 2004d, page 6-117). At one site approximately 4,800 feet upstream of the emergency spillway, road sidecast encroached into the bypassed channel, causing an undercut for nearly 400 feet on the opposite bank. This undercut has produced an estimated 276,000 cubic feet of sediment (PacifiCorp 2004d, page 6-117).

Peaking Reach: The J.C. Boyle Reservoir and Dam have reduced the **sediment supply** into the Klamath River downstream, while peaking operations from the Powerhouse have increased the substrate size of the limited sediment present in the J.C. Boyle Bypassed River and Peaking Reaches (PacifiCorp 2004d, page 6-134). Under current operations, the flow required to **mobilize the bed** has increased, while the recurrence interval of these flows has decreased (compared to the Without-Project scenario). For example, currently near the BLM campground in the J.C. Boyle Peaking Reach (RM 217.5), estimated flows of greater than 40,000 cfs would be necessary to mobilize bed materials. The reduced sediment supply coupled with frequent peaking operations has increased the average substrate size (coarsened the streambed), requiring a magnitude of higher flows greater than the largest peak flow recorded in this reach. Without the Project, approximately 5,000 cfs flows would mobilize the streambed about every two years (PacifiCorp 2004d, page 6-135). Loss of bedform features and alteration of sediment transport processes reduces the amount of productive diverse aquatic habitat (Milhous 1998).

Increased flows and reduction in the frequency of flows necessary to mobilize the streambed have reduced **channel structure and complexity** in the J.C. Boyle Peaking Reach. The channel lacks active alluvial features and is dominated by "featureless bedforms" (PacifiCorp 2004d, 6-115). This, in effect, reduces the distinction between channel features, and thus decreases fish habitat diversity (Hill et al 1991). In addition, the limited sediment supply to this reach contributes to reducing the dynamic channel structure. If hydrologic patterns, sediment availability, or streamside vegetation are altered, then channel morphology would subsequently

adjust to these new conditions (Kauffman et al 1997). This is often expressed by a simplification in stream structure (i.e. loss of pools, decreased channel sinuosity, and loss of channel diversity (Kauffman et al 1997).

2. Riparian Habitat

Bypassed Reach: Reduced flows create conditions suitable for the establishment and survival of undesirable riparian vegetation, and species such as **reed canary grass** have encroached on the stream channel (PacifiCorp 2004a, Exhibit E, page 5-149). Reed canary grass is well-suited to survive in excessively coarse substrate (areas that lack gravel and smaller sized material) and gains a competitive advantage over other native riparian species that do not establish in these conditions. Reduced base and seasonal high flows from Project operations have adversely affected the location and type of riparian vegetation in the J.C. Boyle Bypassed River Reach.

Periodic flooding of riparian vegetation is important for maintaining riparian plant species (Hill et al 1991; Marston et al 1995). Inundation from **riparian maintenance flows** provides the nutrients and substrate necessary for establishment and survival of riparian species (Kauffman et al 1997). Since current Project operations reduce the magnitude and frequency of flood flows in the bypassed reach, the upper elevation of the riparian area is reduced. This produces a narrow riparian area that is mostly defined by the 100 cfs base flow provided by the Project. Although PacifiCorp analysis only reviewed "riparian vegetation maintenance flows" for the J.C. Boyle Peaking Reach, the same analysis is appropriate to apply to the J.C. Boyle Bypassed River Reach. The relationships between seasonal high flows and riparian vegetation are similar because the general physiographic and climatic conditions between the peaking reach and the bypassed reach are comparable. According to PacifiCorp analysis, 3,300 to 5,800 cfs "riparian maintenance flows" are required in the J.C. Boyle Peaking Reach to inundate riparian all riparian vegetation (PacifiCorp 2004c, pages 3-105 to 3-106). The year-round base flow of 100 cfs (except for spills) currently provided by the Project does not produce the "riparian maintenance flows," thus reducing the width of the riparian habitat in the J.C. Boyle Bypassed River Reach (PacifiCorp 2004a, Exhibit E, pages 5-25 and 5-26).

In the upper portion of the J.C. Boyle Bypassed River Reach, the river is constrained by **sidecast material** present in the margins of the active stream channel. This material was generated during the construction of the J.C. Boyle Canal and road and continues to impact 1.5 miles of the channel. The sidecast material has constricted the channel and altered the riparian vegetation along most of the reach (PacifiCorp 2004a, Exhibit E, page 5-25). Alteration of instream flows and changes in sediment regimes can result in decreased bank stability (Rosgen 1996) and loss of riparian vegetation (Hill et al 1991). Desirable riparian vegetation (e.g., willow) does not establish and survive in the conditions created by the boulder-sized rocks comprising the sidecast. Further, in some areas this material has entered the active channel and is causing accelerated bank erosion on the opposite bank (PacifiCorp 2004d, page 6-117).

Peaking Reach: Sediment transport measurements indicate that current Project peaking operations generate flows capable of moving suspended sediment and fine-grained bedload (i.e. sand) (PacifiCorp 2004d, page 6-117). During 3,000 cfs peaking events, the bedload transport rate is approximately one ton per day, while the suspended sediment transport rate is approximately 250 tons per day. Peaking operations continue to **deplete fine sediment** from the J.C. Boyle Peaking Reach which already has a reduced supply of sand and fine sediment due to the effects of the J.C. Boyle Reservoir and Dam (PacifiCorp 2004d, page 6-44). These increased

sediment transport rates are likely to impact sediment deposition in riparian areas and aquatic habitat. Further, flow fluctuations contribute to **erosion of gravels and fine sediment** below dams by scouring the channel margins in the poorly vegetated varial zone (Brandt 2000) which further exacerbates stream bed armoring (Marcus et al 1990). This reduces the amount and distribution of riparian vegetation that would otherwise be available for aquatic life. Rearing fish, including sucker larvae and trout fry rely on low velocity channel margins. Lack of riparian vegetation in these areas limits the productivity and cover value for fish. The varial zone in the J.C. Boyle Peaking Reach is the elevation range within the active channel that is affected by daily fluctuation cycles resulting from operation of the Project facilities (PacifiCorp 2004d, page 3-101).

Flow fluctuations in the J.C. Boyle Peaking Reach have enhanced conditions conducive to the establishment and survival of undesirable riparian species, such as **reed canary grass**, and reduced the potential for establishment of other native riparian species (e.g., coyote willow.) Of the limited riparian vegetation in the varial zone, most of it is reed canary grass (PacifiCorp 2004a, Exhibit E, page 5-150). This invasive plant thrives in nutrient-rich conditions subject to frequent inundation (PacifiCorp 2004b, pages 3-112 and 3-114) and is capable of out-competing more desirable riparian species under these conditions (PacifiCorp 2004b, page 3-28). The life history of reed canary grass is conducive to disturbed conditions, such as hourly and daily flow fluctuations. The seeds respond well to mechanical disturbance (e.g., scour) (PacifiCorp 2004b, page 3-108) and the species is adapted to survive in frequently inundated coarse substrates (PacifiCorp 2004b, page 3-22).

Frequent inundation and exposure within the **varial zone** create conditions that allow reed canary grass a competitive advantage over other native riparian species. The distribution and extent of other riparian vegetation within the varial zone is limited and reed canary grass dominates the vegetation species mix (PacifiCorp 2004a, Exhibit E, page 5-150). In addition, peaking operations cause the distribution of this species to extend over a broad horizontal distance as frequent large fluctuations between high and low flows inundate and expose the varial zone (PacifiCorp 2004b, page 3-102). The current average varial zone width is approximately 48.0 feet, as interpolated from average wetted widths (PacifiCorp 2004b, Table 6.7-1) for flow fluctuations from 3,000 cfs to 325 cfs in the J.C. Boyle Peaking Reach (PacifiCorp 2004b, page 6-32). The effect of peaking operations on the varial zone differs throughout the peaking reach, depending on whether the channel is broad and "U"-shaped with terraces and point bars or confined and "V"-shaped. In narrow portions of the channel water level fluctuations would result in a greater change in stage. However, in broad lower gradient segments of the channel that have lower bank slopes, inundation or dewatering occurs over a wider horizontal area of the streambed.

<u>Bypassed Reach and Peaking Reach</u>: Changes in the flow and sediment regimes due to Project operations and facilities impact the potential establishment of desirable riparian vegetation. PacifiCorp analysis indicates that the J.C. Boyle Reservoir traps "…sediment which alters the amount of **fine substrate available** for establishment of riparian vegetation for some distance downstream…" (PacifiCorp 2004a, Exhibit E, page 5-148). J.C. Boyle Dam reduces the input of gravel, sand, and silt to this reach (PacifiCorp 2004a, Exhibit E, page 5-148). In addition, flow diversions and changes in the flow regime reduce the **potential for scouring and sediment deposition** of the limited material that is transported downstream of the dam (PacifiCorp 2004c, page 6-135). Since the streamflows, sediment supply, and bed mobility are reduced, the extent

of substrate appropriate for establishment of willows and other native riparian plants is decreased. Thus, the Project contributes to a **lack of willow** production (PacifiCorp 2004a, Exhibit E, page 5-102). Riparian hardwoods typically germinate and establish on "…freshly deposited alluvium in channel positions low enough to provide adequate moisture but high enough to escape scour…" (Scott et al 1993). The Project, however, maintains frequent scour conditions that do not provide alluvium over a large portion of the area where willows have the potential to establish. The inability of species like willow to compete successfully with reed canary grass under current Project conditions reflects the ability of reed canary grass to thrive under altered hydrologic regimes.

Project-related impacts on the distribution and type of riparian vegetation present in the riparian area affect the movement and migration of **wildlife species** that utilize this habitat. According to PacifiCorp, the "…patchy distribution of riparian habitats and unnatural distribution of riparian plant species may decrease the linear movement of several avian, reptile, amphibian, and mammalian species." (PacifiCorp 2004c, page 6-54) These species include a number of riparian focal species that potentially occur in the Project area (PacifiCorp 2004c, page 6-54), some of which are currently BLM sensitive species (Oregon and Washington BLM special status species list as of March, 2006). (See Table 4-2 below.) Riparian focal species use riparian habitats more often than upland habitat (PacifiCorp 2004c, page 6-54). For example, the long-term monitoring performed by the Klamath Bird Observatory indicates that riparian areas are important for breeding and during fall migration (PacifiCorp 2004c, page 6-56). Thus, the distribution of riparian habitat may have an adverse impact on the distribution of riparian-dependent bird species. Further, in the Project area there are special status herptile (e.g., Western pond turtle) and mammal (e.g., Townsend's big eared bat) species that rely on wetland and riparian habitat during some stage of their life cycle (PacifiCorp 2004c, page 5-84).

Table 4-2: Riparian Focal and BLM Sensitive Species Potentially Occurring in the Project Area.

Common Name	**Scientific Name**
Yellow warbler	*(Dendroica petechia)*
Purple martin	*(Progne subis)*
Black crowned night heron	*(Nycticorax nytcticorax)*
Western yellow-billed cuckoo	*(Coccyzus americanus)**
Song sparrow	*(Melospiza melodia)*
Oregon spotted frog	*(Rana pretiosa)* *
Willow flycatcher	*(Empidonax traillii)**
Western toad	*(Bufo boreas)* *
Yellow breasted chat	*(Icteria virens)*
Foothill yellow-legged frog	*(Rana boylii)* *
Source: Terrestrial Resources Final Technical Report, page 6-54 (PacifiCorp 2004c) * Indicates sensitive species.	

3. Fish Habitat Impacts

J.C. Boyle Bypassed River and Peaking Reaches:

Fisheries studies conducted in the Keno, J.C. Boyle Bypassed, and J.C. Boyle Peaking Reaches provide an indication of the impacts of reduced fish migration, low base flows, and the large flow fluctuations caused by the Project operations. Creel census data from Toman (1983) illustrates that numbers of trout in the J.C. Boyle Bypassed and J.C. Boyle Peaking Reaches were less than in the Keno Reach, and the size of fish was significantly larger in the Keno Reach.

This pattern was also revealed in PacifiCorp 2005a Section 3.9.3, (Addley et al 2005) which showed that trout are significantly larger and have higher growth rates in the Keno Reach than in the J.C. Boyle Peaking or Bypassed River Reaches. Oregon Department of Fish and Wildlife research from 1988-1991 (Buchanan et al 1991; Hemmingsen et al 1992; Buchanan et al 1994) and the Final Environmental Impact Statement (EIS) for the proposed Salt Caves Project (Federal Energy Regulatory Commission 1990) also noted low adult trout densities in the upper end of the peaking reach. The FERC EIS reported that trout in the upper peaking reach had relatively low growth rates and that large trout were under represented in the population age structure. The FERC EIS cited five years of investigation compiled by the City of Klamath Falls.

J.C. Boyle Bypassed River Reach:
Evidence provided in PacifiCorp studies supports the conclusion that Project operations have negative impacts on fish habitat in the bypassed reach. Specifically, the **redband trout fishery and habitat**, including food availability, fish production, and overall fish size (Addley et al 2005) are impacted by Project operations. Macroinvertebrate drift data show lower drift density in the bypassed reach compared to the Keno Reach above J.C. Boyle Dam. In the Keno Reach, drift density was 11 times higher in July and 2.4 times higher in September than drift density in the bypassed reach (Addley et al 2005, page 5). This difference in density does not include the much lower total productivity that results from less habitat area available due to lower base flow (approximately six times less flow in the bypassed reach than in the Keno Reach in June, July, and August.) The largely static flows in the bypassed reach coupled with the high proportion of low nutrient spring water may be contributing factors to low drift density and may help explain the lower fish growth and survival observed relative to the Keno Reach. The studies show that fish growth, fish survival of older age classes and fish size-at-age in the bypassed reach are less than observed in the Keno Reach (PacifiCorp 2004b). The foraging model over-predicted observed growth in the J.C. Boyle Bypassed River Reach. It would be necessary to decrease the temperature and/or observed drift density inputs to the model to match the slow growth observed in the J.C. Boyle Bypassed River Reach (Addley et al 2005). This suggests that static flows or some other habitat limitation may be affecting fish growth and survival. Similar patterns in fish population structure were reported by Beak Consulting Inc. (City of Klamath Falls 1986). Trout age distributions (few trout over three years of age and of smaller size at age) and macroinvertebrate drift data suggest that existing flow conditions limit both habitat availability and forage productivity, thus affecting redband trout growth and productivity. The evidence from recent redband trout studies (Addley et al 2005; ODFW 2003) and other previous studies (e.g. Toman 1982) suggests that the minimum inflow of 100 cfs in the J.C. Boyle Bypassed River Reach does not provide for a productive fish community in this reach.

PacifiCorp analysis illustrates that project-related flow reductions affect **fish movement and migration** (PacifiCorp 2004b, page 5-36 and 37). Historically, migrations of redband trout were documented throughout the Klamath River basin (Fortune et al 1966). Redband trout in the J.C. Boyle and Keno areas of the river exhibit a spring time migration from the Frain Ranch area (RM 217) to Upper Klamath Lake (RM 251), with a smaller migration during the fall (Fortune et al 1966, page 112). Recent passage at J.C. Boyle Dam continues to be less than 10% of that reported one year after project construction of J.C. Boyle Dam (Buchanan et al 1991). In addition, average size of redband trout passing over the ladder showed a decline in fish size over the 30 years since the dam was constructed (Hemmingsen 1997).

The fish passage and movement study conducted by PacifiCorp shows that in ten instances, downstream migrating fish pass quickly by the J.C. Boyle Powerhouse (PacifiCorp 2004b). However, information on five upstream-moving fish shows that the two longest delays observed (213 and 24 hours) occurred near the powerhouse. These fish moved into the vicinity of the powerhouse during an extended period of power generation and remained in this vicinity for up to 213 hours. This fish data represents 20% of the observations of upstream passage past the J.C. Boyle Powerhouse. These observations indicate that **flow alterations, including low minimum flow in the bypassed reach, may be affecting fish movement and migration**. During power generation, approximately 80% to 90% of the total flow is coming from the powerhouse, potentially causing a stronger attraction than the J.C. Boyle Bypassed River Reach, because of higher flows or a more concentrated homing scent, which could result in migration delay or cessation (PacifiCorp 2004b, page 5-1).

No field evaluations were conducted by PacifiCorp to evaluate **fish stranding or displacement** in the J.C. Boyle Bypassed River Reach. Although a study was requested below all dams and powerhouses (USDI 2004), no analysis of the effects from ramping due to the Project was performed above J.C. Boyle Powerhouse. However, down ramping during cessation of spill events can cause displacement, stranding, and mortality of fish and invertebrates (Cushman 1985; Hunter 1992; ODFW 2006). Evidence that stranding has been a problem due to Project operations is apparent from review of ODFW file reports, which provide accounts of numerous fish strandings and die-off events below Link River, Keno, and JC. Boyle Dams (ODFW 2006). In the bypassed reach, a fish mortality and stranding event was reported by ODFW on April 11, 1989 when inflows were reduced to the base flow of 100 cfs after an extended duration of spill. The fish stranding and die-off reported by the public and an ODFW research crew included dead and salvaged suckers, redband trout, dace, and sculpins. The event followed a 450 cfs and 520 cfs successive decrease in mean daily flow measured at Keno Dam during the previous two days. The flow in the bypassed reach was reduced by approximately 2,500 cfs or about 96% during the previous five days. Were it not for the diversion to the powerhouse, the reduction in flow volume would have been approximately 55% over the same period. Thus, the impacts of flood events are magnified in the bypassed reach because the rapid decrease from flow volume during flood events to the 100 cfs base flow causes a large relative change. Since redband spawning occurs in the bypassed reach and juvenile redband trout migrate into this reach from Spencer Creek, there is the potential for stranding after spill events, particularly in the spring when fry are present during the recession of flood flows. Additionally, high ramp rates could interfere with spawning success in this reach.

<u>J.C. Boyle Peaking Reach</u>:
Downstream **dewatering and desiccation of spawning habitat** were documented in studies of the J.C. Boyle Peaking Reach (City of Klamath Falls 1987). The Final EIS for the proposed Salt Caves Project (FERC 1990) noted low adult trout densities in the upper end of the peaking reach. The EIS reported that trout in the upper peaking reach had relatively low growth rates and that large trout were under-represented. The FERC EIS concluded that flow fluctuations below the J.C. Boyle Powerhouse caused chronic stress on trout and stranding of eggs, fry, and juveniles. Stress occurred from daily flow fluctuations and related changes in water temperature and water quality. These flow fluctuations caused trout to continue to seek new feeding and resting habitat while water temperature changed metabolism and feeding rates. Stage changes during hydroelectric peaking cycles may inhibit spawning (Hunter 1992; Anglin et al 2004), and can

dewater redds if spawning takes place during the high flows of the peaking cycle (Anglin et al 2004).

When peaking occurs during the middle of the summer, daily water temperature fluctuations of up to 12° Celsius occur in the J.C. Boyle Peaking Reach (City of Klamath Falls 1986; BLM 2003). In September of 2002, daily water temperature fluctuations in the peaking reach were only 2° Celsius after peaking operations were stopped temporarily, compared to fluctuations of 8° Celsius shortly before (PacifiCorp 2004). During off-peak periods of operation, the spring inflow dominates the flow volume, therefore, decreasing water temperature. However, during peaking reservoir water dominates the flow volume, therefore increasing water temperature. BLM's (2003) analysis of water temperature data during this same time period and in June 2003 demonstrates the relationship between water temperatures that occur during peaking to the water temperature resulting from the prevalence of cool spring waters from the bypassed reach. PacifiCorp water quality modeling results show that a steady flow would provide slightly lower daily maximum water temperatures and higher minimum water temperatures. In addition, water quality modeling of without-Project flow would provide even lower daily maximum temperatures and similar minimum temperatures in comparison to the existing condition (PacifiCorp 2005a, page 27; Addley 2005).

Research has shown that large daily fluctuations in temperature compromise growth and survival rates of rainbow trout (Hokanson et al 1977). The thermal effects of peaking likely compound the effects of high water temperature that are near or above the thermal tolerances for salmonids (US EPA 2003) in the peaking reach. Therefore, increases in diurnal fluctuations likely incur additional stress and energetic cost to redband trout.

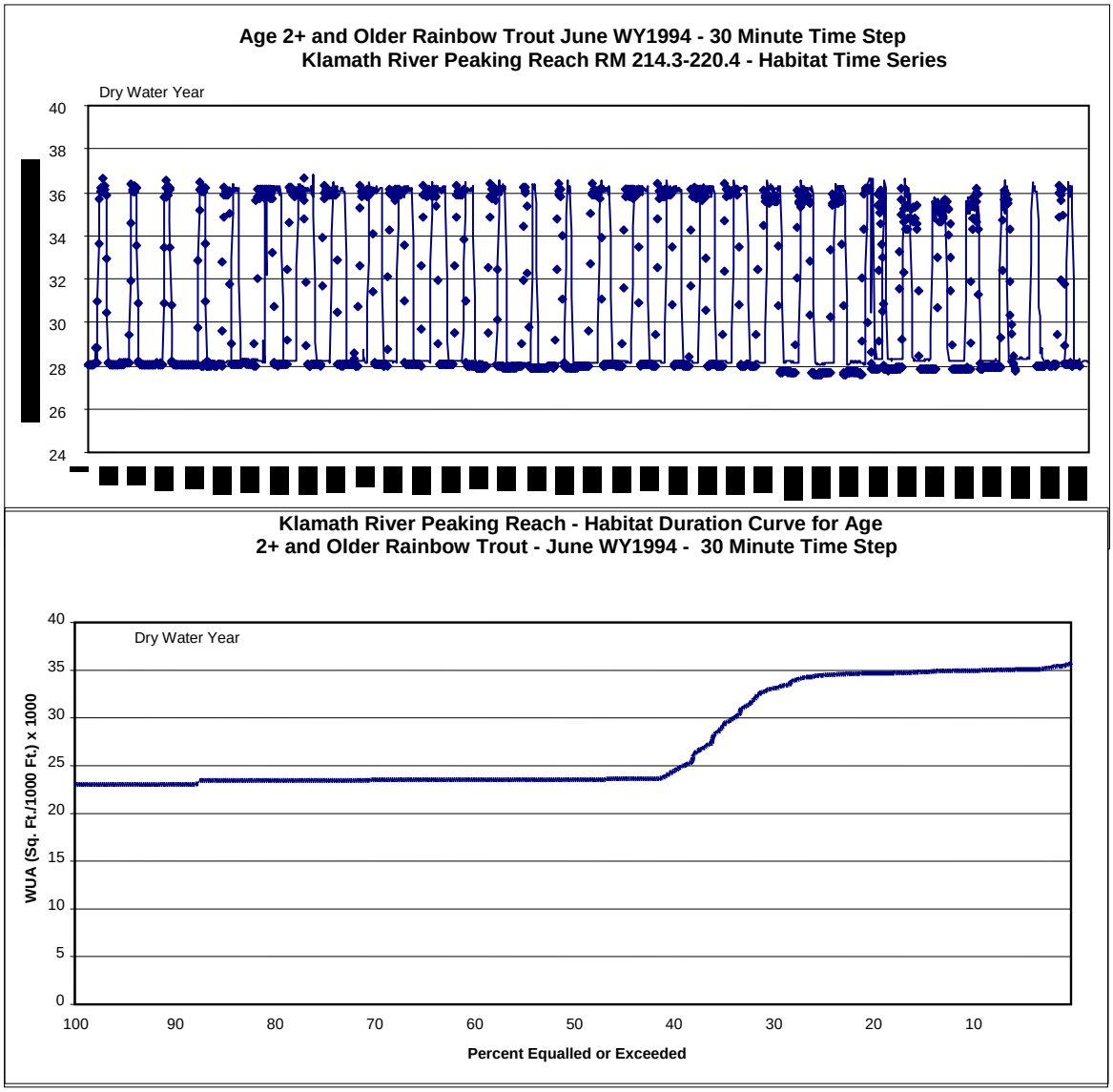
Flow fluctuations can dewater spawning beds, interfere with **spawning** at both low (when storage occurs) and peaked flows, and can result in mortality of incubating and rearing juveniles (Marcus et al 1990). Dewatering, desiccation of sucker spawning habitat, and larval stranding have been documented in the J.C. Boyle Peaking Reach (City of Klamath Falls 1986). Thus, the Project has direct effects on stranding and mortality in the peaking reach.

The effects of the Project peaking operations reduce the **amount and distribution of riparian vegetation** that would otherwise be available for aquatic life. Juvenile fish rearing habitat is generally located within ten feet of near shore areas in the varial zone. Rearing fish, including sucker larvae and trout fry rely on low velocity channel margins for escape cover and feeding. Lack of riparian vegetation limits productivity and cover values for fish (Bowen et al 2003).

The effect of peaking operations on the varial zone differs throughout the peaking reach, depending on whether the channel is broad and "U"-shaped with terraces and point bars or confined and "V"-shaped. In narrow portions of the channel water level fluctuations would result in a greater change in stage. However, in broad lower gradient segments of the channel that have lower bank slopes, inundation or dewatering occurs over a wider horizontal area of the streambed. Since a larger area across the channel and streambanks are affected by the Project, in broad portions of the reach, these areas would tend to have higher rates of fish stranding (Hunter 1992). Aadland (1993) concluded that riffle, raceway, and shallow-pool habitats were the most sensitive to flow fluctuations.

Redband trout and other native fish populations are impacted by peaking operations because these flows limit habitat area as a function of frequent low flow periods. This impact is illustrated in the time series analyses shown in Figure 4-1 (adapted from USDI BLM 2002). This data demonstrates that daily peaking operations **reduce suitable habitat** area to base flow area (approximately 320 cfs) for approximately 60% of the month of June in 1994. The 30-minute time step graph (adapted from USDI BLM 2002) illustrates the frequency and magnitude of the change to which fish and other aquatic animals must adjust on a daily basis. These graphs illustrate the change in available habitat area and the rate at which fish and invertebrates must adjust to rapidly changing conditions twice daily (USDI BLM 2002). PacifiCorp did not investigate the potential energetic cost of these flow fluctuations on trout growth and survival (Addley et al 2005).

Figure 4-1: Time Series Analysis from BLM Instream Flow Study (USDI BLM 2002).



Habitat availability information can be used to assess impacts to fish due to Project peaking operations. As Hunter (1992) points out, instream flow analysis using Instream Flow Incremental Methodology (IFIM) can be used to estimate habitat effects from flow fluctuations,

but IFIM "…is a complex and engrossing methodology that often distracts from other biological effects of hydropower development." Some of the other effects including displacement, food availability, stranding, and geomorphic impacts are discussed below.

The effects of a daily change in flow magnitude due to peaking operations are known to affect overall reach productivity and cause direct **fish mortality due to stranding** (Cushman 1985; Hunter 1992). Changes in surface water elevation cause **fish stranding** and dewatering of spawning areas during down ramping events (Cushman 1985; Hunter 1992). Studies of ramping below dams show that stranding rates increase as a function of increasing magnitude of stage change, and increasing rates of change (Bradford et al 1995). In the Bradford study, daytime stranding rates (2% bar slope) for coho juveniles in a controlled lab experiment ranged from 20% at a 2.4 inches per hour down ramp rate to 65% at an 11 inches per hour down ramp rate. Standing rates for juvenile rainbow trout were proportionally lower but exhibited similar patterns. Rapid flow increases in regulated reaches can wash out redds (Anglin et al 2005), displace fry (Hunter 1992), displace macroinvertebrates (Gislason 1985), and can incur energetic costs to fish due to frequently changing locations of available fish habitat (Anglin et al 2005). This is relevant for rearing of suckers and trout in the Klamath River because most of the habitat for rearing fish is in near-shore areas, subject to dewatering from Project peaking operations (PacifiCorp 2004b).

Physical Habitat Simulation (PHABSIM) is a method of assessing the habitat values that channels currently provide at different flows to assist with setting flow standards (Annear et al. 2004). The results of the Physical Habitat Simulation (PHABSIM) relationships provided by PacifiCorp (PacifiCorp 2005 - Flow Addendum) reflect the result of over 50 years of sediment transport impairment and regular peaking fluctuations. These changes include simplification of channel bedforms, loss of habitat diversity, loss of gravel point bars, gravel benches, and spawning areas; coarsening of the streambed; and reduced riparian productivity due to the impacts of peaking operations on the varial zone. The WUA relationships show that geomorphic changes caused by current Project operations may have reduced the extent and quality of aquatic habitat and are impairing riparian ecological processes. One explanation for why the WUA relationships do not change with changes in flow in the peaking reach is that habitat availability may be shifting with the shoreline as flow increases within the varial zone.

4. Recreation

J.C. Boyle Bypassed River Reach: According to the PacifiCorp Recreation FTR, "Project-related effects on boating in this reach have been substantial" (PacifiCorp 2004k, page 2-64). In addition "…pre-Project flows in the J.C. Boyle bypass were likely to provide flows between 1,000 and 3,000 cfs for several months each year (probably from late spring to mid summer, and then again in late fall to early winter)." Thus, the proposed operation of the Project (i.e. 100 cfs) impacts boating in this reach.

J.C. Boyle Peaking Reach: The BLM administers 21 permittees to provide commercial whitewater boating trips on the J.C. Boyle Peaking Reach of the Klamath River. The whitewater reach downstream of the J.C. Boyle Dam and Powerhouse includes 74 rapids (28 Class I, 25 Class II, 16 Class III, 3 Class IV, and 2 Class V rapids) that create a quality whitewater boating experience (PacifiCorp 2004k, Exhibit E, Page 7-29; USDI BLM 1990a, page 2-19). In the summer of 2004, a total of 4,141 visitors rafted the peaking reach. From May through October rafting visits ranged from 152 in October to 1,441 in July. The rafting use increases from May

through July and decreases from August through October, with the highest number of rafting visits in July and August (See Table 4-3).

Table 4-3: 2004 Upper Klamath Commercial Rafting Visits by Day of the Week and Month

2004 Upper Klamath Commercial Rafting Visits by Day of the Week and Month*							
	May	**June**	**July**	**August**	**September**	**October**	**Total**
Monday	11	72	157	105	28	6	379
Tuesday	38	109	110	142	0	7	406
Wednesday	7	31	32	48	0	72	190
Thursday	0	97	212	105	54	0	468
Friday	18	86	224	255	62	0	645
Saturday	72	182	517	371	161	64	1,367
Sunday	34	119	189	245	96	3	686
Total	180	696	1,441	1,271	401	152	4,141
* Data compiled January 2006.							

C. River Corridor Management Condition – Procedure for Development

As described above, Project operations do not protect stream channel integrity, riparian habitat, or fish habitat in the J.C. Boyle Bypassed River Reach or J.C. Boyle Peaking Reach. To develop the Condition, BLM utilized a multiple use resource management approach to arrive at a flow regime that would maintain and restore these resources, while also protecting recreation and providing for power production. Minimum base flows, coupled with a flow regime that includes inter-annual and intra-annual variation, are appropriate for maintaining fish habitat and riparian processes. Research also indicates that beyond prescribing a minimum flow, an appropriate flow regime based on season and water year type should be determined (Richter et al 1997; Stanford et al 1996).

To determine the flow regime to protect stream channel integrity, riparian habitat, and fish habitat, BLM used available site specific information and peer reviewed literature. The resulting flow alternatives were then analyzed with respect to impacts to recreation and power. This is achieved by implementing the direction in the KFRA RMP including the ACS objectives.

To assist in this analysis, BLM developed a Flow Management Scenario (FMS) model to assess and visualize alternatives for river flow allocation (USDI BLM 2006b). Model development was preceded by evaluating the scope and character of flow-dependent resources and the suitability of various flow regimes for specific resources. BLM used the model to run a wide range of scenarios to determine a flow regime that integrates across the BLM multiple use objectives by meeting the BLM needs for aquatic and riparian resources, while providing recreation and power generation opportunities.

The following section describes the development of four components of the Condition:

- a proportional allocation of flow to the bypassed reach and a minimum flow;
- a seasonal high flow;
- a weekly peaking opportunity; and
- ramp rate limitations.

1. Proportional Flow and Minimum Flow

The BLM began development of the proportional and minimum flow by considering the need to provide for the adequate protection and utilization of the BLM reservation, including maintenance and restoration of natural resource values and utilization for whitewater boating and power generation.

The Instream Flow Council (IFC), a nonprofit organization comprised of state and provincial fishery and wildlife agencies, recommends developing instream flow prescriptions that address five riverine components: 1) hydrology; 2) habitat; 3) geomorphology; 4) water quality; and 5) connectivity (Annear et al 2004). The IFC also notes that utilizing a percentage of unimpaired hydrology can serve as a robust and reasonable starting point in preparing a flow recommendation where site specific data is problematic (Annear et al 2004). This utilization of a percentage of unimpaired hydrology approach requires validation with site specific assessments of how biological and geomorphic processes respond to flow. This validation provides the rationale for the adaptive management component of the Condition.

The BLM coordinated with an interagency group to develop a methodology for instream flow recommendations, including fish and wildlife agencies responsible for submitting recommendations pursuant to Section 10(j) of the FPA (U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, and Oregon Department of Fish and Wildlife). The interagency group used the best available information to determine the flows recommended for instream habitat for fish in the Project reaches. BLM then analyzed and modified these flow recommendations to accomplish BLM multiple resource management direction.

Interagency Group

The interagency group analysis used the Tennant (1976) and Tessman (1980) method as supported by site specific information from the PHABSIM results; wetted perimeter analysis; water temperature modeling information; inundation of side channels; and an unimpaired hydrology approach. To determine the minimum base flow, the interagency group used a modification of the Tennant (1976) methodology. Instead of using the 30% of undepleted average annual flow, as recommended by Tennant (1976) for good survival conditions for most aquatic life forms and general recreation, the group used 40% of average annual flow (624 cfs). This increase in the percentage of average annual flow to 40% was made to compensate for using impaired average annual flow verses undepleted average annual flow.

To determine the proportional flow, the interagency group used a modification of the Tessman methodology (1980). Instead of using the mean monthly or mean annual flow, as recommended

by Tessman (1980), the group used 40% of the three-day average inflow. This change was made to account for local hydrologic conditions and variations in flow within the month and year.

Site specific information was also used by the interagency group to arrive at a minimum base flow recommendation. The interagency group considered using a PHABSIM analysis; however, the results were not informative for making flow recommendations because the changes in fish habitat are not responsive to changes in flow. However, the WUA curves for the J.C. Boyle Bypassed River and Peaking Reaches demonstrated that as flow is increased, habitat increases for fry, particularly as flows reach edge habitat provided by shoreline riparian vegetation.

In addition, the wetted perimeter analysis demonstrates the flows in the peaking reach should be between 700 cfs to 800 cfs to avoid the most extreme habitat dewatering and associated impacts. Further, the water temperature analysis demonstrates that the inflow to the J.C. Boyle Bypassed River Reach of 600 cfs to 800 cfs would not adversely affect thermal conditions for redband trout and anadromous fish. As a result of the analyses considered, the interagency group recommends a minimum base flow of 40% of the average annual flow (624 cfs) and 40% of the three-day average inflow, whichever is greater, to provide for fish habitat.

BLM

To achieve its objectives, the BLM minimum flow requirement differs from the interagency group, and is 30% of average annual flow (470 cfs), while the 40% proportional flow element is the same. The development of the BLM minimum and proportional flow is described in further detail below.

Minimum Base Flow: The Tennant method (Tennant 1976) is one of the first and best known percentage-of-hydrology methods. The purpose of the Tennant method is to obtain seasonally adjusted instream flow recommendations with some "…hydrological relevance for maintaining natural habitat, geomorphological, and recreational attributes of streams and rivers…" (Annear et al 2004). In his study of 11 streams in Montana, Nebraska, and Wyoming, Tennant (1976) found empirical support for his method, which recommends base flows that provide good survival conditions for most aquatic species.

The Tennant method states that 30% of unimpaired average annual flow is recommended for sustaining good survival conditions for most aquatic resources and general recreation, while 60% of average annual flow provides flows for excellent to outstanding habitat for aquatic resources and the majority of recreational uses. Tennant states that since it was derived from such a large varied dataset it can be applied successfully to streams throughout the United States (Tennant 1976). The IFC supports this claim by stating that the percentages established by Tennant were determined from data collected at a wide range of streams and do not usually require adjustment (Annear et al 2004).

According to the IFC (Annear et al 2004), the Tennant method is robust and a reasonable beginning for quantifying instream flow needs to which refinements can be made as necessary. Based on review of Tennant by the IFC (Annear et al 2004), this "…method should be associated with biological habitat needs…" at different times of year "…to be most useful in a specific region."

To determine the minimum base flow, BLM used the Tennant method and published daily flow data for the period of record (USGS Klamath River below the J.C. Boyle Powerhouse gage, #11050700, 1961-2004) to derive average annual inflow of 1780 cfs. The BLM used daily flow data for the period of record, and not unimpaired hydrology, because this represents the current condition. Inflow from springs between J.C. Boyle Dam and the gage was accounted for by subtracting 220 cfs (PacifiCorp 2004d page 5-39) from the average daily flow values, because there are no significant tributaries in this reach (PacifiCorp 2004d page 5-38 and 5-39). The average annual flow for inflow to J.C. boyle Reservoir is 1560 cfs (1780 cfs minus 220 cfs) and 30% of the average annual flow is 470 cfs.

The BLM examined the effects of a minimum flow of 30% of the average annual flow on aquatic, riparian using the current hydrology for the period of record, as well as other site specific information:

- The minimum flow was analyzed in the context of the PHABSIM results and the effects on available fry habitat;
- The wetted perimeter data was evaluated to determine the flows necessary to avoid the most extreme habitat dewatering and associated impacts;
- The minimum base flow was evaluated for the effects on side channel inundation for fish habitat.

See Section D (Effects of the River Corridor Management Condition) for a detailed discussion of the effects of the minimum base flow on natural resources.

In addition to analysis of impacts to natural resource values, BLM considered the impacts on recreation and power production in developing the minimum flow requirement. The development of the Condition included an analysis of the impacts of the flow Condition on the quality and quantity of recreational opportunities provided with the required flow regime. The development of the minimum streamflow requirement also compared the number of boating days resulting from implementation of the FLA proposed requirements, the interagency recommended flows, and the BLM minimum streamflow requirement. The number of available boating days in the peaking reach was calculated using the BLM Flow Management Scenario Model (USDI BLM 2006b) and compared to actual use data to determine a flow regime that balances the need to provide recreation opportunities with other resource values such as fisheries. The effects of the minimum base flow on rafting opportunities are analyzed in detail in Section D (Effects of the River Corridor Management Condition).

The minimum base flow of 470 cfs for the J.C. Boyle Bypassed River Reach would allow for power production except during the required seasonal high flow. When the inflow is greater than 470 cfs water would be available for power production. When inflow is between 470 cfs and 1175 cfs, all inflow above 470 cfs would be available for storage and power generation. When inflow is greater than 1175 cfs, a proportion of inflow (up to 60% of inflow) would be available for storage and power generation as describe below. The effects of the minimum base flow, including maximum ramp rates, minimum bypass reach flows, and proportional flow allocation are analyzed for their effects on power generation in Section D (Effects of the River Corridor Management Condition).

<u>Proportional Flow</u>: According to the IFC review (Annear et al 2004) of the Tennant method, average annual flow does not often reflect seasonal patterns in hydrology. Further, this review states that the intention of this method was to use different flows at different times of year to

follow the natural hydrograph to the extent possible. Hence, the Tennant method is appropriate for determining the minimum base flow requirement (for example see Armstrong and Parker 2003) while the Tessman (1980) approach is effective in addressing seasonal high flows through a proportional flow allocation (e.g., Maunder and Hindly 2005; Estes and Osborne 1986).

Tessman modified Tennant's approach to be more responsive to systems with a large amount of natural variation by calibrating for local hydrologic and biologic parameters, including monthly variability. By combining annual flow statistics with monthly variability, the Tessman approach provides inter-annual variation. The Tessman approach uses a 40% proportional flow in relation to mean annual flow and mean monthly flow. The 40% of flow is needed to account for large fluctuations in flow during different months of the year (Tessman 1980). The Condition utilizes this percentage and applies it to the inflow to J.C. Boyle Reservoir. To account for local hydrologic conditions, variations in flow within the months and year, and the storage capacity of J.C. Boyle Reservoir, the Condition refines the Tessman approach to require 40% of the inflow, as determined from the average flow of the previous three days. When inflow exceeds 1,175 cfs (1,175 cfs * 40% = 470 cfs), 40% of the inflow would be provided and flow would increase above the minimum base flow requirement. Thus by applying the Tessman approach, flows are increased above the minimum base flow and reflect the seasonal variability. Inter-annual variation is needed for establishing and maintaining riparian vegetation, including disturbance regimes from high and low water year extremes (Richter 1986).

The modification from the average annual or average monthly flow to the average flow of the previous three days represents a change from the traditional "flatline" Tennant flow requirement and provides intra-annual variability. The Condition uses a smaller time step than Tessman (three days instead of monthly or annually) to provide for more frequent variations, facilitate Project operations, and accommodate the relatively small storage capacity of the J.C. Boyle Reservoir. By providing 40% of flows averaged from the previous three days, seasonal patterns based on water availability and appropriate amounts of inter-annual variation are incorporated.

2. Seasonal High Flow

In addition to the minimum base flow and proportional flow, providing a seasonal high flow to the bypassed reach sufficient to mobilize and distribute sediment is needed to support riparian and geomorphic processes. An annual flushing flow is often required to clean and redeposit gravel to provide quality spawning habitat (Wilcock et al 1996). To achieve desired ecological effects, the seasonal flow should be of adequate duration and frequency to mobilize and redistribute sediments, flush fine sediments from spawning beds (Wilcock et al 1996), deposit riparian plant seeds and fine sediment (Tessman 1980), wet the riparian area at the beginning of the growing season (Junk and Wantzen 2004), and provide a disturbance regime for germination of riparian plants (PacifiCorp 2004c, page 3-107; Hill et al 1991; Hansen et al 1998).

The Condition requirement for the timing, magnitude, and duration of the seasonal high flow was determined based on needs of riparian vegetation on BLM-administered lands in the bypassed and peaking reaches. The timing of the flushing flow (once 3,300 cfs is available between February 1st and April 15th) coincides with the early part of the growing season and germination of riparian species. The seasonal high flow duration of one week was derived from analysis of seasonal high flows at the USGS gage below Keno Dam (#110050500). One week was the minimum duration of seasonal high flows over 3,300 cfs (analysis of USGS gage records from

1990 to 2004). Flows over 3,300 cfs after February 1st, occurred in six of the last 15 years. The duration of continuous flows over 3,300 cfs averaged 28 days with a maximum 78 days and a minimum of seven days. The gage data suggests that the seasonal high flow would only occur in relatively wet years.

According to PacifiCorp analysis, in the peaking reach, 3,300 cfs to 5,800 cfs "riparian vegetation maintenance flows" are required to inundate riparian vegetation (PacifiCorp 2004c, page 3-105 to 3-106). A flow of 3,300 cfs corresponds to a return interval of about 1.5 years at the Klamath River below the J.C. Boyle Powerhouse gage (BLM analysis of USGS #11510700). Flows with a return interval of 1-2 years are often the flows necessary to support channel maintenance processes such as sediment transport and streamside vegetation (Gorden 1992). This return interval flow frequently corresponds to the "bankful dishcharge" which is the flow that fills the stream to its banks and is often assumed to control the form of alluvial channels (Gorden et al 1992; Rosgen 1996)". The 3,300 cfs seasonal high flow derived from the peaking reach data is also applicable to the bypassed reach. Flows above 3,300 in the bypassed reach would increase the frequency and magnitude of sediment bed mobility in the bypassed reach (PacifiCorp 2004d, page 6-134). Bed mobilization is needed to maintain the quality and quantity of spawning habitat (Wilcock et al 1996).

3. Weekly Peak

The Condition requires the Licensee to minimize peaking to no more than once per week targeted on weekend days during the summer months (May 1st to October 31st). The Condition reduces the impacts on aquatic and riparian resources, while providing for whitewater boating and power generation. By reducing the frequency of daily peaking events, impacts to fish habitat are expected to decrease. The peaking operations flow regime in the Condition integrates requirements for recreation, power generation, and aquatic resources, such that a quality whitewater boating opportunity is possible and power can be produced, while the effects of peaking on fish are reduced.

To accomplish objectives to provide for whitewater boating, the Condition allows peaking operations from 1,500 to 3,000 cfs a maximum of once per week with a priority set for Saturday, Sunday, then Friday from May 1st to October 31st. According to the PacifiCorp Recreation Flow Analysis for the J.C. Boyle Bypassed River Reach and the Hells Corner segment of the Klamath River, 1,500 cfs would be near the optimal level of flow for whitewater boating. Fifteen hundred cfs would allow for commercial whitewater rafting trips through both of these reaches. The analysis also indicated that 3,000 cfs would be the maximum flow to allow for a quality whitewater boating opportunity (PacifiCorp 2004k).

The season of use and priority days for peaking operations necessary for whitewater boating are based on commercial rafting use reports compiled from 1985 to 2005 (USDI BLM 1985-2005). The reports illustrate that the highest use days are Saturday, Sunday, and Friday, and that the rafting season extends from the beginning of May to the end of October. For example, during the summer of 2004, 66% of rafting visits were on Friday, Saturday, or Sunday. In addition, from May through October rafting visits ranged from 152 in October to 1,441 in July. The rafting use increases from May through July and decreases from August through October, with the highest number of rafting visits in July and August. (Refer to Table 4-3 above.)

4. Ramping Rates During Controlled Events

The Condition requirement for ramp rate limits was determined by evaluating relevant literature, site specific studies by PacifiCorp, and relevant site specific reports, and information provided by Oregon Department of Fish and Wildlife and others. Additionally, a comparison of existing ramp rates was evaluated against a relatively unaltered hydrograph in a major tributary to the Upper Klamath River to better understand the flow variability conditions under which native species likely evolved. (See Huntington 2004 and discussion of his findings below.)

The Condition requirement for ramping rates limits up or down ramping to two inches per hour for the bypassed and peaking reaches except during uncontrolled events and implementation of the seasonal high flow. This rate is considered adequate to limit stranding mortality for fisheries and other aquatic organisms as a function of rapid changes in vertical stage and rapid dewatering of the channel bed when fry are not present (Hunter 1992). Hunter (1992) noted that stranding of salmonid fry can occur at ramping rates as low as one inch per hour. He recommends no artificial ramping when Chinook fry are present because they are more vulnerable to ramping than other salmonids.

PacifiCorp evaluated stranding potential downstream of the bypassed reach however, results provided little insight to potential stranding or displacement effects because fish density was very low under current Project operations (PacifiCorp 2005). Findings from the PacifiCorp study evaluating potential fish stranding and entrapment in the peaking reach (PacifiCorp 2005) are consistent with the findings of other stranding and entrapment studies that report difficulty in detecting stranded fish due to predation and burrowing (Hunter 1992). PacifiCorp surveys indicated low numbers of stranded fish and low numbers of fish present in the study area. Thus, it is expected that stranding observations would be commensurate with fish density (Hunter 1992). In addition, there were no reliable fish population estimates and no application of a lower ramp rate to assess the effectiveness of a lower ramp rate in preventing fish stranding. Although the PacifiCorp study did not have the data needed to analyze an adequate ramp rate, fry and juvenile stranding rates are substantially reduced when ramping rates are equal to or less than two inches per hour (Hunter 1992). The results of the PacifiCorp study show that ramp rates attenuate in a downstream direction. A ramp rate below the powerhouse (RM 219.7) of about nine inches per hour attenuated to about five inches per hour at Frain Ranch (RM 214.3) and an eight inch ramp rate at the powerhouse attenuated to about a three inch per hour ramp rate near Shovel Creek (RM 206.3). If attenuation at lower ramp rates is proportional to attenuation at higher ramp rates, then a two inch ramp rate would be attenuated to about 1.1 inches at Frain Ranch and about 0.75 inches per hour at Shovel Creek.

Laboratory (Bradford et al 1995) and field studies (e.g., Anglin et al 2005) show that ramp rates over two inches per hour can cause harm to aquatic species, including rainbow trout fry, salmonid eggs, and spawning success. Studies of ramping below dams show that stranding rates increase as a function of increasing magnitude of stage change, and increasing rates of change (Bradford et al 1995). In the Bradford study, daytime stranding rates (2% bar slope) for coho juveniles in a controlled lab experiment ranged from 20% at a 2.4 inches per hour down ramp rate to 65% at an 11 inches per hour down ramp rate. Stranding rates for juvenile rainbow trout were proportionally lower but exhibited similar patterns.

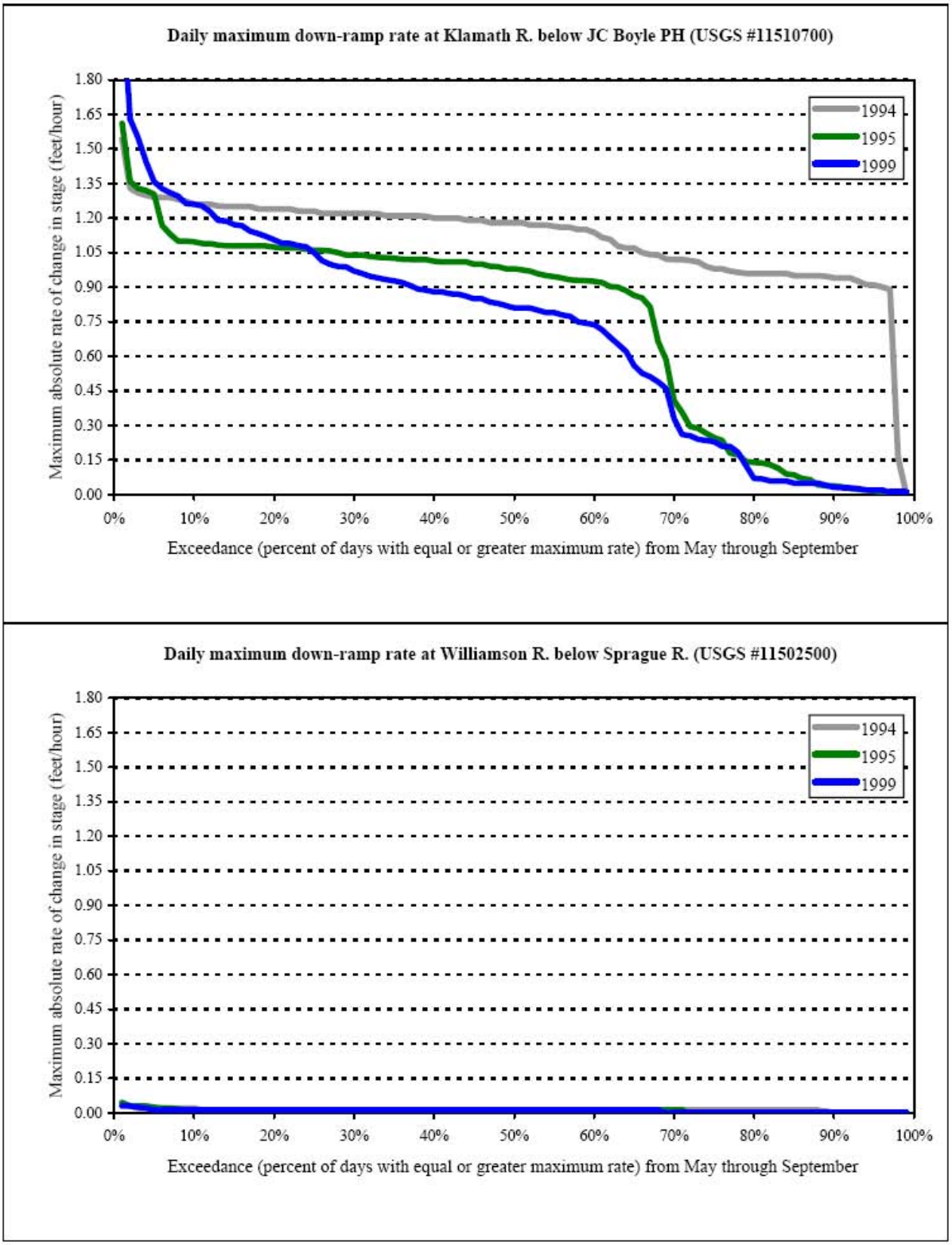
In addition to an analysis of existing studies, the ramp rate limit for the Condition was determined through evaluation of the Huntington analysis, comparing the J.C. Boyle Peaking Reach (2004) to the Williamson River. This analysis was used to determine what the appropriate ramp rate would be for a similar river system with no peaking operations. Huntington (2004) compared stage change rates on the Williamson River to stage change rates at the J.C. Boyle Peaking Reach below the Powerhouse gage (USGS #11510700), using the period from May to September. The Williamson River hydrograph is comparable to the Klamath River because of the presence of upstream springs, upstream irrigation diversions, and it is located in the same subbasin. The Williamson gage is likely the best-available source of information on the approximate levels of up ramp and down ramp rates that might be seen at the gage site below the J.C. Boyle Powerhouse (USGS #11510700) if no water was diverted for Project operations. The data from the Williamson gage likely represents the rate of stage change under which the Klamath basin aquatic species evolved.

Results of stage-change analysis for the Williamson River gage site below Sprague River are provided in Figure 4-2 (Huntington 2004). Daily maximum rates of increase or decrease in stage at the Williamson River site are approximately two inches during May to September 1994, 1995, and 1999, as compared to approximately 2.2 feet at the gage below J.C. Boyle Powerhouse (USGS #11510700) during the same years. This was a period after peak runoff had occurred at both sites and also a period during which small juvenile fish in the river system would have been relatively vulnerable to stranding or trapping by rapid flow reductions (PacifiCorp 2004b, page 6-3).

In determining a ramp rate for the Bypassed and Peaking reaches, the PacifiCorp findings and relevant literature was used to determine a rate that balanced aquatic species concerns but still provides for recreation and power generation. Ramp rates were modeled using the Flow Management Scenario Model (USDI BLM 2003) to better understand the relative difference between the ramp rates proposed by the Licensee and those more protective of aquatic resources.

The ramp rate limits provided in the Condition, based on recommendations in Hunter (1992), are designed to reduce but not eliminate stranding and displacement of trout and other aquatic organisms. Reducing the rate of water level change would provide additional time for fish to adjust to spatial changes in habitat availability potentially reducing energetic costs and vulnerability to predation.

Figure 4-2: Exceedance values for daily maximum rates of decline (down ramp) below the J.C. Boyle Powerhouse (USGS Gage # 1150700) and on Williamson River (USGS Gage # 11502500) during 1994, 1995, and 1999 (Huntington 2004, Figure 6, page 16).



D. Effects of the River Corridor Management Condition

The Condition would alter the current Project flow regime from a low static base flow (except for spills) in the J.C. Boyle Bypassed River and Peaking Reaches to a proportional flow with a higher overall minimum base flow. The Condition increases the base flow in the J.C. Boyle Bypassed River Reach from 100 cfs to no less than 470 cfs when the inflow to the J.C. Boyle Reservoir is at least 470 cfs. The Condition requires the Licensee to provide 40% of the inflow at the upstream portion of the J.C. Boyle Bypassed River Reach, with a required minimum base flow of 470 cfs. When 470 cfs is not available, then an amount no less than the inflow from the Klamath River above J.C. Boyle Reservoir is required to be released to the bypassed reach. This provision of the Condition addresses water availability, especially for dry years, and variability in the annual flow regime. Thus, the Condition requires an overall increased base flow from the current condition and flows that are more reflective of seasonal events, including high and low flows (Tessman 1980; Annear et al 2004).

The modeled flow regime provided to the bypassed reach is illustrated for the year 1994 (dry), 2000 (average) and 1998 (wet) (water year types are based on BLM 2002) in Figure 4-3 (Parts A, B, and C). These figures illustrate the intent and approximate outcome of the flow requirements, including the one week diversion suspension for seasonal high flow.

For the dry year (1994), a higher proportion (66%) of the available water supply is bypassed because the 470 cfs minimum flow requirement would provide between 40% and 100% of the total inflow for much of the year. In 1994 (Figure 4-4, Part A), inflow never exceeds 3,300 cfs, and therefore, no seasonal high flow requiring suspension of diversion is provided. However, inflow drops below 470 cfs in the summer and therefore no diversion is provided during that period.

In total, 46% of the annual flow is provided to the bypassed reach in the year (2000). When the Condition was modeled with FMS using data from 2000, flows to the bypassed reach were maintained above the minimum flow (i.e. 470 cfs) for all months. Further, when the water availability increased from January through May, flows through the bypassed reach reflected this change (See Figure 4-4, Part B). During the year 2000, an inflow event of greater than 3,300 cfs occurs between February 1 and April 15, and therefore a seasonal high flow occurs.

In 1998 (wet year), the BLM flow condition provides 47% of the annual flow to the bypassed reach. In this year the seasonal high flow is illustrated because inflows over 3,000 cfs occur (Figure 4-4, Part C).

Figure 4-3 (Parts A, B, and C) illustrates that minimum base flows are provided except during the summer of very dry years. Flows in the bypassed reach are generally proportional, as Tessman (1980) recommends, and reflective of inflow to J.C. Boyle Reservoir.

The effects of the flow requirements on a weekly peaking cycle were also modeled using the BLM Flow Management Scenario Model (USDI BLM 2006b). Examples of the flow allocations hydrographs are provided in Figure 4-4 for a dry year (1994), an average year (2000), and a wet year (1998). A weekly peaking cycle provides rafting opportunities and flows for power generation except in July and most of August in the dry year (1994). Like all models, FMS

makes some simplifying assumptions; see the model documentation submitted on the CD along with this filing for details (USDI BLM 2006b).

Figure 4-3A: FMS Modeled Flow Regimes for the J.C. Boyle Bypassed River Reach for a Dry Water Year (1994)

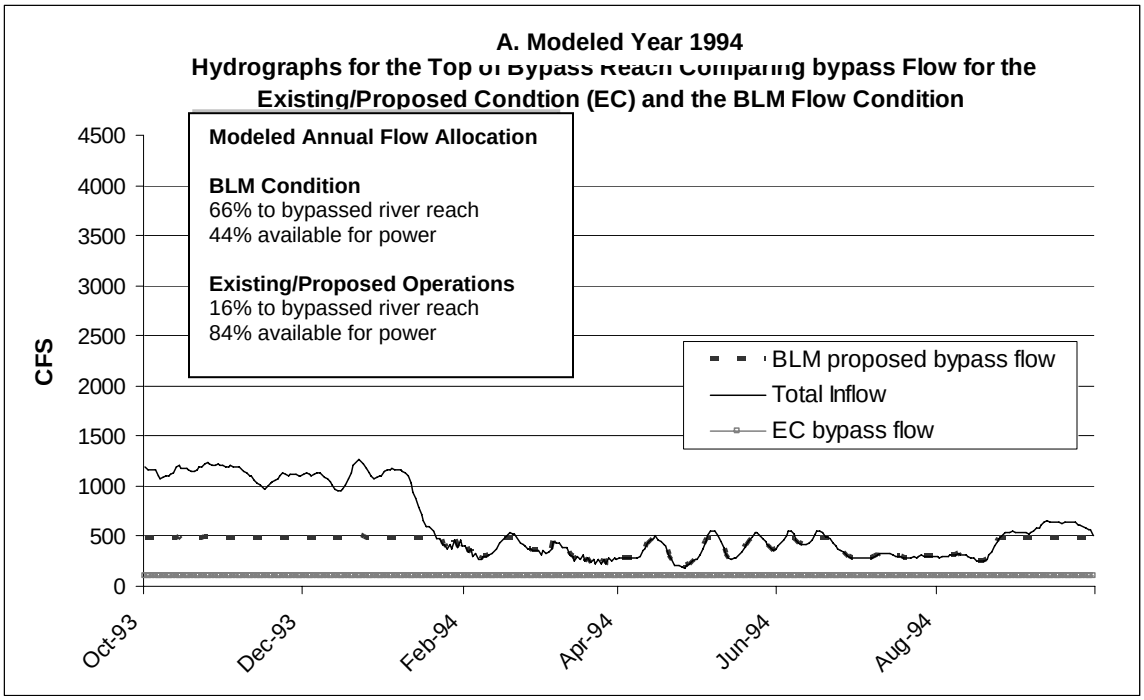


Figure 4-3B: FMS Modeled Flow Regimes for the J.C. Boyle Bypassed River Reach for an Average Water Year (2000)

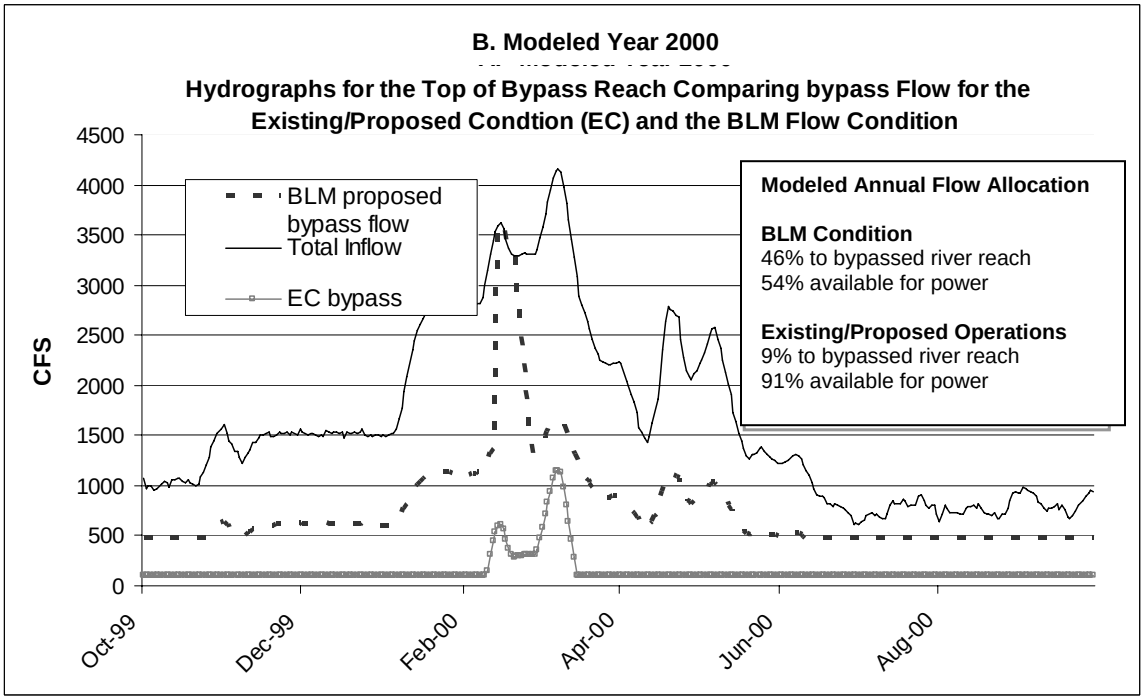
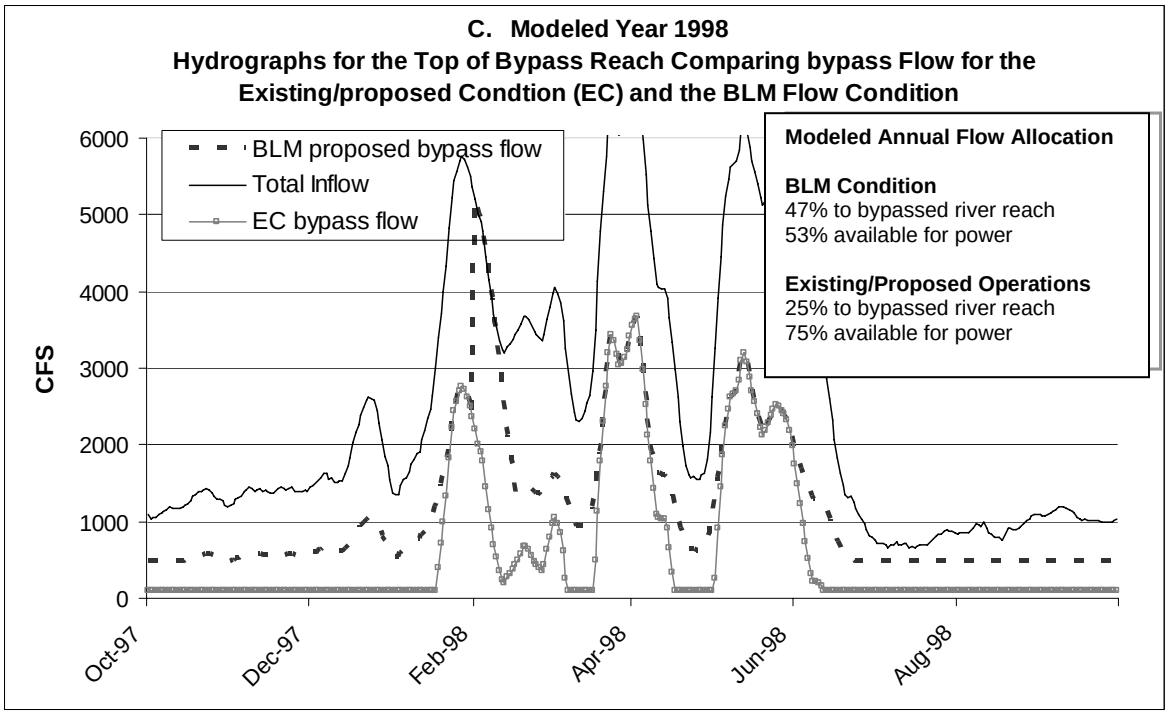
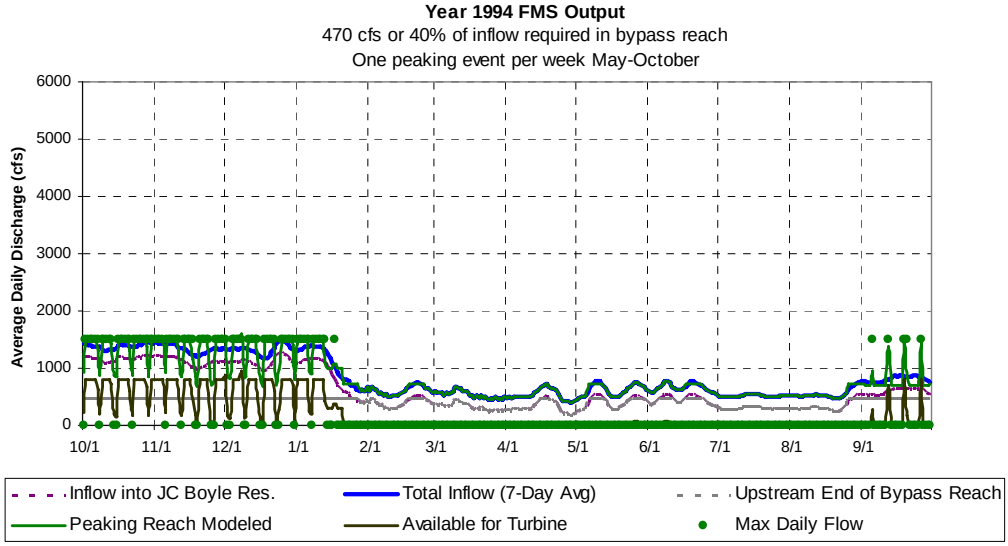


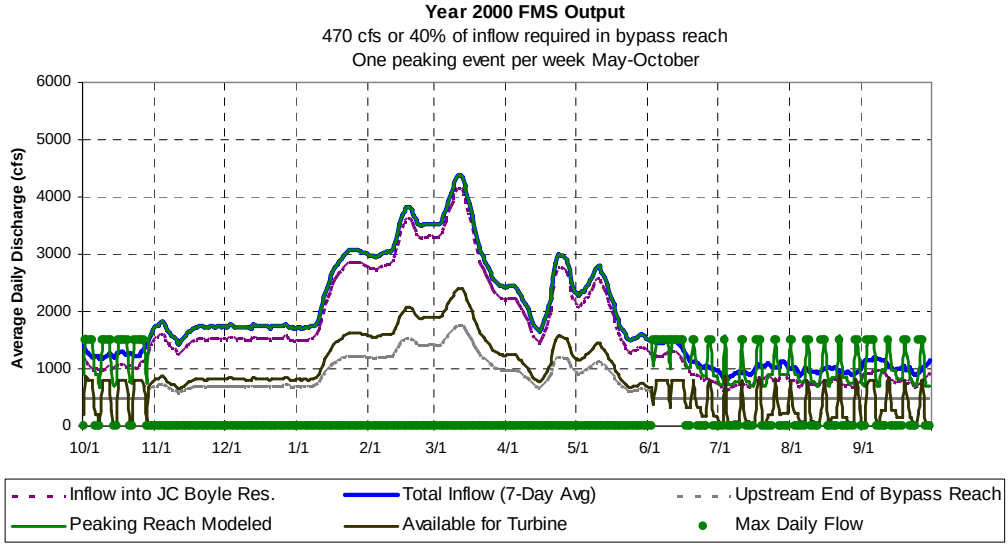
Figure 4-3C: FMS Modeled Flow Regimes for the J.C. Boyle Bypassed River Reach for a Wet Water Year (1998)

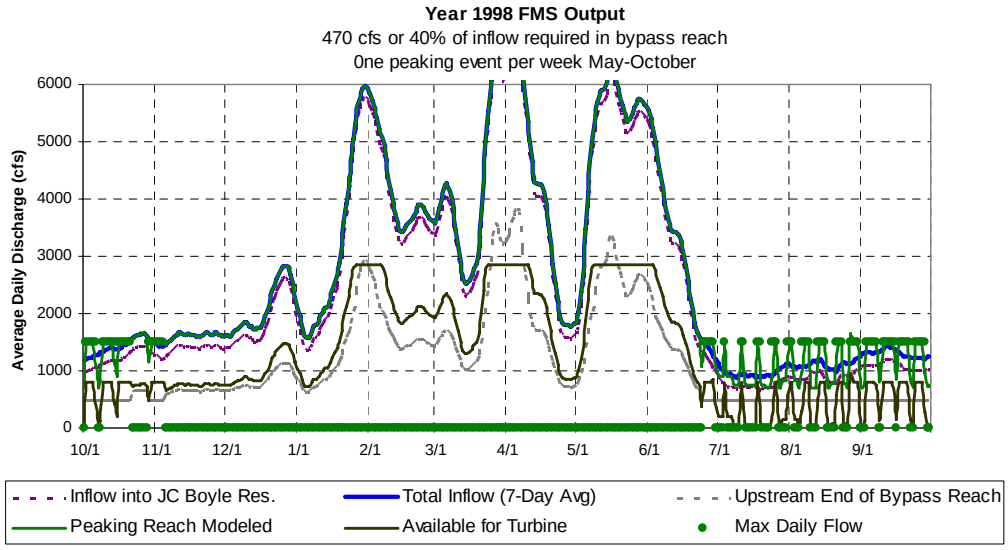


[Figures 4-3A, 4-3B, and 4-3C above illustrate modeled J.C. Boyle Bypassed River Reach Hydrographs showing Minimum Streamflow Condition bypass flows for Existing Condition (EC) compared to the BLM Condition flow requirement (470 cfs minimum or 40% of inflow) and seasonal high flow for the year 1994 (A), 2000 (B) and 1998 (C), a dry, average, and wet year respectively. Hydrographs are derived from the Klamath River below the J.C. Boyle Powerhouse gage data (#11510700) minus 220 cfs to account for spring inflow and smoothed to 7-day running average for visual presentation. Data from USDI BLM 2002.]

Figure 4-4: Flow allocations hydrographs (dry year-1994, average year-2000, wet year-1998).







1. Stream Channel Integrity

Impacts of the Condition in the Bypassed and Peaking Reaches:
In addition to the minimum base flow and proportional flow, an un-diverted seasonal high flow for one week to the bypassed reach is expected to mobilize sediment in the stream bed and distribute this sediment in a manner beneficial to riparian and geomorphic processes. An annual seasonal high flow would support high quality spawning habitat by redistributing gravels and flushing fine and embedded sediments (Wilcock et al 1996). A seasonal high flow of at least one week in duration would increase stream channel complexity and desirable bedform characteristics. Seasonal high flows are needed to maintain stream channel and riparian processes that provide fish habitat (Hill et al 1991).

2. Riparian Habitat

Impacts of the Condition in the Bypassed Reach:
The proportional flow requirement provides for the receding flows during the growing season necessary for establishing riparian vegetation on terraces on BLM-administered land. Flows needed to restore frequent inundation of the riparian vegetation and nutrient cycling processes rely on gradually receding flows during the growing season (Hill et al 1991; Stromberg 2001). The requirement of a 40% proportional flow with a 470 cfs minimum base flow would provide a more frequently inundated riparian area, thus increasing the amount of aquatic habitat provided by submerged and inundated riparian vegetation. The width of the riparian area would be expected to increase as sediments are deposited in the active channel. The Condition would improve the riparian and fish habitats by providing flows more similar to those in which desirable riparian vegetation and aquatic species are adapted. Flows occurring in the bypassed reach that are below 470 cfs would allow for some establishment of desirable riparian vegetation below the base flow waterline. This riparian habitat would provide cover and feeding areas for early life stages of rearing fish.

Due to the lack of data provided by PacifiCorp for the J.C. Boyle Bypassed River Reach as previously requested (USDI 2004), BLM evaluated other relevant studies (e.g., Hill et al 1991 and Stromberg 2001) to assess the effects of the Condition on riparian habitat. This literature shows that there would be an increase in riparian habitat based on an increase in frequency and magnitude of the seasonal high flow. The Condition would provide the increased base flow, proportional flows, and seasonal high flows needed for protection of the BLM reservation and so provides for the attainment of the KFRA RMP ACS objectives.

Impacts of the Condition in the Peaking Reach:
The Condition would provide the increased base flow and seasonal high flows during the growing season necessary for establishing riparian vegetation on terraces on BLM-administered land. The requirement of a 40% proportional flow, with a 690 cfs minimum base flow (470 cfs minimum flow and 220 cfs spring accretions), would inundate more of the riparian area, thus increasing the amount of aquatic habitat provided by submerged and inundated riparian vegetation. The width of the riparian area would be expected to increase as sediments are deposited in the active channel. The Condition would improve the riparian and fish habitats by providing flows more similar to those in which desirable riparian vegetation and aquatic species are adapted.

The Condition requires a reduction in the frequency of peaking events to once per week in the summer months (May 1st-October 31st). Reduced frequency or timing of inundation in the upper varial zone (PacifiCorp 2004d, page 3-101) is expected to reduce reed canary grass in these areas (PacifiCorp 2004a, Exhibit E 5-150). Since reed canary grass is adapted to survive in disturbed conditions subject to frequent inundation (e.g., hourly and daily flow fluctuations), reducing the frequency of peaking events is expected to reduce reed canary grass in the upper varial zone.

Impact of the Condition in the Bypassed River and Peaking Reaches:
A seasonal high flow of at least one week in duration would increase stream channel complexity and desirable bedform characteristics. Seasonal high flows are needed to maintain stream channel and riparian processes that provide fish habitat (Hill et al 1991). By requiring that the seasonal high flow be provided after the last day of February, this flow is likely to occur during the early part of the growing season.

3. Fish Habitat Quantity and Quality

Impacts of the Condition in the Bypassed Reach:
The Condition would increase fish habitat quantity and improve habitat quality as riparian and geomorphic processes are improved. A flow that reflects seasonal variability, including flood events, would restore ecological functions necessary for the protection of the BLM reservation and provides for the attainment of KFRA RMP fish habitat objectives and ACS Objectives. The results of PacifiCorp studies focusing on fish production (Addley et al 2005; PacifiCorp 2004b) demonstrate that restoring base flows and seasonal high flows to the bypassed reach would be necessary to maintain and improve fish habitat.

The Licensee conducted a PHABSIM analysis for the bypassed reach but the results appear to be unresponsive to changes in flow. The PHABSIM analysis conducted by the Licensee in the Klamath River reflects the results of a highly modified flow alteration and impacts on channel shape in the J.C. Boyle Bypassed River Reach. The Weighted Usable Area (WUA) relationships for rainbow trout presented by PacifiCorp in their April 2005 addendum to the instream flow study are remarkably flat, indicating that microhabitat is unresponsive to changes in flow. Therefore, the current PHABSIM relationships are not informative and have limited utility in determining flow needs for most life stages of trout and sucker.

The WUA do curves show that there is minimal habitat for trout fry and sucker larvae (low percent of total area for the entire range of flows), and therefore may be a limiting factor for cohort recruitment in the bypassed reach. The WUA estimates for the bypassed reach suggest that trout fry and sucker larvae habitat availability increase with increasing flows up to about 800 cfs, because more edge habitat is available at higher flows (PacifiCorp 2005 - Instream Flow Addendum Report). Since more riparian vegetation is inundated at higher flows, more trout fry and sucker larvae habitat would be available under the flow proportional flow regime required by the Condition. Figure 4-4 (above) shows that 800 cfs is available to the bypassed reach during May and June of the average and wet years when these life stages would likely be present and a proportion of the inflow would be added to the base flow.

The Condition provides for “riparian vegetation maintenance flows” which would inundate all riparian vegetation (PacifiCorp 2004c, pages 3-105 to 3-106) and seasonal high flows which

would redistribute gravel and fine sediment to edge habitat along the channel margins. Cumulatively, with the addition of gravel (See Section D – RGMP of the Condition), these processes would lead to an increased extent and improved quality of riparian vegetation, thus increasing habitat availability for critical life stages (trout fry and sucker larvae) of native fish.

Increasing the minimum base flow above the existing condition (100 cfs) results in more suitable habitat availability for trout fry. According to the PacifiCorp WUA curves for redband trout, a 470 cfs minimum base flow allows for a 32% increase in fry suitable area, over the existing minimum flow (See Table 4-4).

Table 4-4: J.C. Boyle Bypassed River Reach Percent of Optimal Fry Habitat Availability for Existing Instream Flow Requirement and the BLM 4(e) Base Flow Requirement.

J C Boyle Bypassed River Reach			
	Flow (cfs)	**% of Area**	**% of Maximum**
PacifiCorp Existing Condition	100	6.1%	65.8%
BLM 4(e) Minimum Flow	470	6.4%	86.8%
Flow values are the releases at J.C. Boyle Dam and do not include spring accretions which were weighted for flow accretions at each habitat simulation transect (PacifiCorp 2005 - Instream Flow Studies Addendum Report)			

Side channels are often characterized by slower velocities and provide for high quality microhabitat for rearing and spawning fish (Bowen et al 2003). PacifiCorp (2004b) identified nine side channels below the J.C. Boyle Powerhouse, but did not identify any in the J.C. Boyle Bypassed River Reach. BLM identified six side channels in the bypassed reach using aerial photographs. It is expected that base flow increases approaching 700 cfs would result in water flowing in most of the bypassed reach side channels, and that the proportional flow allocation would further inundate side channels during critical spawning and rearing periods.

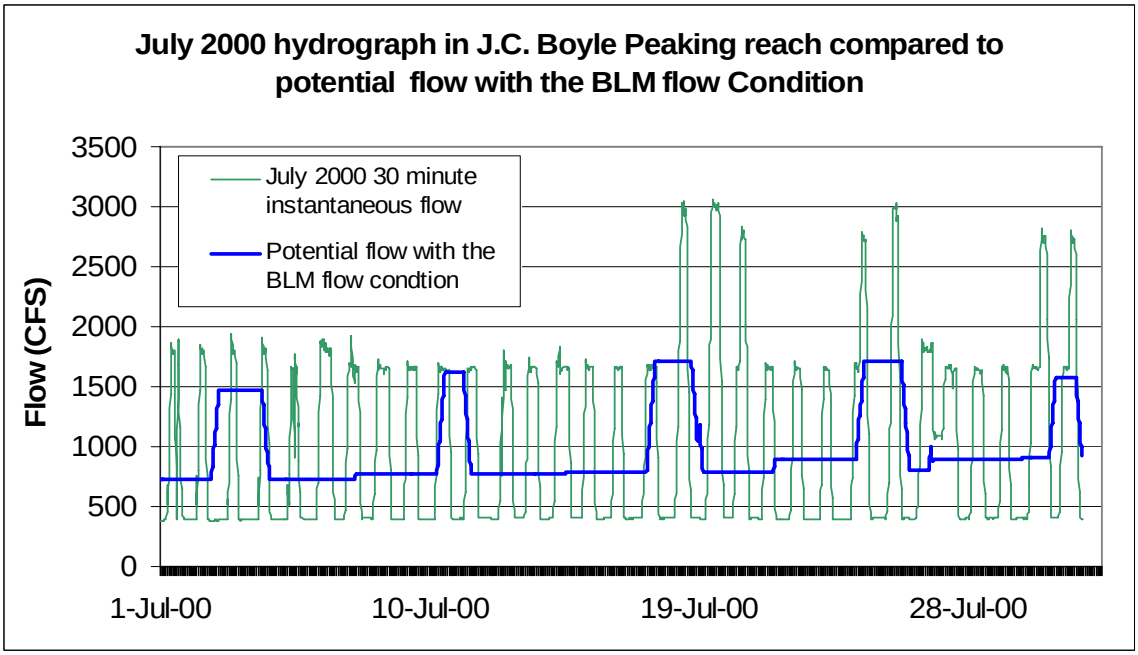
Impacts of the Condition in the Peaking Reach:
The amount of wetted perimeter change occurring between 350 cfs and 700 cfs is approximately 3.8 feet per 100 cfs versus 1.9 feet per 100 cfs between 700 cfs and 1,500 cfs (PacifiCorp 2005 - Peaking Impacts Report). This data indicates that the smallest degree of change to the wetted perimeter occurs at higher flows, and that flows that do not drop below 700 cfs would avoid the most extreme dewatering and associated impacts. The minimum base flow condition requiring a discharge that would result in 690 cfs downstream of the J.C. Boyle Powerhouse would avoid extreme changes in the wetted perimeter in the varial zone. As a result, the Condition would prevent dewatering of many of the low gradient (less than 2% to 4%) bank slopes that are susceptible to conditions that cause fish stranding.

Reducing flow fluctuations at least six months of the year to once per week would alter the varial zone, such that an increase in aquatic and riparian habitat would be expected. Reducing the amount of peaking would decrease the frequency of scour in the varial zone. Less scouring and more stable flows would support the establishment and survival of desirable riparian vegetation. It is anticipated that the decreased frequency of scouring would allow substrate to persist, such that the material needed for establishment of desirable species (e.g., willows) would be present in the varial zone. Further, providing a higher, more stable base flow would allow riparian vegetation to recolonize the varial zone. This larger riparian area would become aquatic habitat available for fish, macroinvertebrates and other aquatic life. In comparison to current frequent

flow fluctuations that favor the undesirable reed canary grass riparian community, the Condition requirement for reduced ramp rates combined with a more constant and higher base flow would aid in re-establishment of desirable riparian communities.

The Condition requires the Licensee to provide the same minimum flows on the weekdays in the J.C. Boyle Peaking Reach that result from the implementation of the J.C. Boyle Bypassed River Reach flow requirements. In addition, the weekly peaking cycle during the summer months (May 1st to October 31st) would decrease the number of peaking events from daily during most summers to four or five times a month (Figure 4-5). This would decrease impacts from summer daily peaking to the fisheries and riparian resources, while providing for power generation and whitewater boating opportunities. Reducing the magnitude of flow fluctuations and increasing base flow can improve fish productivity (McKinney et al 2001).

Figure 4-5: Instantaneous 30 minute flow measured below J.C. Boyle Powerhouse during July, 2000 compared to a potential peaking cycle under the BLM streamflow condition.



The Licensee conducted a PHABSIM analysis for the peaking reach, but the results appear to be unresponsive to changes in flow. The PHABSIM analysis conducted by the Licensee in the Klamath River likely reflects impacts on channel shape, channel complexity, substrate composition, and riparian vegetation from the highly modified flow in J.C. Boyle Peaking Reach. The Weighted Usable Area (WUA) relationships for rainbow trout presented by PacifiCorp in their April 2005 addendum to the instream flow study are remarkably flat for adults and juvenile habitat, changing only slightly over the range of flow available to the Klamath River. Therefore, the current PHABSIM relationships have limited utility in determining flow needs for most life stages of trout and sucker.

Although the results of the adult and juvenile habitat analysis for the peaking reach are difficult to interpret because of their unresponsiveness to changes in flow, the result for fry habitat availability indicate substantial increases in fry habitat with an increase in minimum base flow. The WUA estimates for the peaking reach suggest that trout fry and sucker larvae habitat

availability increase with increasing flows. More habitat is apparently available at higher flows because more edge habitat becomes available (PacifiCorp Instream Flow Addendum Report 2005). In addition, these higher flows come into contact with existing riparian vegetation (PacifiCorp Instream Flow Addendum Report 2005). More fry and sucker larvae habitat would be available under the minimum base flow requirement in the Condition (see Figure 4-4 above). The WUA curves show very low amounts of habitat are available for trout fry and sucker larvae at any flow (low percent of area), and therefore may be a limiting factor for cohort recruitment in this reach. Fry may be the most critical life stage limiting trout populations in the peaking reach due to low habitat availability.

The BLM instream flow analysis (USDI BLM 2002) indicates that substantial increases in fry habitat availability and moderate increases in juvenile and adult habitat availability would be gained with an increase in minimum base flow conditions. Additionally, the proportional flows would result in increased flows in April, May, and June when trout fry and sucker larvae are present, providing even greater habitat gains, particularly for early life stages (Table 4-5).

Table 4-5: Percent of total area and percent of optimal habitat availability interpreted from PacifiCorp instream flow analysis (PacifiCorp 2005).

J C Boyle Peaking Reach			
	Flow (cfs)	**% of Area**	**% of Maximum**
PacifiCorp Existing Condition	~325	3.8%	57.4%
BLM 4(e) Minimum Flow	~690	3.9%	65.8%
Values calculated from PacifiCorp (2005) WUA curves.			

The proportional flows would likely result in increased flows in April, May, and June during the runoff season when trout fry and sucker larvae are present (PacifiCorp 2004b), providing habitat gains, particularly for early life stages. However, PacifiCorp did not provide time series analyses using the available periodicity information for the modeled species and life stages. This is a recommended procedure in Instream Flow Incremental Methodology (IFIM) for determining potential habitat bottlenecks in species life histories when evaluating flow needs for regulated rivers (Bovee et al 1998).

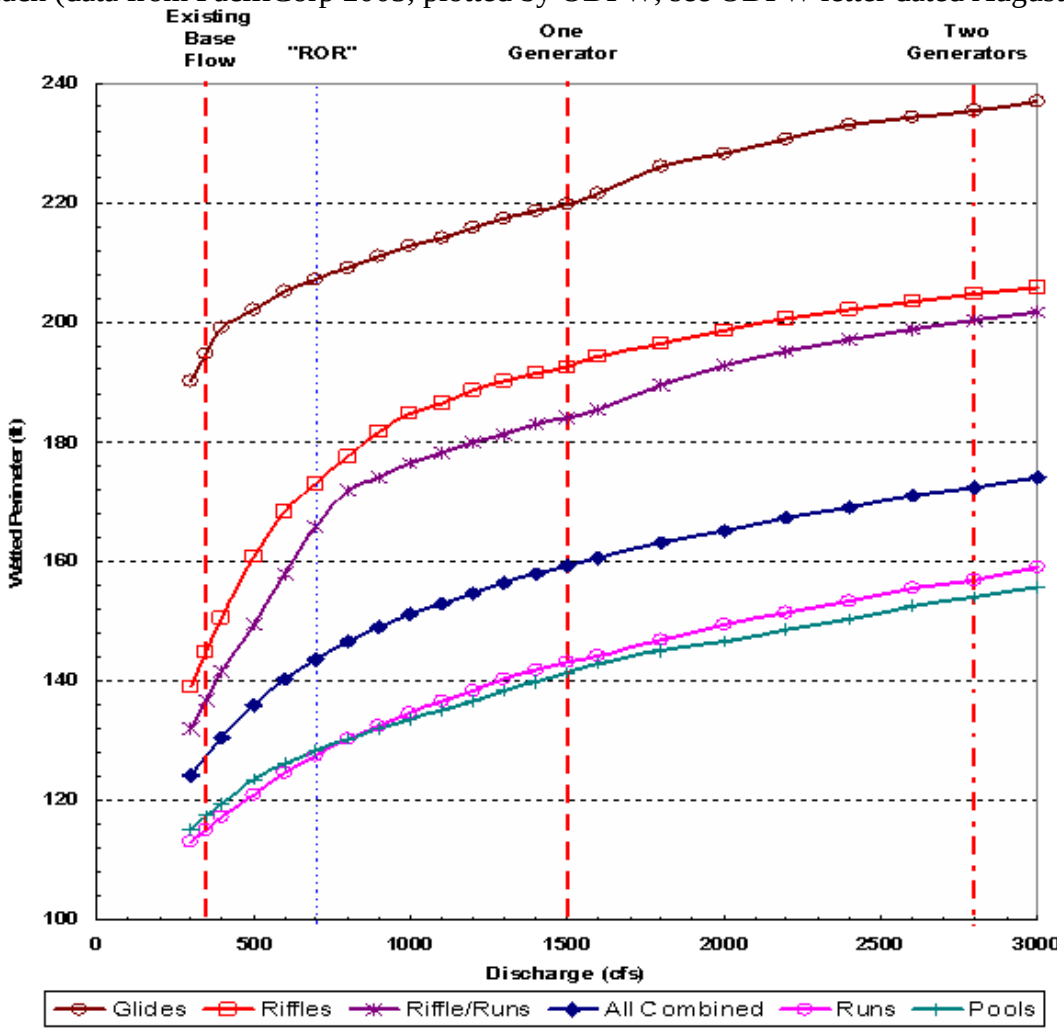
The conclusion that the BLM flow requirement would provide increased habitat availability is also supported by the BLM flow study (USDI BLM 2002, Figure 24, page 62) which derived habitat relationships for the upper peaking reach. The WUA versus stream discharge relationships for both BLM and PacifiCorp studies, when viewed in light of their limitations due to channel impacts and inclusive of other biological and physical data (e.g. macroinvertebrate drift, sediment transport and riparian vegetation) suggest that the increased base flows would benefit aquatic and riparian resources.

PacifiCorp conducted a wetted perimeter analysis in the peaking reach (PacifiCorp 2005), however the analysis was limited to a comparison of the peaking cycle base flow (lowest flow reached during a peaking cycle) against a single, assumed continuous flow under the undefined "Run of River" (ROR) flow regime (Figure 4-6). The full range of peaking impacts occurs over the lowest to highest flows during peaking cycles, including both single- and two-turbine operations, with a range of approximately 350 cfs to 1,500 cfs and 350 cfs to 3,000 cfs respectively. The wetted perimeter analysis in the peaking reach indicated that the percent of

wetted perimeter change for a single turbine peaking operation is 32% for all types of habitat and 47% in riffle habitats. Over the range of two-turbine peaking operations, the change in wetted perimeter is 48% for all types of habitat and 61% in riffle habitats. These changes represent the extent of dewatering in the channel which commonly occurs daily from peaking.

Inflection points on the wetted-perimeter analysis indicate areas of rapid changes, especially in sensitive habitat and/or microhabitats and features. Representation of an overall average curve (as in PacifiCorp 2005) obscures these changes, as they are combined with all the non-sensitive areas. The greatest amount of wetted perimeter change occurs over the range of 350 cfs to 800 cfs, indicating the highest degree of impact in this range. Figure 4-6 suggests that the flow in the peaking reach should generally range above 700 cfs to 800 cfs in order to avoid the most extreme dewatering and associated impacts (the approximate range of the inflection point in average wetted perimeter). Providing the required minimum bypassed reach flow combined with spring accretions results in approximately 700 cfs in the peaking reach during off-peak operation periods. This avoids the high dewatering impacts associated with flows lower than the inflection points (Figures 4-5 and 4-6).

Figure 4-6: Wetted perimeter versus discharge for all habitat types in the J.C. Boyle peaking reach (data from PacifiCorp 2005, plotted by ODFW, see ODFW letter dated August 12, 2005).



The BLM flow condition would result in less frequent peaking events from May through October (weekly versus daily) as illustrated in Figure 4-5 which compares a potential outcome of the flow requirements in the Peaking Reach in July, 2000 to the existing flow conditions. Peaking events would be lower in magnitude relative to base flow and occur less abruptly due to ramping rate restrictions. It is expected that lowering the frequency and magnitude of peaking events would reduce the energetic costs associated with peaking induced fish movements and reduce the likelihood of fish stranding and associated predation and mortality.

Further support for meaningful increases in habitat quality and quantity is provided by PacifiCorp in the analysis of side channel inundation flows (PacifiCorp 2004b, Table 4.7-7). Side channels often have slower velocities and provide high quality microhabitat for rearing and spawning fish (Bowen et al 2003). The Licensee identified nine side channels in the J.C. Boyle Peaking Reach and estimated the streamflow at which inundation of the side channels would occur. Six of these side channels receive flows when streamflows are greater than the current minimum flow (approximately 330 cfs per PacifiCorp 2004b). Of these, four would begin to receive flow at streamflows of approximately 700 cfs. According to this analysis, seven of these side channels could be potentially dewatered following peaking flows that recede to a base flow of 330 cfs. In contrast to the nine side channels identified by PacifiCorp, BLM identified 36 side channels in the J.C. Boyle Peaking Reach using aerial photographs. This indicates that there is even more potential for increased habitat with the Condition than indicated by the PaciCorp analysis.

Impacts of the Condition in the Bypassed and Peaking Reaches:
The Condition provides **habitat connectivity** for resident and migratory fish, and potentially anadromous fish. The flows required in the Condition provide spawning and rearing habitat in the J.C Boyle Bypassed River and Peaking Reaches. Instead of 10% to 25% of the flow in the Klamath River at the J.C. Boyle Powerhouse, the minimum and proportional flow would result in at least 25% to 63% at the J.C. Boyle Powerhouse. Thus, delays in migration would be less likely and depth and cover for migration would be increased.

PacifiCorp evaluated stranding potential downstream of the bypassed reach (PacifiCorp 2004a, Peaking Effects Study). However, the results provide little insight to potential stranding or displacement effects because fish density was very low during the study. Furthermore, no studies were conducted in the bypassed reach where most of the spawning activity in the Klamath mainstem occurs (PacifiCorp 2004b). Since a proportion of inflow would be required as instream flow in the bypassed reach, water levels would need to be managed such that impacts from water level adjustments are not causing excessive fish mortality or impairing spawning success. A ramp rate of two inches per hour would provide for protection for aquatic organisms to adjust to changing water levels without excessive mortality due to poor spawning success, entrapment, or stranding (Hunter 1992).

4. Recreation

Impacts of the Condition in Bypassed Reach:

According to PacifiCorp analysis, (PacifiCorp 2004k, page 2-61, 62, 2-90, 91), for the bypassed reach, kayakers identified a flow of around 500 cfs as a minimum to use the river for transportation, and rafters 1,000 cfs as a starting point for acceptable quality. Kayakers

"recognized that quality "technical trips" are not provided until flows are above 800 cfs. An optimal range for "technical kayaking trips" is from about 900 to 1,200 cfs." For rafters an optimal range for technical boating was 1,000 to 1,300 cfs. Standard opportunities for both craft appear acceptable at about 1,300 cfs, and they are optimal from that flow to about 1,600 or 1,700 cfs."

The proportional flow requirement in the Condition would provide opportunities for recreational boating. Depending on the water year, acceptable to optimal flows for kayaking and rafting would be provided in the range of 800-1200 cfs during the spring runoff for some years. Flows in this range are provided in May for year 2000 and through June in the year 1998. The benefits to providing flows for boating on the J.C. Boyle Bypassed River Reach include expanding opportunities for multi-day trips on the Hell's Corner Reach and providing challenging, short distance trips down to the Spring Island launch site for single day use.

Impacts of the Condition in the Peaking Reach:

According to PacifiCorp analysis (PacifiCorp 2004k, page 2-61, 2-62, 2-90, and 2-91) for the peaking reach, kayakers identified a flow of around 500 cfs as a minimum to use the river for transportation, and quality "technical trips" are not provided until flows are above 700 cfs. An optimal range for "technical kayaking trips" is from about 800 to 1,200 cfs. For the peaking reach, boaters required a minimum of 700 cfs to use the river for transportation. "An optimal range for technical rafting is about 900 to 1,300 cfs." "Boaters recognize the difference between technical and standard trips. The transition between these trips is about 1,200 to 1,300 cfs for kayaks, and about 1,400 to 1,600 cfs for rafts." "Standard opportunities for rafting become optimal at about 1,450 cfs. Standard opportunities for kayaking are acceptable at 1,300 cfs, but they require 1,450 cfs to be optimal." The development of the minimum streamflow requirement also compared the number of boating days resulting from implementation of the FLA proposed requirements, the interagency recommended flows, and the BLM Condition.

The impacts of the Condition were evaluated using the BLM Flow Management Scenerio (FMS) model, and compared the number of days of actual rafting use to the number of days available for rafting with the BLM Condition, and the interagency group fish flow recommendation. A limitation of this comparison is that the actual use does not reflect the number of days available as shown in the FMS Modeled Flows. It is expected that implementation of a weekly peaking cycle would result in a shift of use, from weekdays to the weekends. It is also expected that some boating opportunities would be lost due to the unavailability of adequate rafting flows during weekdays. The FMS Model results shows that the interagency group fish flow recommendation provides less total and weekend rafting days than the BLM Condition (Table 4-6).

Table 4-6: Projected Rafting Use Resulting from the BLM Condition

Year	Rafting Use Reports		FMS Modeled Flows			
	Actual Use		BLM Condition		Fish Flow	
	Total Days of Use	Weekend Days of Use	Total Days Available	Weekend Days Available	Total Days Available	Weekend Days Available
1994 (dry)	110	53	12	12	0	0
2000 (avg)	114	54	108	69	93	59
1998 (wet)	103	47	127	72	115	64

5. Power

In accordance with the BLM's multiple use objectives, the Condition provides for power operation. Since a 40% proportional flow is required, up to 60% of the inflow to J.C. Boyle Reservoir is available for diversion to the J.C. Boyle Canal and the turbines, as long as the base flow requirements are met. A base monthly model has been developed using CALSIM, a general purpose river and reservoir systems planning model developed by the State of California Department of Water Resources (personal communication, Nancy Parker, US Bureau of Reclamation, March 2006). The BLM Condition was modeled to determine power generation using the period of record (1959 to 2000). These results show the modeled power production available during five water year types (Table 4-7). A discussion of various approaches to valuing replacement power can be found in the technical memo: Replacement Power Values, DOI Office of Policy Analysis, March 27, 2006.

Table 4-7: Modeled J.C. Boyle Power Production Using BLM Condition—470 cfs minimum flow or 40% of inflow whichever is greater and a 2 inch per hour ramp rate below JC. Boyle Powerhouse.

Klamath River Power Production in MWH – J.C. Boyle					
	Dry	**BA**	**Avg**	**AA**	**Wet**
Oct	12,680	15,391	16,145	12,835	11,644
Nov	16,105	18,864	19,065	16,324	19,587
Dec	16,469	19,803	25,772	25,522	27,807
Jan	13,284	19,588	28,731	28,143	27,397
Feb	5,798	18,205	21,617	26,513	28,219
Mar	4,413	21,325	27,200	39,954	50,641
Apr	1,555	11,054	23,464	39,841	55,458
May	1,144	4,749	14,040	27,854	34,049
June	36	725	4,206	5,865	23,039
July	0	188	1,070	1,959	3,607
Aug	0	2,692	3,290	3,235	5,116
Sept	1,444	5,420	10,723	11,430	12,847
Total	72,928	138,004	195,324	239,474	299,410

The Condition integrates flows needed for maintenance and improvement of aquatic and riparian resources, while also allowing for power production.

Rationale - (C) Streamflow Measurement and Reporting: J.C. Boyle Bypassed River and Peaking Reaches

1. Current Project Measurement and Reporting

The Project currently maintains two stream gages in cooperation with USGS on the Klamath River in Oregon. These gage stations include the Klamath River near Keno (below Keno Dam, #11509500) and Klamath River below the J.C. Boyle Powerhouse (#11510700). The Spencer Creek near Keno stream gage (above the confluence with the J.C. Boyle Reservoir, #11510000) was operated intermittently through September, 2003 by Oregon Department of Water Resources. Instream flow data from the USGS gage sites is made available to the public through the USGS National Water Information System (NWIS) for surface water, and a report of the flow record is provided to the Commission annually. In addition to an annual report, PacifiCorp notifies the Commission when Project operations are out of compliance with the existing license requirements.

2. Current Project Measurement and Reporting Impacts

There is a lack of discharge data for the J.C. Boyle Bypassed River Reach since the Project currently maintains stream gages upstream of the J.C. Boyle Dam and below the J.C. Boyle Powerhouse. As a consequence, information that could be used to determine Project impacts to aquatic and riparian resources is not available. Further, since there is no stream gage in the bypassed reach, the analysis of effects from spring accretions is limited.

Responding to impacts to riparian and aquatic habitat from non-compliance due to Project operations is delayed as a result of the current measurement and reporting system. For example, the Project has had regular non-compliance issues, including ramp rates in the J.C. Boyle Peaking Reach (Huntington 2004). According to Huntington, the nine inch per hour ramp rate required by the license was exceeded in 1994, 1995, and 1999. Ramp rates up to 14.4 inches per hour were documented all of these years. Although a record of non-compliance events is submitted to the Commission, the BLM is not notified. Thus, evaluation of potential effects to resources by the BLM is delayed or absent.

3. Development of the Streamflow Measurement and Reporting Requirement

Data that is accurate and current is needed to monitor streamflow and ramping rate requirements for implementation of the Condition. The Condition is requiring instream flow monitoring from four stream gages and an annual report. Flow data from the required sites is needed to determine locations where Project operations are out of compliance and could impact riparian and aquatic habitats in the bypassed and peaking reaches. The additional streamflow data required from sites where discharge is not currently measured would be used to improve analysis of potential resource effects in the bypassed reach.

The Licensee shall provide real-time flow information and projections for both the J.C. Boyle Bypassed River and Hells Corner Reaches to allow boaters to take advantage of regularly scheduled boating releases and natural spill events. Commercial rafting outfitters and private

boaters would benefit from flow forecasts. In addition, providing up-to-date flow information in an easy and accessible way would also benefit anglers.

4. Effects of the Streamflow Measurement and Reporting Requirement

The annual reporting process provides a means of identifying potential natural resource impacts due to Project operations and provides a process to implement adaptive management during the term of the new license. Continuous discharge data from the required sites allows for timely determinations of where and when natural resource impacts may be occurring. Providing flow information allows the public to take advantage of flows that would be suitable for kayaking, rafting, and fishing and other recreational activities. Implementation of annual monitoring and reporting would provide a means for the BLM to inform the Licensee and the Commission when impacts to resources arise during the term of the new license. By reporting this data, there is a record of information that may be used to develop strategies to prevent similar Project impacts in the future. The discharge data and annual report would be used to ensure the flow regime, including ramping rates, required in the Condition has been implemented.

Rationale - (D) River Gravel Management Plan (RGMP)

Gravel augmentation would restore spawning gravel to portions of the Klamath River channel that have been deprived of sediment inputs due to the Project. Larger gravels and cobbles that are unsuitable for use by spawning fish dominate (Kondolf and Matthews 1993; PacifiCorp 2004d). PacifiCorp states that "pebble count results indicate potential bed coarsening immediately downstream of Project dams and in the J.C. Boyle peaking and bypass reaches" (PacifiCorp 2004d). As a result, the channel has limited gravel-sized material necessary for the spawning life history stage of salmonids and other native fishes. Maintaining an annual supply of gravel and cobble sized material aids in accomplishing ACS objectives. Mitigation of Project effects to channel complexity (side channels, point bars, riffles, and floodplains) would lead to attainment of BLM management objectives for restoring and maintaining geomorphic processes and aquatic and riparian habitats in the J.C. Boyle Bypassed River and Peaking Reaches. The addition of adequate quantities and sizes of gravel and cobble material is needed to provide spawning substrate for both resident and anadromous fish and other aquatic life.

1. Impacts

Current Project impoundments, including J.C. Boyle Reservoir and Dam, trap and block sediment movement downstream through the J.C. Boyle Bypassed River and Peaking Reaches (PacifiCorp 2004a, Exhibit E, page 5-148 and PacifiCorp 2004d, page 6-111). According to the FLA, the primary project impact on geomorphology and sediment transport is the capture of bed load material delivered from tributaries by Project reservoirs (PacifiCorp 2004a, Exhibit E, page 3-184). This, coupled with limited gravel recruitment from the presence of J.C. Boyle Dam (City of Klamath Falls 1986) (PacifiCorp 2004a, Exhibit E, page 4-9), causes gravel to be scarce in the J.C. Boyle Bypassed River Reach. Based on the PacifiCorp Sediment Budget Analysis, the average annual input of sediment from the tributaries between Keno Dam and J.C. Boyle Dam was 6,134 tons per year (PacifiCorp 2005 - Master Sediment Budget). Thus, between the

J.C. Boyle Reservoir and Dam, approximately 6,134 tons per year of suspended sediment and bedload are blocked from moving down the J.C. Boyle Bypassed River and Peaking Reaches.

Oregon Department of Fish and Wildlife surveys conducted in 1998 found substrate composition was 64% boulder and 28% cobbles in the J.C. Boyle Bypassed River Reach (ODFW 1998). Gravels are generally lacking except for an area below the canal spillway where deposition has occurred from hillslope erosion (PacifiCorp 2004d, page 6-86). The characteristics of substrate in the bypassed reach are consistent with impacts associated with stream habitat below a bedload-capturing dam; presence of bedrock, cobble and boulder, and few patches of spawning gravels.

Most trout were observed spawning in marginally suited "patch gravels" behind boulders and in the area below the emergency spillway that contains gravel because of recruitment from hillside erosion below the emergency spillway. Thus, according to PacifiCorp analysis, the limitation of gravel in this reach is limiting trout spawning (PacifiCorp 2004a, Associated Fisheries Benefits). Since substrate in the J.C. Boyle Peaking Reach is heavily armored with boulders and large cobbles and contains only a few small pockets of tightly embedded gravel behind boulders, (PacifiCorp 2004a, Exhibit E, page 4-11), there is no or little spawning habitat for trout (City of Klamath Falls 1986; USDI BLM 2002). Gravel accumulation in this reach is limited, because J.C. Boyle Dam blocks gravel recruitment and there are few tributary streams to contribute gravel. PacifiCorp identified that the lack of redband trout spawning habitat as a potential limiting factor for fish in this reach (PacifiCorp 2004a, Exhibit E, page 4-13).

Changes in the flow and sediment regimes due to Project operations and facilities impact the potential establishment of desirable riparian vegetation. J.C. Boyle Dam reduces the input of gravel, sand, and silt to this reach (PacifiCorp 2004b, Exhibit E 5-148). In addition, flow diversions and changes in the flow regime reduce the potential for scouring and sediment deposition of the limited material that is transported downstream of the dam (PacifiCorp 2004c, pp. 6-135). Further, since the streamflows, sediment supply, and bed mobility are reduced, the extent of substrate appropriate for establishment of willows and other native riparian plants is decreased.

According to PacifiCorp analysis, the Project contributes to the lack of willows in streamside areas (PacifiCorp 2004b, Exhibit E 5-102). Riparian hardwoods typically germinate and establish on freshly deposited alluvium in channel positions low enough to provide adequate moisture but high enough to escape scour (Scott et al. 1993). The Project, however, maintains static hydrologic and geomorphic conditions that do not provide alluvium over a large portion of the area where willows have the best potential to establish.

In the upper portion of the J.C. Boyle Bypassed River Reach the river is constrained by sidecast material present in the margins of the active stream channel. This material was generated during the construction of the J.C. Boyle Canal and road and continues to impact 1.5 miles of the channel. The sidecast material has constricted the channel and altered the riparian vegetation along most of the reach (PacifiCorp 2004b Exhibit E, 5-25, 2004). Alteration of instream flows and changes in sediment regimes result in decreased bank stability and loss of riparian vegetation (Hill 1991; Rosgen 1996). Desirable riparian vegetation (e.g., willow) does not establish and survive in the conditions created by the boulder-sized rocks comprising the sidecast. Further, in

some areas this material has entered the active channel and is causing accelerated bank erosion on the opposite bank (PacifiCorp 2004d).

2. Development of the condition

The amount of gravel supplied to the bypassed and peaking reaches was derived from the average annual input from tributaries between Keno Dam and J.C. Boyle Dam. The average annual input to the reach above the J.C. Boyle Dam was determined to be 6,134 tons per year (PacifiCorp 2004d, AIR WQ-5, Master Sediment Budget 051105k.xls). Thus, the Condition requires the gravel augmentation to range from 1,227 tons per year (20% of 6,134 tons per year) to 6,134 tons per year or 100% of the average annual input (See Table 4-8).

Table 4-8: Gravel Augmentation

	Average Annual Input from Tributaries above J.C. Boyle Dam	PacifiCorp Proposal for First year*	BLM Proposal Annually for 5 years*
J.C. Boyle Bypassed River Reach	6,134 tons per year	100 to 200 cubic yards (2% - 3% of amount blocked.) Also states "10% to 20% of tributary amount.	1,227 tons per year (20% of amount blocked) into bypassed and peaking reach.
* Augmentation in future years based on evaluation.			

According to the Final License Application (FLA), gravel augmentation is proposed as an enhancement measure by PacifiCorp, in part because of the effects on geomorphology and sediment transport from the capture of bed load by Project reservoirs (PacifiCorp 2004a, Exhibit E, page 3-184). PacifiCorp proposed the following gravel augmentation enhancement measures:

> "The volume of the initial augmentation in selected reaches is calculated as 10 to 20% of the average annual volume of tributary and hillslope inputs trapped in the upstream Project reservoir(s). The range of 10 to 20% adjusts the results of the sediment budget to reflect the fact that only a fraction (probably less than 10 percent) of the total tributary sediment yield in each reach is composed of spawnable material. Given the long-term reduction in gravel supply below Project dams, gravel augmentation could begin with a larger volume to fill in-channel storage sites." (PacifiCorp 2004a, Exhibit E, page 4-169)

PacifiCorp found the median size of material that was sampled in the reservoirs deltas where tributary inputs are deposited to be 34.16 mm (PacifiCorp 2004d, page 6-128). Kondolf and Wolman (1993) compiled an extensive data set of salmonid spawning gravels which showed that the median gravel size used for spawning was 25 mm and the geometric mean gravel size was 16mm. Their analysis also found that salmonids can use a wide range of gravel sizes.

Timing and location of gravel augmentation is required as part of the RGMP because of the potential adverse impacts to resident and anadromous fish. Timing of gravel placement must be considered, as protection of habitat during spawning periods is necessary. Further, the location of gravel placement is essential to the success of providing additional fish habitat since the augmentation of gravel should occur where smaller substrate is lacking and where fish could use this material for different life stages.

3. Condition Impacts
The RGMP would provide a strategy (implementation, monitoring, and adaptation) for satisfying KFRA RMP management direction, including maintenance and improvement of aquatic and riparian resources.

Sediment augmentation is needed on a recurring basis at multiple sites established throughout the bypassed and peaking reaches to mitigate for Project impacts that occur downstream from J.C. Boyle Dam and to meet management direction for aquatic and riparian habitat. Initial large volumes of gravel delivered to multiple sites would replenish in-channel storage sites that have been deprived of sediment. In addition, by providing sediment in subsequent augmentation events, substrate would be distributed by alluvial processes.

Adding river material with a median gravel size appropriate for spawning salmonids would create a dynamic and complex river channel. This substrate size is deposited, re-mobilized, and transported more frequently than larger sized material. The augmentation of appropriately sized gravel would create substrate with clean interstitial spaces; provide gradually sloped channel margins (optimal for channel margin rearing habitat); would minimize encroaching vegetation on point bars; and would create a fine substrate replacement on floodplain terraces.

Addition of ample quantity, and appropriately sized gravel and cobble material are needed to increase channel complexity and availability of spawning habitat for resident, migratory, and anadromous fish. Implementation of the RGMP would provide for the geomorphic and ecological processes needed to adequately protect aquatic and riparian resources, and provide for the attainment of KFRA RMP and ACS objectives, in the J.C. Boyle Bypassed and Peaking Reaches.

Rationale - (E) Adaptive Management Plan

The Adaptive Management Plan (AMP) includes provisions and processes for applying adaptive management principles. Adaptive management strategies would provide the necessary link between the Conditions and the KFRA RMP management direction. The AMP includes an adaptive management strategy that incorporates implementation, monitoring, and evaluation of results to allow the Licensee to determine effectiveness of the Condition. Effective monitoring plans developed in coordination with the resource agencies would provide the best opportunity for achieving aquatic resource objectives in the Project area over the term of the License (Castleberry 1996).

The components of the River Corridor Management Condition are expected to produce changes in channel morphology that would mitigate for the continuing impacts under the new License. As additional minimum, seasonal high, and variable flows are returned to the J.C. Boyle Bypassed River and Peaking Reaches, there would be alterations in the amount and quality of available fish habitat due to changing channel configurations. Consequently, continuous monitoring is required to assess changes in channel morphology and to provide for the appropriate instream flows to protect the BLM reservation. This information would be used as the basis for providing scientifically based alterations in instream flows to mitigate the impacts of Project operations.

Habitat condition, habitat production, spawning habitat, and habitat connectivity monitoring data would provide the basis for determining whether the Condition is providing for the needs of fish habitat. Fish-habitat relationships generated for the bypassed and peaking reaches reveal that Project operations have impacted substrate suitability and near shore vegetation cover. After implementation of the Condition, it is predicted that habitat would change. The habitat monitoring is necessary to evaluate if those changes meet the KFRA RMP objectives. Fish passage provisions required under Section 18 prescriptions may result in additional species interactions, changes in fish community structure. Fish habitat monitoring is needed to determine effects of Project operations and implementation of the Conditions on the resident, migratory, and anadromous fish species.

Condition No. 5 – Cultural Resources Inventory and Management

A. Conduct Cultural Resources Inventory

Within one year of issuance of the License, the Licensee shall complete cultural resources inventory of Bureau of Land Management (BLM) land within the Area of Potential Effect (APE).

1. In consultation with the BLM and affected tribes, the Licensee shall conduct a cultural resources inventory of approximately 77.2 acres of BLM-administered land within the APE that have not been inventoried (Figures 5-1 through 5-5).
2. The Licensee shall employ survey standards consistent with BLM Class III survey protocols for cultural resources (USDI BLM 1998).
3. In consultation with the BLM and affected tribes, the Licensee shall document newly identified sites according to BLM and State Historic Preservation Office (SHPO) standards and assess the sites for eligibility on the National Register of Historic Places (NRHP). Newly discovered sites shall be incorporated in an amended HPMP that includes measures for the continued protection and management of cultural resources.
4. The Licensee shall submit a draft report to the BLM documenting the results of the survey within 60 days of survey completion. The report shall follow SHPO report guidelines. The Licensee shall allow a minimum of 30 days for the BLM to review and make recommendations on the draft before finalizing the report and filing it with the Commission. A copy of the final report shall be submitted to the BLM, affected tribes, and the SHPO.
5. In consultation with the BLM and affected tribes, the Licensee shall develop a protocol for conducting cultural resources surveys on BLM land prior to future Project activities proposed within the APE. If a project is proposed within an area where cultural resource surveys are older than 15 years, the Licensee shall conduct a new survey.
6. In consultation with the BLM and affected tribes, the Licensee shall develop procedures for handling, cataloging, interring, or repatriating cultural resources on BLM land exposed by unanticipated Project related effects.

B. Amend Historic Properties Management Plan

Within 18 months of issuance of the License, the Licensee shall amend the Historic Properties Management Plan (HPMP) to address the management of sites on BLM-administered lands within the APE.

1. The Licensee shall amend the HPMP with measures to monitor, stabilize, protect, restore, and/or mitigate for known damages to sites within the APE on BLM land including sites: 35KL18, 35KL21/786, 35KL22, 35KL24, 35KL550, 35KL558, 35KL567, 35KL576, 35KL577, 35KL629, 35KL630, 35KL632, 35KL633, 35KL635, 35KL785, 35KL791, 35KL1083, and JC03-29. Sites discovered during the completion of surveys on BLM land within the APE shall also be included in the amended HPMP.
2. The Licensee shall submit a draft of the amended HPMP to the BLM for review. The Licensee shall allow a minimum of 30 days for the BLM to review and make recommendations on the draft before finalizing the report and filing it with the Commission. A copy of the final amended HPMP shall be submitted to the BLM, affected tribes, and the SHPO.
3. Monitoring (per the amended HPMP) of BLM cultural sites within the APE shall be completed by a qualified professional archaeologist (as defined in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation).

Monitoring shall involve, at a minimum, visiting 20% of the eligible sites each year to assess impacts, the effect of mitigations in preventing degradation of the resource, whether eligible properties are being affected by Project operations, and whether non-eligible historic properties should be re-evaluated for consideration of eligibility. Monitoring shall be initiated within 180 days of Commission approval.

4. The Licensee shall prepare an annual report documenting mitigations, new findings and assessment of the effectiveness of mitigations in preventing degradation of cultural properties on BLM land. This report shall be submitted to the Commission, the BLM, and affected tribes for use by the BLM into its' Annual Program Summary and Monitoring Report.
5. In consultation with the BLM and affected tribes, the Licensee shall develop a schedule for implementing the amended HPMP. The schedule for implementation for BLM sites within the APE shall address first, those sites which are at greatest risk of continued Project degradation.
6. In consultation with the BLM and affected tribes, the Licensee shall review and/or revise the HPMP every five years to incorporate new information regarding the condition or effects to historic properties on BLM lands (based on the results of effectiveness monitoring); or changes in site eligibility as a function of policy, law, regulation, or advances in scientific technology.

Rationale

Cultural resources on the BLM reservation are managed pursuant to the *Antiquities Act of 1906*, the *Archaeological Resources Protection Act* (ARPA) *of 1979*, the *Historic Sites Act of 1935*, the *Historic and Archaeological Data Preservation Act of 1974*, the *National Historic Preservation Act* (NHPA) of 1966 (as amended), the *National Environmental Policy Act* (NEPA) *of 1969*, the *American Indian Religious Freedom Act* (AIRFA) *of 1992*, the *Native American Graves Protection Act* (NAGPRA) *of 1990*, the *Federal Land Policy and Management Act* (FLPMA) *of 1976*, Executive Order 11593 issued in 1972, and 36 CFR part 800. In addition, the Klamath Falls Resource Area Management Plan (USDI BLM, 1995a) directs the BLM to identify, manage and protect cultural resources as well as to consult and coordinate with affected Native American tribes. Specifically the RMP directs BLM:

- To identify cultural resource localities and manage them for public, scientific, and cultural heritage purposes.
- To conserve and protect designated cultural resources for future generations.
- To continue to fulfill government-to-government and trust responsibilities to appropriate American Indian tribes regarding heritage and religious concerns.

The Project affects cultural resources as a function of flow management, roads, facilities operation, and recreation use. Eighteen NRHP-eligible cultural sites on BLM-administered land exist within the currently defined APE. The Licensee has acknowledged impacts to cultural sites within the Project boundary resultant of public access and recreation (e.g., "Some of these sites appear to be affected by Project operations and/or Project-related activities such as public access and recreation" PacifiCorp 2004e, page 3-1). Additional impacts identified by the Licensee include looting, vandalism, erosion, road and utilities development, livestock grazing, and camping (PacifiCorp 2004e, Tables 3.6-1 and 3.6-2).

Recreation in the Project area is expected to increase over the period of the next license (PacifiCorp 2004k, page 3-54). The Licensee notes that visitors to the Project area mainly are concerned with resting/relaxing, fishing, camping and boating opportunities (PacifiCorp 2004k, pages 3-59 through 3-60). Within the APE on BLM land, these opportunities tend to occur on the river terraces and immediately adjacent to the river. These terraces contain the remains of numerous historical and prehistoric sites which are at risk of continued disturbance. Increased recreation use results in increased disturbance associated with casual collection of artifacts and inadvertent disturbance. This will continue over the period of the new license and over time will contribute to the loss of cultural resources or at a minimum, reduce site integrity.

Of particular concern is the use of all-terrain vehicles (ATVs), including motorcycles, within the canyon. Disturbance to archaeological sites on BLM lands by ATV use has been documented (Canaday 2003) and is expected to continue. At several sites within the canyon, especially at Frain Ranch, ATVs are using prehistoric house pit depressions as jumps/ramps and obstacle courses (PacifiCorp 2004e). This severely disturbs the artifacts as well as the integrity of the structures. Disturbance of archaeological sites from ATV use is expected to continue as long as access to these areas is unrestricted.

BLM consults and coordinates with the Klamath Tribes (a federally recognized tribe consisting of the Klamath, Modoc and Yahooskin band of Paiute) on a bi-monthly basis complying with the above referenced federal laws and regulations. All federal actions that have a potential to affect cultural resources within traditional Klamath tribal territory are identified at these meetings. The intent of the condition is to assemble the appropriate information necessary consult and coordinate with affected tribes in the way BLM is required by law. The Shasta Nation and Shasta Tribe (non-federally recognized) are also kept apprised of major federal undertakings within their traditional tribal territory.

The BLM cultural resource condition is intended to provide for the continued protection of cultural properties on BLM-administered lands.

Complete Cultural Resources Inventory

BLM lands within the APE have not been fully inspected for cultural resources. Therefore, the full extent of Project effects on the BLM reservation is unclear. All BLM lands within the APE require cultural resources surveys to fulfill the intent of the NHPA as well as to meet Tribal trust responsibilities. The BLM routinely conducts cultural resource surveys for its' own ground disturbing activities and requires outside entities wishing to conduct undertakings on federal land to comply with cultural resource laws and regulations.

The Licensee did not identify a cultural resources APE prior to the initiation of cultural resources surveys. Instead, the Licensee proposed a Field Inventory Corridor (FIC) that would encompass the APE when one was designated. Cultural resource surveys were conducted within portions of the FIC during the 2002/2003 field seasons. A proposed APE was submitted to the California and Oregon SHPO and the Yurok Tribal Heritage Preservation Officer on February 2, 2004. A copy of the proposed APE was also provided to the Cultural Resources Work Group (CRWG) at this time. The surveys conducted within the FIC do not adequately cover the entire APE. The Licensee stated in a letter to the Oregon SHPO dated August 2, 2004 (PacifiCorp 2004g), that all land within the APE was adequately inspected for cultural resources. The Licensee maintains that areas within the APE located on BLM land should be surveyed by the BLM. The BLM has

noted (USDI 2004; Raby 2004a; and Raby 2004b) that under Section 106 of the NHPA, the Licensee is obligated to ensure that surveys within the APE are conducted. Further, the BLM notes that portions of the APE on BLM lands have been inspected by BLM to meet management objectives unrelated to the Project re-licensing activity. However, when one compares past surveys with those conducted by the Licensee within the currently defined APE, it is clear that several hundred acres have yet to be inspected. Included in this total are approximately 77.2 acres of BLM land that have not been surveyed. Additional BLM land within the APE has also not been inspected, but it is too steep or marshy for effective survey. The 77.2 acres identified here are areas of relatively gentle topography (BLM Figures 5-1 through 5-5).

Changes in vegetation cover, surface visibility, erosional forces, and survey techniques can affect the reliability of past surveys. BLM routinely re-surveys areas prior to undertakings if the original survey is older than approximately 15 years and often sooner if a proposed undertaking is planned within areas considered to be high probability for containing cultural resources (river terraces, adjacent to water, etc.). The condition requires the Licensee to re-inspect past surveyed areas on BLM land if new ground disturbing projects are proposed for areas that have past survey clearance older than about 15 years.

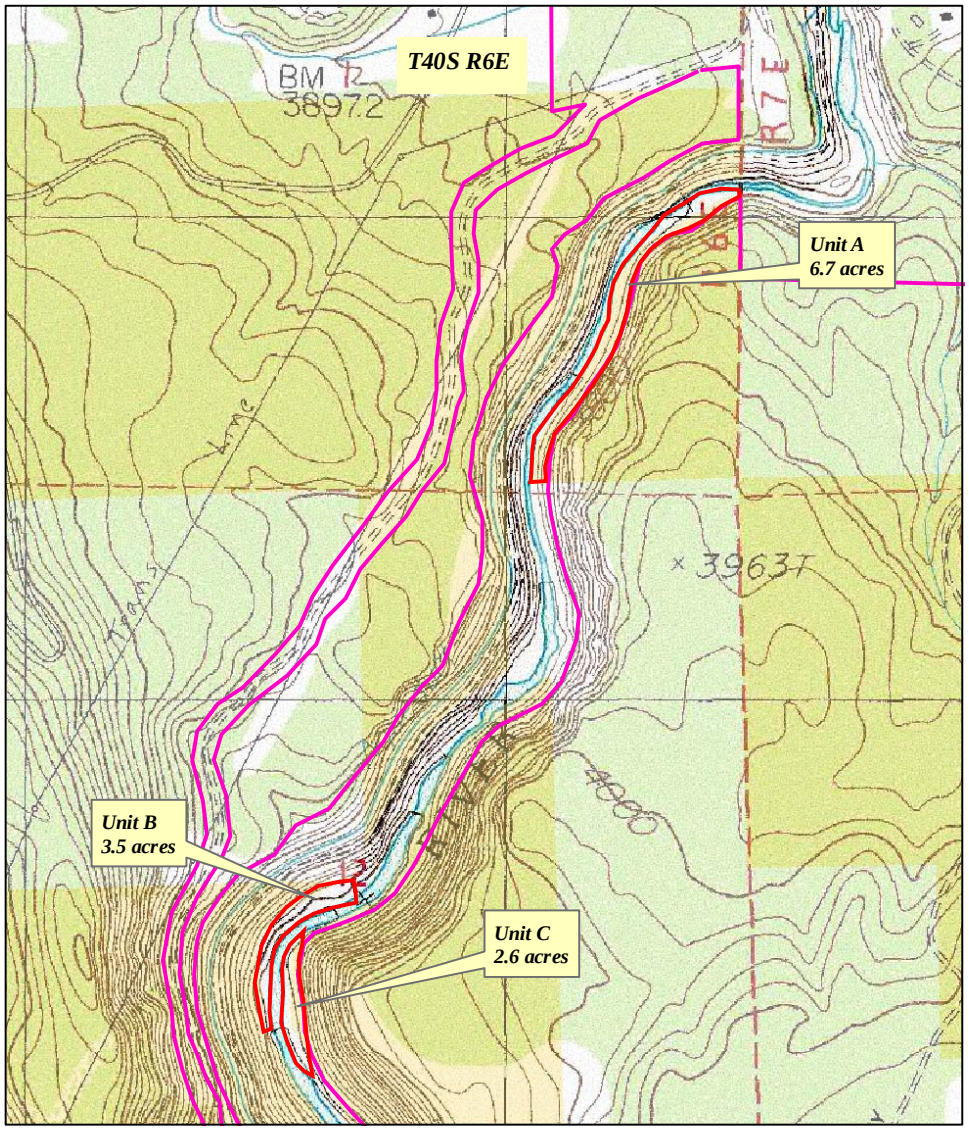
Amend Historic Properties Management Plan

Cultural resources on BLM lands have and will continue to be affected by the Project. The Licensee did not adequately address the survey, protection, monitoring, and mitigation of cultural resources located on BLM lands. The HPMP does not include NRHP eligible sites located on BLM-administered land within the J.C. Boyle Peaking Reach. These sites are within the APE included in the FLA, are impacted by Project operations, and must be included in the HPMP. The Licensee notes, "The FERC has regulations that require that a Historic Properties Management Plan be prepared to mitigate and manage Project effects on cultural resources that are eligible for the National Register of Historic Places (NRHP)." (PacifiCorp 2004j, page 1-1). In the Final Technical Report, the Licensee evaluates NRHP eligibility for 20 sites on BLM land within the APE (PacifiCorp 2004e, Table 3.6-1 and 3.6-2). Two sites (35KL634 and 35KL1419) are not eligible for inclusion in the NRHP. One site (35KL785) was not evaluated because it was not within the FIC inspected by the Licensee. The Licensee's proposed APE now encompasses this site that the BLM considers eligible for the NRHP. The 17 remaining sites were evaluated by the Licensee as being eligible for inclusion in the NRHP. At the time, the Licensee noted the effect of Project operations on these sites (PacifiCorp 2004e, Table 3.6-1 and Table 3.6-2). However, none of the sites are included in the HPMP. This condition requires the Licensee to include these sites in the HPMP.

The 18 sites on BLM-administered land within the APE immediately adjacent to the Klamath River in the J.C. Boyle Peaking Reach are impacted by flow fluctuations eroding the river bank. At least one prehistoric site (35KL22) containing human remains has been impacted (PacifiCorp 2004e, Table 3.6-1). Emergency stabilization efforts currently protect a portion of this site. Additional cultural deposits, both upstream and downstream of the stabilized area remain at risk from erosion through periodic wetting and drying of fragile archaeological deposits. Continued ramping, changes in discharge during summer months, and the short duration of peaking will continue to affect the stability of sites adjacent to the river.

The BLM monitors at least 20% of its' cultural resources as directed in the RMP (USDI BLM 1995a). The intent of the condition is to incorporate monitoring of cultural resources on BLM-administered land within the APE consistent with BLM's current management direction.

BLM Figure 5-1: Cultural resource survey requirements within the PacifiCorp defined APE. These areas within BLM land were not inspected by PacifiCorp during their surveys.



Cultural Resource Survey Requirements

1 inch equals 1,000 feet

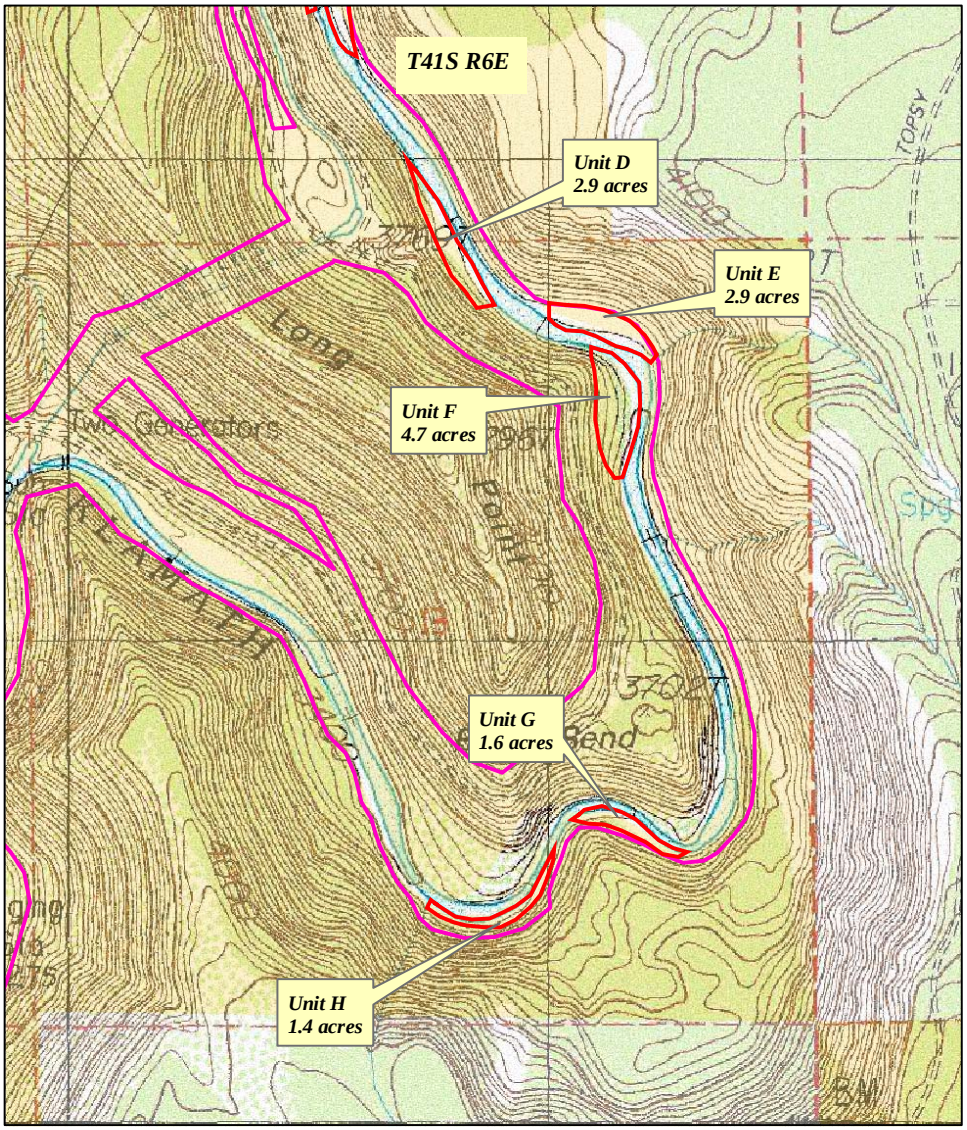
N
W
E
S

cultural_survey_needed
PacifiCorp_APE_(approximate)

Miles
0 0.1 0.2 0.3 0.4 0.5

Prepared by: tcanaday
Creation Date: 8/11/2005 11:08:24 AM

BLM Figure 5-2: Cultural resource survey requirements within the PacifiCorp defined APE. These areas within BLM land were not inspected by PacifiCorp during their surveys.



Cultural Resource Survey Requirements

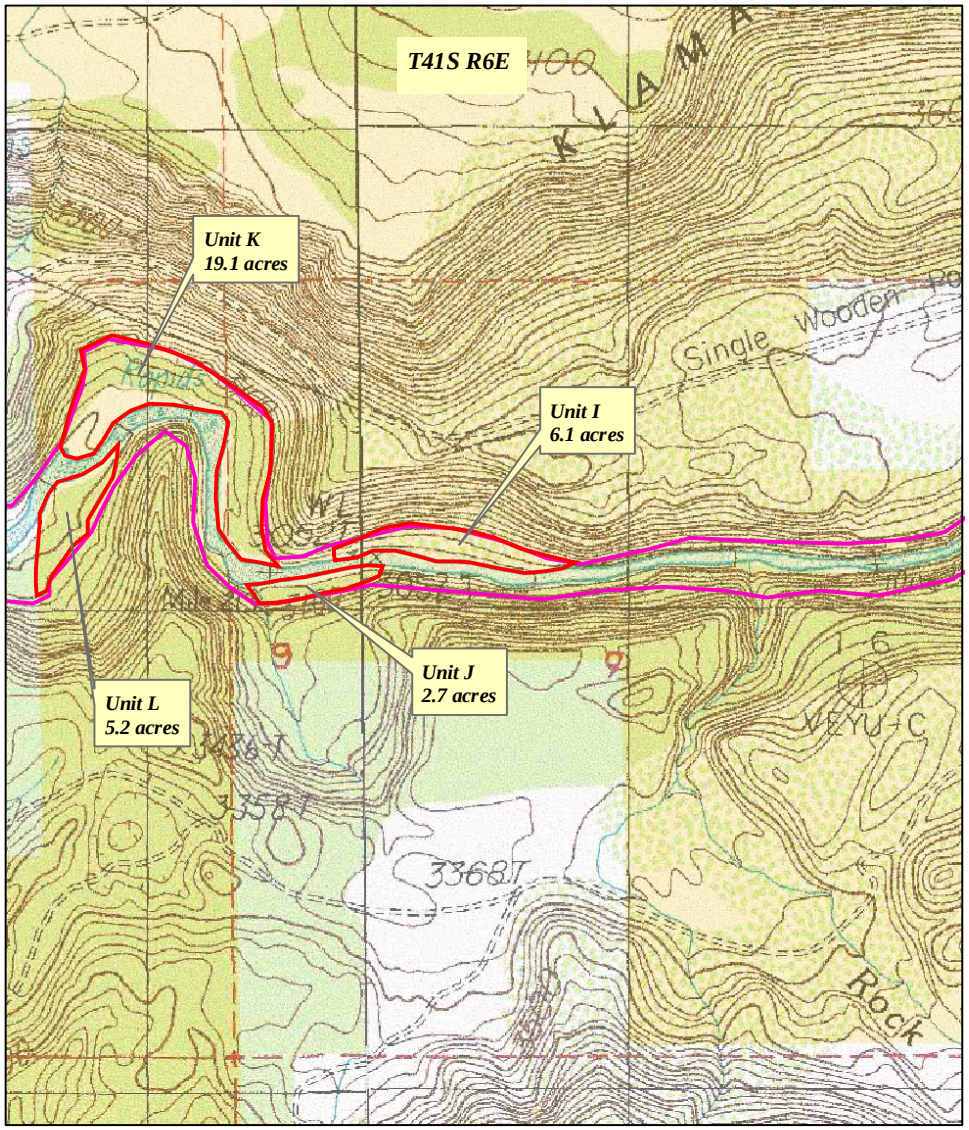
1 inch equals 1,000 feet

Miles
0 0.06 0.12 0.18 0.24 0.3

cultural_survey_needed
PacifiCorp_APE_(approximate)

Prepared by: tcanaday
Creation Date: 8/11/2005 11:08:24 AM

BLM Figure 5-3: Cultural resource survey requirements within the PacifiCorp defined APE. These areas within BLM land were not inspected by PacifiCorp during their surveys.



Cultural Resource Survey Requirements

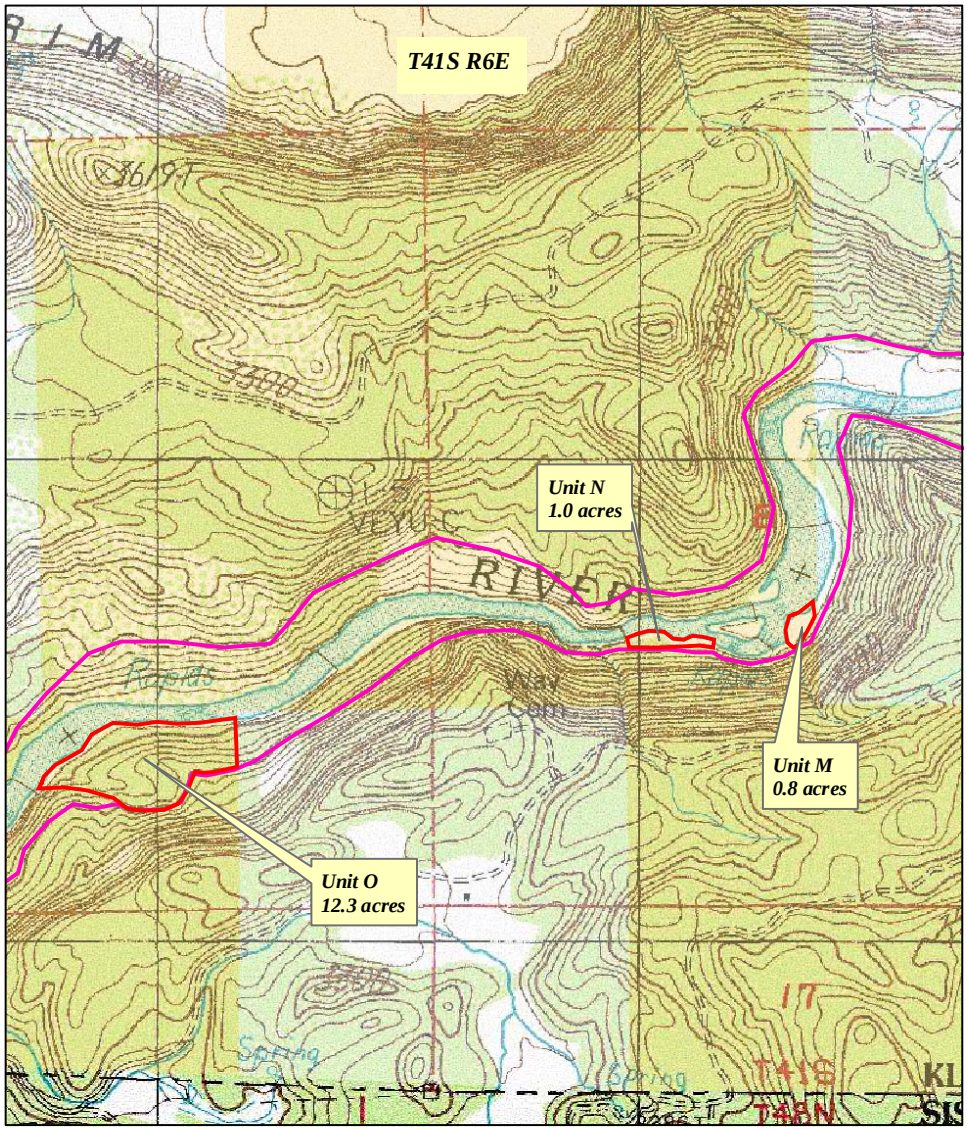
1 inch equals 1,000 feet

Miles
0 0.06 0.12 0.18 0.24 0.3

cultural_survey_needed
PacifiCorp_APE_(approximate)

Prepared by: tcanaday
Creation Date: 8/11/2005 11:08:24 AM

BLM Figure 5-4: Cultural resource survey requirements within the PacifiCorp defined APE. These areas within BLM land were not inspected by PacifiCorp during their surveys.



Cultural Resource Survey Requirements

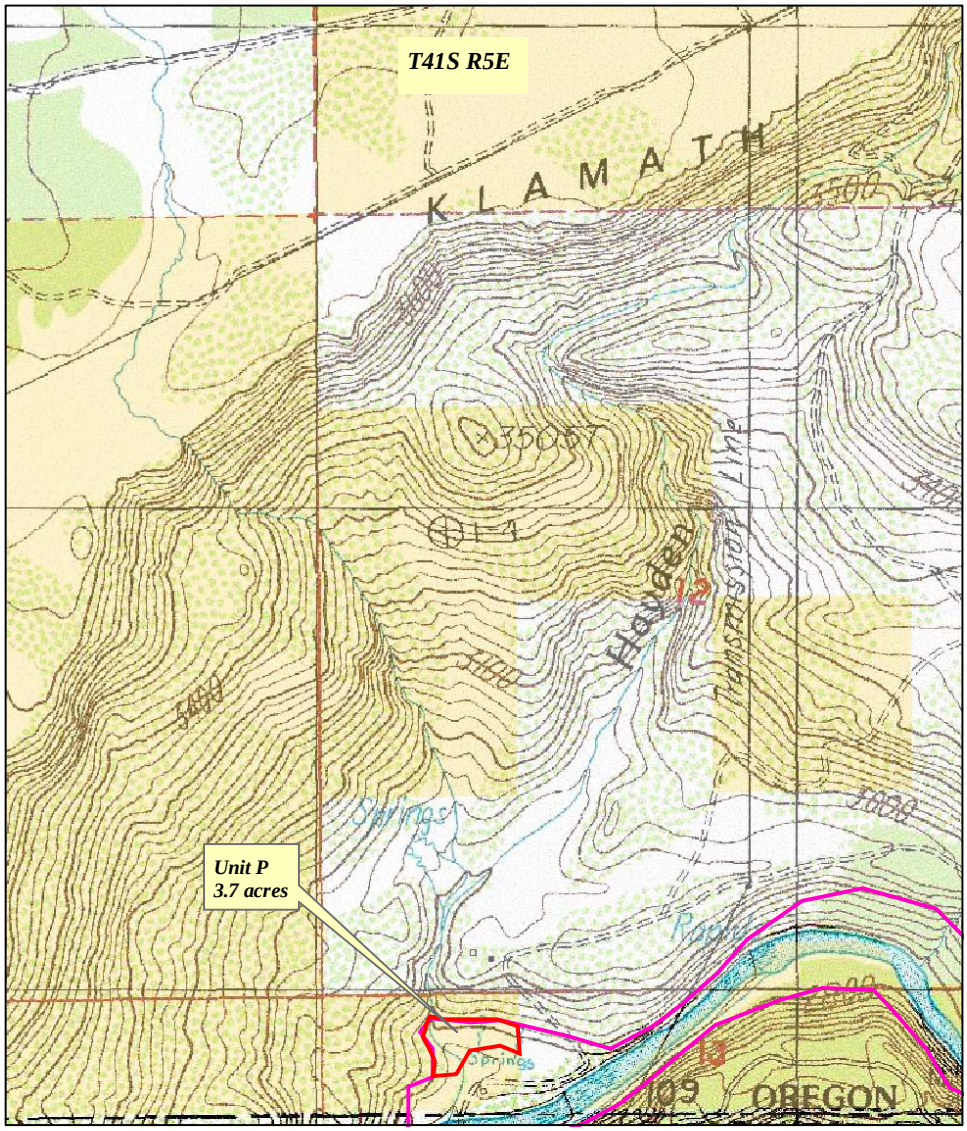
1 inch equals 1,000 feet

Miles
0 0.06 0.12 0.18 0.24 0.3

cultural_survey_needed
PacifiCorp_APE_(approximate)

Prepared by: tcanaday
Creation Date: 8/11/2005 11:08:24 AM

BLM Figure 5-5: Cultural resource survey requirements within the PacifiCorp defined APE. These areas within BLM land were not inspected by PacifiCorp during their surveys.



Cultural Resource Survey Requirements

1 inch equals 1,000 feet

Miles
0 0.1 0.2 0.3 0.4 0.5

cultural_survey_needed
PacifiCorp_APE_(approximate)

Prepared by: tcanaday
Creation Date: 8/11/2005 11:08:24 AM

Condition No. 6 – Recreation and Aesthetic Resources Management

A. Within one year of issuance of the license, The Licensee shall develop and file with the Commission a Recreation Resources Management Plan (RRMP). At a minimum the RRMP shall:

1. Include descriptions of existing and potential recreation sites and trails on Bureau of Land Management (BLM) administered lands affected by the project, including Topsy Campground, Spring Island Boaters Access, Klamath River Campground, dispersed day-use sites and Stateline Takeout.
2. Include a schedule for implementation, maintenance, capital improvements, and monitoring for those BLM recreation facilities affected by the Project.
3. Include a schedule of costs. The Licensee shall identify responsibility for the costs of operating, maintaining and monitoring Topsy Campground, Spring Island Boaters access, the Stateline Takeout, the Klamath River Campground and dispersed day-use sites. The Licensee shall work with the BLM to identify the appropriate instrument for shared administration of these sites.
   (a) Include maintenance and development provisions for recreation sites, day-use areas, and non-motorized and motorized trails located on BLM-administered lands affected by the Project. These sites include: Topsy Campground; J.C. Boyle Bypass Reach boating and fishing access sites and associated access trails; Spring Island Boaters Access; Klamath River Campground; and dispersed day-use sites used by whitewater boaters along the Klamath River; scouting trails at major rapids; and the Stateline Takeout.
4. Include provisions for working with the BLM to define standards for facilities operation and maintenance; facility replacement, modification, or upgrade; and monitoring for those BLM recreation facilities affected by the Project.
5. Include provisions to bring facilities up to BLM standards for handicap accessibility, public health and cleanliness, safety, and security.
6. Include provisions for monitoring visitor use of BLM-administered lands that are affected by the Project at an interval no greater than five years. To assess when new facilities or management are needed, a framework for monitoring shall incorporate a feedback loop and necessary trigger points for action for adaptive management.
7. Include provisions for a visitor-use report to the BLM. The BLM shall be given the opportunity to review the report and discuss the findings with the Licensee. The report shall be filed with the Commission no later than 30 days after the BLM has submitted comments to the Licensee and the report is final.
8. Include a provision for annual review and modification of the RRMP.
9. Include a Visual Resource Management (VRM) Plan that includes provisions and guidelines for managing visual (e.g., aesthetic) resources on BLM-administered lands from the headwaters of J.C. Boyle Reservoir to Iron Gate Reservoir. The VRM plan should describe how the design, maintenance, and construction of Project facilities will maintain or preserve visual resource values. The VRM plan shall be consistent with BLM VRM objectives and guidelines (USDI BLM 1995a, pages 43-44 and Map 2-5; USDI BLM 1993, page 33). The VRM Plan shall include provisions for aesthetics at the bypass canal and other concrete structures, switch yards, power houses, buildings, penstocks, powerlines (metal structures); and Project recreation facilities including campgrounds and day-use sites. The following are examples of the types of mitigation measures that may be used to meet VRM objectives for the Project:
   (a) For bypass canal and other concrete structures: mitigate color and form contrasts by application of acid/stain agent (e.g., Permeon) to reduce contrasts in existing structures;

by addition of earthtone coloring agents in concrete mix for new structures; and in concert with vegetative screening or landscaping. Vegetative screening or landscaping may require systematic watering, fertilizing or other measures to ensure its survivability and effectiveness over the term of the license.

(b) For switch yards, power houses, buildings, penstocks, powerlines (metal structures): mitigate color and form contrasts by application of paint/stain earthtone colors selected from the surrounding natural appearing landscape colors to reduce contrasts; and in concert with vegetative screening or landscaping. Replace conductors with non-reflective materials at such time as reflectors would otherwise be replaced.

(c) For Project recreation facilities including campgrounds and day-use sites: mitigate color and form contrasts by vegetative or structural screening for all existing and newly constructed recreation facilities. Mitigate impacted areas with vegetation plantings to reduce erosion, improve aesthetics and screening.

(d) For J.C. Boyle Powerhouse and Canal access roads, Project roads, and other landform alterations: mitigate color and form contrasts by establishing vegetation. Application of soil tackifiers and bio-stimulants may be necessary to facilitate revegetation. Talus slopes and cutbanks; mitigate color and form contrasts by establishing vegetation. Application of soil tackifiers and bio-stimulants may be necessary to facilitate revegetation.

B. The Licensee shall prepare a draft RRMP after consultation with the BLM. The Licensee shall allow a minimum of 30 days for the BLM to comment and make recommendations on the draft RRMP before finalizing the plan and filing it with the Commission. The Licensee shall include with the Plan documentation of consultation, copies of comments and recommendations and include descriptions of how the recommendations, and a description of how the comments and recommendations are accommodated by the RRMP. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on Project-specific information. At the time it files the Plan with the Commission, the Licensee shall serve a copy of the filed documents upon the BLM.

C. The BLM reserves the right to require changes to the Plan by filing modifications to the RRMP within 30 days of service. Upon Commission approval, the Licensee shall implement the Plan, including any changes required by the BLM.

Rationale

Recreation Resource Management Plan

Summary Statement

The purpose of the condition is to foster a cooperative working relationship between the BLM and the Licensee to ensure: maintenance and improvement of recreation opportunities at BLM facilities which support a recreation demand that was created as a result of the Project operations (i.e., summer whitewater boating and fishing); continued provision of "a wide range of recreation opportunities that contribute to meeting projected demand within the planning area" (USDI BLM 1995a, page 47) for both public and commercial interests; the equity in assumption of costs incurred for Project-related recreation at BLM recreation facilities; and maintenance and preservation of the visual (scenic) resources on BLM-administered lands.

Recreation Opportunities and Demand

Summer whitewater rafting, base flow fishing, and reservoir-based boating, camping, and fishing are resultant of the Project. Peaking operations for power generation accommodate whitewater boating that otherwise would be absent during summer months. Predictable flows that accommodate whitewater boating have sustained a commercial whitewater boating industry on the Klamath River. In the absence of the Project, the Upper Klamath River would likely afford only technical whitewater or low-flow boating (e.g. kayaking) opportunities after midsummer. The Project has also created and sustained a demand for reservoir based recreation. In response to demand for Project-related recreation and the need for access, BLM has developed and continues to maintain recreation infrastructure within the Project boundary. BLM incurs the cost associated with construction and maintenance of this infrastructure as well as for the costs associated with staffing, planning, maintenance, and monitoring use and condition of these facilities.

Recreation use and demand for developed, staffed and maintained facilities will continue to grow as the population of the Klamath Basin expands over the next 30 to 50 years (PacifiCorp 2004k, pages 5-46-49). Increased recreation use of the Project presents a challenge to Federal land management that requires balancing resource protection with increased demand for diverse recreation opportunities. Increased recreation use of public lands without a corresponding increase in capital improvements necessary to maintain infrastructure will ultimately result in negative impacts to other resource values, the quality of the recreation experience, and to human health and safety. To date, the cost associated with developing or maintaining recreation infrastructure has mainly been borne by the BLM

BLM management direction for the Klamath River canyon calls for the operation and maintenance of the Topsy Campground, Spring Island Boaters Access, the Klamath River Campground, the Stateline Takeout, and dispersed day-use sites (USDI BLM 1995a, page 49). However, the recreation demand which BLM accommodates has increased as a function of Project operations and facilities that serve this recreation interest. To date, the BLM has had to incur all costs associated with management and maintenance of recreation facilities.

The Commission acknowledges recreation demand resultant of Project operations and requires the details of recreation management be developed through a comprehensive recreation management plan (Code of Federal Regulations - 18 CFR Ch. 1, 4-1-96 Ed.). The Commission requires that the comprehensive recreation management plan be prepared in consultation with federal agencies with managerial responsibilities for Project lands including agency recommendations for creating, preserving or enhancing recreation opportunities at the Project and in the Project vicinity.

The Licensee developed a Draft Technical Report for Recreation Resources (PacifiCorp 2003c) and the Recreation Needs Summary (PacifiCorp 2003d) that identified existing and proposed recreation facilities and opportunities for the BLM-administered lands including: Topsy Campground, Spring Island Boaters Access, Klamath River Campground, Stateline Takeout, and dispersed day-use sites. Although these needs were omitted from subsequent filings to the Commission regarding recreation needs and opportunities in the Final License Application (PacifiCorp 2004a) the recreation needs remain and should be addressed. In the absence of provisions to improve, develop, or maintain these facilities the Licensee would fail to meet existing or projected demand for recreation resources (PacifiCorp 2004k, pages 5-46 through 5-

49). The BLM condition is intended to accommodate the recreation demand that both the BLM and the Licensee have perpetuated and supported.

Topsy Campground [A.4.(a)]

The Topsy Campground has been shown to receive recreation use that is a direct result of the Project reservoir and would not have been constructed if the Project had not created a demand for this type of recreation facility. Existing recreation demand for developed camping at the J. C. Boyle Reservoir is met entirely by the Topsy Campground. The Topsy Campground is located within Powersite Withdrawal #258 authorized by Executive Order #6910, on J.C. Boyle Reservoir (BLM Map 1) and is included in the license for Project No. 2082 (Federal Power Commission 1963 - letter to BLM State Director, Oregon). The Topsy Campground is the only developed and staffed camping facility on the J.C. Boyle Reservoir. Demand for camping at Topsy Campground is high on most weekends during summer months and the number of campsites (16), group sites, and improved day-use sites are limited. In fact, the BLM has had to close the entrance to Topsy Campground on weekends when site capacity is filled.

Availability of a potable water supply at Topsy Campground has become problematic. Two wells at the site have failed due to poor water quality and currently BLM transports potable water to the site. A reliable potable water supply is a necessity for public safety and health. The Licensee recognized the need for water system improvements, stating, "BLM's water system needs refurbishment and/or a new potable well source created." (PacifiCorp 2004k, page 5-20)

The Topsy Campground access road is potholed, washboarded, and as a result is difficult to maintain. The BLM receives frequent complaints from the public regarding the condition of the road and associated dust. This situation, and other similar situations, should be evaluated in the plan to address these concerns and reduce road hazards and dust from vehicles.

The BLM and the Licensee, in the Draft Technical Report for Recreation Resources (PacifiCorp 2003c) and the Recreation Needs Summary (PacifiCorp 2003d), identified the need for a group site on J.C. Boyle Reservoir to handle large weekend gatherings, and additional day-use picnic and camping sites for Topsy Campground. Day-use and camping sites at the Topsy campground are not designed to accommodate the increased number of day-users, campers, or groups that access the area. Off-site developments at the Boyle Bluffs area are preferred as additional space for expansion at Topsy Campground is not available. The Licensee has recognized this need in the Final License Application: "Approximately 10 new RV/tent campsites will likely be needed as the BLM's Topsy Campground reaches capacity. Infill or expansion is not feasible at this location. A new day use and campground facility at Boyle Bluffs may be considered." (PacifiCorp 2004a, Exhibit E, page 7-99)

J.C. Boyle Bypass Reach [A.4.(b)]

The BLM administers lands along the J.C. Boyle Bypass Reach for fishing, hiking, sightseeing, and other dispersed recreation. The J.C. Boyle Bypass boating and fishing access sites have not been improved with signage, barriers, or designated parking spaces. Historically, the Licensee allowed angler and boater access to the reach. Additional graveled and delineated boating and fishing access sites on BLM-administered lands are needed to meet existing demand, provide safe parking and trail access to the Bypass reach. These sites were identified by the Licensee for potential development: "*J.C. Boyle Bypass Reach/Powerhouse Area Fishing Access Trails.*" There are a number of opportunities to formalize user-defined trails and/or create new hardened

fishing access trails in the J.C. Boyle bypass reach/powerhouse area. Formalized fishing access trails could be developed below J.C. Boyle dam and near the J.C. Boyle powerhouse. One or more pull-offs along the Canal Access Road could be used for parking. A second location for a formalized trail would start at the gravel parking area adjacent to the J.C. Boyle Powerhouse 'shed' and follow the river upstream. This short fishing access trail probably would require some new trail construction." (PacifiCorp 2004k, pages 5-100 and 5-101)

Spring Island Boater Access [A.4.(c)]

The Spring Island site was developed in the early 1980s by the BLM in response to public demand for a public whitewater boat launch below the J.C. Boyle Powerhouse. The BLM considered the request in consultation with PacifiCorp and whitewater outfitters. Prior to this request, the Licensee prohibited whitewater boat launches at a site immediately above the Powerhouse. PacifiCorp erected signs at the launch site to deter boater access. Since 1982, the BLM has monitored use of this site and has incurred 100% of the cost of maintenance of this facility. Monitoring and maintenance consists of regular site visits (typically twice weekly in summer months for Spring Island and Klamath River Campground) to assist boaters and collect trip reports, collect trash, maintain restroom facilities, and monitor permitted outfitters and other recreation use. BLM estimates recreation use at Spring Island at 5,000 visits per year (USDI BLM 2004a).

The access road leading to the Spring Island Boater's access is often washboarded, dusty, and difficult to maintain. Additional maintenance and re-surfacing is necessary to reduce hazards and for dust control. Additional educational and interpretation materials are needed to better inform the public about whitewater hazards and other safety concerns. These items have been identified as a recreation need in the Recreation Resources Final Technical Report (PacifiCorp 2004k, page 5-143). In addition, the BLM and National Park Service have identified the need for enhanced and up-to-date flow information for the boating public.

If the BLM were to close Spring Island Boater there would be an unmet demand for improved day-use boat launch facility below the J.C. Boyle Powerhouse. No other facility exists or is proposed by the Licensee to meet this demand.

Because this facility has been shown to receive approximately 5,000 annual recreation user visits as a direct result of the Project (flow related whitewater boating), including a substantial commercial whitewater boating industry, and would not have been constructed if the Project had not created a demand for this type of recreation facility, the Licensee shall assume some responsibility for the operations, maintenance and improvement through a negotiated agreement with the BLM.

Klamath River Campground [A.4.(d)]

The BLM's Klamath River Campground is accessed by an extremely rough road that requires maintenance including grading, rock fall protection, and rock removal. The campground would not be accessible by road if this road had not been constructed for the Project. In addition to campers, whitewater boaters and fishermen frequently use the site's facilities. The Licensee recognized the need for road improvements in its Recreation Resources Draft Technical Report (PacifiCorp 2003c, page 5-144): "Consider some improvement to the primitive access road to this site, while not attracting large crowds to this site."

BLM estimates that annual use of the site accounted for approximately 1,000 visits (USDI BLM 2004a). Approximately 70 percent of annual recreation use at this site occurs during the peak season, summer (PacifiCorp 2004k, page 5-72). The majority of visitors in the upper Klamath River participated in whitewater boating (PacifiCorp 2004k, page 3-16). The Klamath River Campground is administered by the BLM that incurs 100% of the costs associated with management, maintenance, and operation of this facility.

The campground is in need of improvement. The access road is rutted and should be improved. The Licensee recognized the need for site improvements in its Recreation Resources Draft Technical Report: "In general, these may include site improvements and/or site relocation." (PacifiCorp 2003c, page 5-144).

Overall, use of this site is considered to be approaching its recreation capacity (PacifiCorp 2004k, pages 5-72 and 5-73) Additional sites are needed to meet demand. If the BLM were to close Klamath River Campground, there would be an unmet demand for improved camping facilities below the J.C. Boyle Powerhouse. There are no other existing or proposed developed facilities for camping on this segment of the Klamath River. As this facility has been shown to receive recreation use that is a direct result of the Project roads and Project operations and would not have been constructed in the absence of the Project, the BLM believes the Licensee has some responsibility for maintaining and operating this facility.

Stateline Takeout [A.4.(e)]

The Stateline Takeout Recreation Site and access road which the BLM and PacifiCorp share responsibility for managing, receives heavy use during peak summer months. Primary recreation users include commercial whitewater rafting companies and the general public. The BLM portion of the Stateline recreation site is impacted as a function of recreation demand and lack of developed camping and day use facilities. The Stateline Recreation Site would not exist in the absence of the Project operations.

Historically, there was no public boating take-out and visitors were charged a fee to use the Copco Store as a take out. Boaters began using Stateline Takeout that is located on public land. Boaters also tried to use the Licensee's fishing access sites as take-outs. Eventually, the Licensee allowed Fishing Access 1 as a take-out, where boaters were dragging boats from the shoreline to the access road. Currently, Fishing Access 1 and Stateline provide the only public boater access. BLM has improved road access to the BLM-administered portion of the Stateline Takeout site. BLM has also provided permanent vault and rented portable toilets at both the BLM and the PacifiCorp portions of Stateline. PacifiCorp's FLA excludes the BLM portion of the Stateline Takeout site; however, the PacifiCorp portion of Stateline Takeout can only be accessed through BLM-administered lands.

The Licensee has identified several resource protection measures and recreation enhancements for the BLM-administered portion of Stateline Recreation site in the draft technical reports and needs summaries. Overall, use of this site is considered to be approaching its recreation capacity (PacifiCorp 2004k, page 5-145). Road improvements are needed to reduce erosion, rutting and impacts from uncontrolled recreation use. Designated camping areas are needed to reduce loss of vegetation and conflicts with cultural sites. These items are necessary to meet an existing recreation demand and reduce conflicts with other resources.

The BLM portion of Stateline Recreation site is the only designated camping area between Copco Reservoir and Stateline. The BLM has incurred 100% of the cost of construction, operation, maintenance, monitoring at the Stateline Takeout since the mid-1980s. The BLM will continue to incur these costs over the period of the License. Due to declining Federal budgets, it is unlikely that the BLM will be able to continue to operate this facility at the same standards for visitor health and safety while meeting an increasing public demand. If the BLM were to close Stateline Takeout due to declining Federal budgets, there would be an unmet demand for improved camping and day-use facilities between Copco Reservoir and Stateline.

As the BLM portion of the Stateline site has been shown to receive whitewater boating use that is a direct result of the Project (PacifiCorp 2004k, pages 5-145 and 5-146) and would not have been constructed in the absence of the Project, the BLM believes the Licensee has some fiscal obligation for maintenance and operation of these facilities.

Dispersed Day-use Sites [A.4.(f)]

Several dispersed and undeveloped campsites and day-use areas on BLM-administered lands receive camping, fishing and boating use. Recreationists gain access to these sites via Project roads or the Klamath River. Several sites have fire grates and picnic tables and serve as "designated" dispersed camps when summer fire restrictions are in effect. BLM administers and incurs 100% of the costs associated with management, maintenance, and operation of these dispersed day-use facilities. These day-use sites are needed to meet an existing recreation demand as identified by the Licensee (PacifiCorp 2004k, pages 5-148 through 5-150). As these day-use sites have been shown to receive recreation use as a result of the Project, the BLM believes the Licensee has some fiscal obligation for maintenance and operation of these facilities and shall negotiate an agreement with the BLM.

Monitoring and Coordination

BLM-administered lands are affected by recreation use that 1) is facilitated by Project roads, facilities, or operations; or 2) has increased as a consequence of user demands. Monitoring visitor use will aid the BLM in developing the agency's Annual Program Summary and Monitoring Report and as well aid in developing projects within the context of a five or 10-year planning horizon. BLM currently conducts yearly monitoring and collects visitor information for Topsy Campground, Spring Island Boat Access, and Klamath River Campground; and monitors whitewater boating and other recreation activities in the upper Klamath River. The Licensee recognized the need to review recreation use as well as facility maintenance and development in its draft RRMP. BLM-administered recreation facilities and roads are managed in conjunction with Project recreation facilities and roads; thus necessitating coordination to continue to meet regional recreation demands. A framework for monitoring that incorporates a feedback loop and necessary trigger points for action for adaptive management is necessary to insure that BLM facilities are adequate to meet recreation demand.

Visual Resource Management (VRM) Plan

The Commission requires discussion of scenic values and protection of this resource in coordination with Federal or state agencies with land management responsibility (18 CFR Ch. 1, 4-1-96 Ed.). The consultation must indicate the nature, extent, and results of the consultation. The report must include a description of the measures proposed by the applicant to ensure that any proposed project works, rights-of-way, access roads and other topographic alterations blend, to the extent possible with the surrounding environment. Powerlines, concrete structures, canals,

roads and other Project facilities detract from the scenic quality of the BLM-administered lands along the lower portion of J.C. Boyle Reservoir and the Upper Klamath River to Irongate Reservoir.

Strong visual contrasts are apparent in the Bypass Reach where large continuous concrete structures dominate much of the view of visitors as they descend into the canyon. (Refer to BLM Figure 6-1.) These Project facilities continue to impact aesthetic resources and do not meet BLM Visual Resource Management class III objectives for the area (USDI BLM 1995a, Map 2-5). VRM Class III objectives allow for moderate levels of change to the characteristic landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements of form, line, color, texture and scale found in the predominant natural features of the characteristic landscape.

The Klamath Falls Resource Area RMP/ROD (USDI BLM 1995a, pages 43-44) and Redding Resource Management Plan (USDI BLM 1993, page 33) requires the BLM to protect the scenic values of the Upper Klamath River, by providing for Visual Resource Management Class II management in the corridor. VRM Class II management is also to be provided within one-quarter mile of the Topsy Recreation site. VRM class II objectives allow for low levels of change to the character of the landscape. Management activities should be seen but should not attract the attention of the casual observer. Changes should repeat the basic elements of form, line, color, texture and scale found in the predominant natural features of the characteristic landscape.

BLM Figure 6-1: Photo of canal from powerhouse access road

The Licensee has indicated that BLM's VRM guidelines and standards would be used to improve some of the existing facilities which are visible from public viewing points on BLM-administered lands (PacifiCorp 2004L, pages 64-66). The BLM has consulted with the Licensee and indicated that additional facilities need to be included in the aesthetics and visual resource enhancement program as they do not meet the VRM objectives for the area. The Project facilities on BLM-administered lands impacting scenic resources include the J.C. Boyle Bypass Canal and other concrete structures, switch yards, power houses, buildings, penstocks, powerlines (metal structures); and Project recreation facilities including campgrounds and day-

use sites. Project structures require screening or concealment using methods as described in this condition in order to meet BLM VRM objectives. The VRM plan shall provide for managing landscape character in such a way as to accommodate existing and new Project facilities. Revegetation and site rehabilitation is necessary to help meet VRM plan guidelines for the Topsy Recreation site. The Licensee has identified in its Draft RRMP that the mitigation measures such as recoating or repainting facilities to reduce contrasts can be accomplished during regular Project maintenance. BLM has requested these items be accomplished within 10 years of License issuance.

The Klamath Falls Resource Area RMP/ROD also requires the BLM to "…manage designated and suitable segments of the National Wild and Scenic Rivers System to protect their outstandingly remarkable values and to maintain and enhance the natural integrity of river-related values in designated and suitable river areas." (USDI BLM 1995a) In 1994, the Upper Klamath River was designated by the Secretary of the Interior as a Scenic River and is included in the National Wild and Scenic Rivers System. Based on this, the BLM must secure interim protections specifically from the J.C. Boyle Powerhouse to the Oregon-California state line on the upper Klamath River until a river management plan has been completed (USDI BLM 1995a, page 45). Among the protections are the provisions for Visual Resource Management Class A management in the river corridor and protection of the free-flowing river values (e.g., outstandingly remarkable values) of recreation, scenic, fish, wildlife, prehistoric, and historic resources, as well as Native American traditional uses.

Condition No. 7 – Vegetation Resources Management Plan

A. Within one year of the issuance of the license, the Licensee shall prepare and file with the Commission a Vegetation Resources Management Plan which includes provisions for managing noxious and invasive plants and threatened, endangered, and sensitive (TES) plants on BLM-administered lands that are affected by the Project. The plan shall:

1. include provisions for surveying, documenting, and protecting TES plants, including a review of BLM special status species, Oregon Natural Heritage Information Center (ORNHIC), California Natural Diversity Database, and California Native Plant Society records; and
2. specifically address the maintenance of the J.C. Boyle Powerhouse, maintenance of transmission line and road rights-of-way (ROW), and use of Project roads.

B. The Licensee shall prepare a draft plan in consultation with the BLM. The Licensee shall allow a minimum of 30 days for the BLM to comment and to make recommendations on the draft plan before finalizing the plan and filing it with the Commission. The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations, and a description of how the comments and recommendations are accommodated by the Plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information. At the time it files the plan with the Commission, the Licensee shall submit a copy of the filed documents to the BLM.

C. The BLM reserves the right of require changes to the Plan by filing modifications to the Plan within 30 days of receipt. Upon Commission approval, the Licensee shall implement the Plan, including any changes required by the BLM.

D. The section of the Vegetation Resources Management Plan which addresses noxious and invasive plants shall include:

1. Protocol for conducting weed surveys, including a review of federal, state and local noxious weed lists, and the list of Exotic Pest Plants of Greatest Ecological Concern in California from the California Invasive Plant Council.
2. Timeline for a systematic survey of land affected by the project, including BLM-administered lands with in the Project area.
3. Protocol for producing a geospatial map (e.g., GIS map) and digital database to store information on species occurrence; distribution; status according to the Oregon Department of Agriculture (ODA) system of ranking species for control; and timing of last survey. The Licensee shall make this data base available to the BLM.
4. Proposed treatments, mitigations, and best management practices for managing weeds on BLM-administered lands that are impacted by Project maintenance, operation, and use.

E. The section of the Vegetation Resources Management Plan which addresses threatened, endangered, and sensitive (TES) plants shall include:

1. Protocol for surveying BLM-administered lands affected by the Project according to accepted protocols to determine or verify the distribution of TES species.
2. Protocol for documenting, protecting and mitigating for impacts to TES species, including a review of BLM special status species, ORNHIC, California Natural Diversity Database, and California Native Plant Society records.
3. Protocol for surveying adjacent to Project roads which cross seasonally wet meadows for occurrence of TES plant species.

Rationale

Noxious Weeds

Maintenance of the J.C. Boyle Powerhouse and Project road and transmission line ROWs as well as use of Project roads impacts vegetation resources administered by the BLM. The Licensee proposed to develop a Vegetation Resources Management Plan (PacifiCorp 2004a, Exhibit E, page 5-122) to guide vegetation and weed management and monitoring near Project facilities and roads, recreation sites, and transmission lines. In the absence of specific details about this plan, BLM has proposed a vegetation management condition that at a minimum will limit the introduction and potential spread of noxious weed species.

Vegetation maps for the Project include 165 acres adjacent to the Klamath River, Jenny Creek, and Spencer Creek and approximately 75 acres adjacent to the J.C. Boyle and Keno Reservoirs that were surveyed for botanical resources. The botanical survey is inadequate for determining the full extent of Project impacts on vegetation resources.

Noxious and invasive weeds are effective at colonizing disturbed areas. Once established these species have the capacity to invade undisturbed, adjacent sites. An integrated vegetation management strategy necessitates understanding the distribution of noxious and invasive as well as other species across the broader landscape. The limited spatial scope of the existing vegetation survey limits the ability to analyze or mitigate for effects to vegetation from Project operations.

The Final License Application (FLA) presents information on the abundance and distribution of noxious weeds and invasive non-native plants. Surveys from 2002 revealed 60 infestations and the presence of 17 target weed species. Infestations include populations of St. Johns' wort, hoary cress, Canada thistle, Dyer's woad, and Mediterranean sage (PacifiCorp 2004c, page 8-5). BLM previously mapped 52 of the 60 infestations. Previous surveys also recorded the presence of common toadflax, Himalayan blackberry, poison hemlock, and salt cedar. Also, six "widespread species" (cheatgrass, Dalmatian toadflax, medusahead, yellow starthistle, and bull thistle) were not mapped, and only their general distribution was described based on plot data. Even with the omission of this information in the FLA, the account of noxious weeds affirms the widespread distribution and abundance of noxious weeds in the Project area.

Information for noxious weeds and invasive non-native plants does not reflect the widespread distribution of various species. Because listed noxious weed species have been targeted for control by the Oregon State Weed Board, the distributions of these species should have been mapped. For example, the distribution and relative abundance of yellow starthistle, a species targeted for prevention and control by the Oregon State Weed Board, should be surveyed and mapped so appropriate treatments to control the species can be developed and implemented. Likewise, Dalmatian toadflax could be managed more effectively if the extent of the species distribution was documented and understood, since a biological invasion is most effectively controlled by treating "outlier" populations (Moody and Mack 1988). This is true for all noxious weed species; and in order to develop an effective, integrated weed management plan, the distribution of all species targeted for control is necessary.

Powerhouse maintenance, transmission line and road ROW maintenance, and use of Project roads contribute to the spread of noxious weeds and invasive non-native plant species, placing other native plant communities at risk. For example, although yellow starthistle infestations that occur along the J.C. Boyle Peaking and Bypass Reaches, the J.C. Boyle Powerhouse, and in association with Project transmission line and road ROWs may be considered outliers to larger concentrations in California, they serve as sources for further dispersal of the species across the entire Project area.

BLM management direction for the control of noxious weeds requires surveys across BLM-administered lands for noxious weed infestations, reporting to the ODA, and coordination with the ODA to reduce infestations (ODA 2005). The BLM is further required to use an integrated pest management approach to reduce or control infestations. To accomplish this, the BLM maintains a cooperative agreement with the Oregon State Weed Board. Through the Oregon State Weed Board, the BLM participates in established WMAs which include all stakeholders in order to coordinate across multiple land ownerships. Both Siskiyou and Klamath counties have established WMAs.

Threatened, Endangered, and Sensitive Species

Project impacts to TES plant species are discussed only as they relate to flow and water level manipulations. Thus, one might conclude that the Project does not affect TES plants which may occur in association with other Project features or are affected by other Project operations. Project facilities and operations directly and indirectly affect TES species and their habitat. Indirect effects include disturbance from Project operations, Project roads, and Project-related recreation.

Information regarding the abundance and distribution of TES species is based on field surveys, review of BLM, ORNHIC, California Natural Diversity Database, and California Native Plant Society records. The Licensee claims that the "intuitive controlled" survey method (Whiteaker et al. 1998; PacifiCorp 2004c, page 5-3) was used, which traverses the entire study area thoroughly enough to see a representative cross section of all the major habitats and topographic features, and then conducts a complete survey for target TES species in areas with a high potential to support these species. However, the Licensee failed to confirm information about known TES plant locations within the survey area "because of their remote location within the study area" (PacifiCorp 2004c, page 5-20). The survey focused on sites "most likely to be directly affected by Project activities," and was limited to ¼ mile (0.40 km) from Project facilities and associated recreation sites, as opposed to areas supporting potential habitat for suspected species. Thus, the location of several known populations of TES plant species that have been recorded from other sources could not be corroborated based on PacifiCorp's results. Confirmation of species presence/absence and distribution is necessary to determine the magnitude of impacts of Project operations on TES species.

Since it is unlikely that the "intuitive controlled" survey method was applied as described in the cited reference, it is unlikely that all TES plant populations within the Project area have been located. Therefore, conclusions regarding direct and indirect impacts from Project operations are incomplete. For example, bristly sedge, a BLM sensitive species believed to be extinct in Oregon, was identified along the J.C. Boyle Reservoir and the Topsy Campground subsequent to the 2002 survey. Several TES species were found in the seasonally wet, alkaline flood plains adjacent to Keno reservoir, and may be impacted by changes in reservoir management. These species are Applegate's milkvetch (federally listed as endangered), short-podded thelypodium, pendulus bulrush, Columbia yellow cress, and salt heliotrope. However, the project area has been redefined to exclude this portion of the study area.

Several other TES plant species are found in seasonally wet meadows not influenced directly by flow manipulations. However, Project roads and roads established from Project roads often cross these meadows and disrupt the natural hydrology to which these species are adapted. These species include red root yampah, Howell's yampah, and Bellinger's meadow foam.

Impacts have been described as "uncertain" and related solely to Project maintenance or flow regulation. Like the evaluation of the affect of Project operations on individual species, assessing changes in habitat as a function of Project operations is described as "difficult." Because impacts to TES plant species are inadequately described, discussion of potential future impacts is likewise inadequate. As a consequence the proposed Vegetation Resources Management Plan lacks detail describing "protections" for plant species and habitats (PacifiCorp 2004a, Exhibit E, page 5-126). Based on this inadequacy, a failure to adequately survey the Project area for TES species, and inappropriate application of the survey methodology, it is unlikely that all TES plant populations within the Project area have been located or that impacts of Project operations have been adequately described. Thus, the provisions of a Vegetation Resources Management Plan, including provisions for TES plant protection are inadequate.

Condition No. 8 – Mitigation for Impacts to Wildlife and Wildlife Habitat

A. Within two years of issuance of the license, the Licensee shall prepare and file with the Commission a Wildlife Habitat Management Plan (WHMP) for Bureau of Land Management (BLM) administered lands affected by Project operations and maintenance PacifiCorp

B. The Licensee shall prepare a draft plan after consultation with the BLM. The Licensee shall allow a minimum of 30 days for the BLM to comment and to make recommendations on the draft before finalizing the plan and filing it with the Federal Energy Regulatory Commission (Commission). The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations, and a description of how the comments and recommendations are accommodated by the Plan. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons based on project-specific information. The Licensee shall provide the BLM copies of all documents filed with the Commission.

C. The BLM reserves the right to require changes to the WHMP and will provide comments and recommendations within 30 days of receipt of the document. Upon Commission approval, the Licensee shall implement the WHMP, including any changes required by the BLM.

D. The WHMP shall include measures for:

- Wildlife Crossings and Escape Ramps for the J.C. Boyle Canal and Effectiveness Monitoring
- Western Pond Turtle Habitat and Effectiveness Monitoring
- Threatened, Endangered, Sensitive, Special Status Species Survey and Monitoring including:

(a) survey protocols for long-term survey and monitoring of TES and SS species and their habitat for BLM-administered lands within the Project to assess impacts and develop necessary mitigations. This information shall supplement the previous study completed by PacifiCorp (PacifiCorp 2004c - Threatened, Endangered, Sensitive and Special Status Species Assessment).

(b) Identify restoration, protection, and/or enhancement measures.

(c) seasonal restrictions for active nest sites on BLM-administered lands for bald eagles, golden eagles, ospreys, peregrine falcons and other raptors that are affected by Project operations.

Rationale – Wildlife Crossings and Escape Ramps for the J.C. Boyle Canal

The J.C. Boyle Canal blocks movement by individual terrestrial mammals and reptiles. The direct impact is limited to the individual animal, but there would be benefits to local populations by enhancing crossing opportunities along the canal.

The Klamath River is the only waterway that crosses the southern part of the Cascade Mountain range and is thus one of the most important big game migration and movement corridors in Oregon. The mixture of vegetation types and landforms supports a diversity of habitats and wildlife species which are designated as an Outstandingly Remarkable Value (ORV) of the

Upper Klamath Wild and Scenic River. Outstanding remarkable characteristics for wildlife include a high degree of species diversity and high wildlife habitat diversity – both of which are present in the Upper Klamath River Canyon (USDI BLM 1990a, page 3-5)

The J.C. Boyle Canal is nearly 11,000 feet (3,352 m) long and is a combination of vertical concrete walls, bedrock, and gunite-lined earthbanks (PacifiCorp 2004c, Table 6.7-8). The entire eastern or downslope wall is concrete and is 16 feet (4.9 m) tall. The west side or inner canal wall varies greatly in height above ground and accessibility. Inside the canal, the height of the freeboard (vertical distance between water and top of inside canal wall) varies depending on the amount of water in the canal, but generally exceeds several feet, so that once animals are in the water they cannot exit except at the two existing escape points. There is no way to cross the J.C. Boyle Canal (PacifiCorp 2004c). For detailed J.C. Boyle Canal wall specifications, see Figure 6.7-2 in PacifiCorp Terrestrial Resources Final Technical Report (PacifiCorp 2004c).

Habitat upslope of the J.C. Boyle Canal is a mixture of mixed conifer, ponderosa pine, and grassland habitats. Along the Bypass Reach of the Klamath River downslope of the canal, narrow patches of riparian grass and riparian shrub (primarily dogwood, willow, and ash) habitat occur intermixed with the large boulders (PacifiCorp 2004c, page 2-97). Many of the wildlife species in this area use these upslope and downslope habitats during some stage of their life cycle (PacifiCorp 2004c, 5-83). The BLM Wild and Scenic River criteria require contiguous habitat conditions to support the biological needs of the wildlife species. (USDI BLM 1990a, page 3-7). The placement and configuration of the J.C. Boyle Canal interferes with BLM's ability to meet contiguous habitat conditions of the wild and scenic river criteria.

Big game species that occur within the Project area include deer, elk, black bear and cougar. Although uncommon in the Project area, black bear and cougar either pass through or reside in the canyon. A migratory herd of 3,100 deer (ODFW estimate, 1988-1989), known as the Pokegama Herd, utilizes the area surrounding the canyon. The majority of this herd winters in and around the Project area (USDI BLM 1990a, page 2-28). The lower portion of the J.C. Boyle Bypass Reach and all of the Peaking Reach including the uplands surrounding the river lies within a larger area designated by BLM and the Oregon Department of Fish and Wildlife (ODFW) as critical deer winter range. The J.C. Boyle Canal area of the Project is in or near this critical deer winter range habitat as described in BLM's Final Eligibility Report Upper Klamath Wild and Scenic River Study. This designation is primarily due to the low elevation that gives rise to light to snow-free conditions during severe winters, providing accessible forage, easier movement, good thermal cover and early spring greenup that furnishes critically needed forage for deer coming off of winter. A small portion of this herd occurs as year-round residents of the Project area (USDI BLM 1990a, page 2-28). Deer trails parallel the right (west or uphill) side of the canal along several sections of the J.C. Boyle Canal (PacifiCorp 2004c, Figure 6.7-2). Deer tracks were observed at one of the vehicle ramps/deer escapes indicating that animals at least occasionally access the canal (likely to drink water) at those protected backwater areas (PacifiCorp 2004c).

PacifiCorp conducted a terrestrial habitat connectivity study of their North Umpqua project that involved a field assessment of wildlife movements affected by the waterways of this project. The study concluded that Project waterways may alter movement patterns or corridors, which, in turn, may make animals more susceptible to predation or hunting mortality (PacifiCorp 2004c, page 6-23). The study also suggested several management options for terrestrial habitat

connectivity focusing on project waterways. Among these recommendations was the installation of wildlife crossings.

PacifiCorp's North Umpqua study also found that populations of small mammals or amphibians are probably affected by Project waterways (PacifiCorp 2004c, page 6-23). There are at least 21 wildlife species (5 Special Status Species) that are potentially affected by the J.C. Boyle Canal that were confirmed as occurring in the study area; at least 55 other species (6 Special Status Species) potentially occur in the study area (PacifiCorp 2004c, Table 6.7-4). Many of these are small mammals and herptiles. During small mammal sampling along the J.C. Boyle Canal in 2003 there were 199 individuals (including recaptures) of at least four species documented. (PacifiCorp 2004c, Table 6.7-5). During BLM's 2000-2001 Herpetological Inventory of the Upper Klamath River Canyon, 1,087 individual herptiles representing 18 species were detected in the Project area (USDI BLM 2001b).

Small and medium-size mammals and reptiles may use the rocky habitat in the middle portions of the J.C. Boyle Bypass Reach. During small mammal trapping, several species of snakes as well as fence lizards, bobcat, raccoon and striped skunk were found immediately adjacent to the northwestern canal wall. Under current operations there is no opportunity for these species to safely cross the Canal to access riparian habitat along the Klamath River. This habitat is thought to represent important summer habitat for reptiles. In addition, even though small mammals have small home ranges, juveniles of many species disperse greater distances and may be affected by the canal (PacifiCorp 2004c).

PacifiCorp's reporting system at J.C. Boyle Canal was designed mainly to record big game mortalities, but wildlife of medium size also are noted (PacifiCorp 2004c, 6-24). Database records have been maintained since 1988. According to the data, monitoring of wildlife entrainment in the J.C. Boyle Canal appears to have been incidental (PacifiCorp 2004c, Table 6.7-2). No entrainment data was recorded between 1959 and 1988. Data collected immediately after the canal was constructed would have indicated the true affect on wildlife and surrounding habitat connectivity. Since 1988, Project personnel have documented six wildlife mortalities at the J.C. Boyle Canal/Forebay. This included five deer and one skunk collected from the J.C. Boyle Forebay trash rack. Entrainment of small animals (herptiles and small mammals) in this canal has not been assessed because the trash rack grates are too widely separated (2 inches [5 cm] gaps) to stop small animals (PacifiCorp 2004c, page 6-25).

Construction and Installation of Wildlife Crossings

Wildlife movement patterns and wildlife dispersal across the Project area is affected by the presence of the J.C. Boyle Canal. (PacifiCorp 2004c, 6.8.2, page 6-57). The canal creates a barrier to wildlife movement and poses a risk of mortality. Overall long-term effects to species may include decreased ability to locate mates, decreased parental investment/involvement with young, decreased ability to disperse, decrease in fitness and increased predation risk (Frid and Dill 2002; Sutherland et. al. 2000). The J.C. Boyle Canal presents a barrier to wildlife movement (PacifiCorp 2004a, Executive Summary, page 5-5) because the canal blocks movement of herptiles and small- to medium-sized mammals (PacifiCorp 2004c, page 4-86) and is an impassible barrier to herptiles. Building wildlife crossings that connect suitable habitat would eliminate a need for animals to enter the canal and ultimately enhance connectivity.

Pacific Gas and Electric (PG&E) assessed canal crossings to determine their effectiveness in the Upper North Fork Feather River Project (PacifiCorp 2003b, page 6-23). The survey revealed that 90% of canal crossings were successful. The study also showed that knowing where to locate escape mechanisms in canals is extremely important because animals cross at specific established locations.

During the 1970s and 1980s, several studies were conducted to document losses of big game in canals located in arid habitats of the California Central Valley and Arizona (PacifiCorp 2004c, page 6-24). The studies demonstrated that deer bridges and escapes are effective at reducing mortality. A recent study in Arizona demonstrated the importance of habitat corridors to allow deer to successful cross a large fenced canal system (PacifiCorp 2004c, page 6-24).

Construction and Installation of Wildlife Escape Ramps
USDI – BLM Instruction Memorandum No. 2004-156 (USDI BLM 2004b) requires that Water developments on public lands be designed to meet the needs of livestock, wild horses, and wildlife. To reduce the risk of wildlife fatalities, the BLM requires escape ramps in water developments. BLM policy direction, as per BLM Manual Handbook H-1741-2 (Water Developments), has been to "Install escape ramps in open water troughs and tanks to protect water quality and to reduce wildlife loss." (USDI BLM 1990b, Section II-3b)

While it may be impossible to prevent all wildlife fatalities associated with water developments, the BLM shall make a reasonable effort to ensure that these projects are as wildlife safe as reasonably possible (USDI BLM 2004b). This includes all existing and future water developments on public lands regardless of who constructed them, when they were constructed, or how construction was authorized (USDI BLM 2004b).

Effectiveness Monitoring of Wildlife Crossings and Escape Ramps
The Klamath Falls Resource Area RMP requires monitoring as part of the BLM's adaptive management strategy. The direction and guidance set forth in the RMP states that "Monitoring is an essential component of natural resource management because it provides information on the relative success of management. Monitoring results will provide managers with the information to determine whether an objective has been met and whether to continue or modify the management direction." (USDI BLM 1995a, page 85) Effectiveness monitoring is to ensure that actions meet the desired objectives (USDI BLM 1995a, page 85)

Rationale – Western Pond Turtle Habitat

Western Pond Turtle Suitable Habitat Surveys
The western pond turtle is a BLM Sensitive species in Oregon. The Project is located near the edge of the turtle's geographic range and at its upper elevational limit within this range. In Oregon, western pond turtle populations are in decline (St. John 2002; Brown et. al. 1995). The lifespan of this long-lived turtle sometimes exceeds 50 years (St. John 2002).

Western pond turtles occur throughout the Project area, although use appears to be concentrated around basking structures (exposed rocks and occasionally logs) and near areas of slower moving water. They require basking sites, such as logs, rocks, etc. (Csuti et al 1997). Basking sites for thermoregulation are an important component of western pond turtle's habitat (St. John 2002). Pond turtles are ectothermic (cold-blooded), which means that their body temperatures

are largely determined by sources of heat outside of their body (Brown et al 1995). Attaining body temperature levels suitable for activity is an important requirement of reptilian ectothermic life. "Elevated temperatures, often of narrow range and at a level characteristic for a species or group, are necessary for the vital life processes of foraging, digestion, reproduction and escape from predators." (Bury 1972) During atmospheric basking, turtles elevate and maintain body temperatures near 32 degrees Celsius through a number of thermoregulatory behaviors including: exposing shell to direct sun (heating), dunking the head, feet or body in water (cooling), changing exposure to heating and cooling sources, rotating the body axis, and extending or retracting the limbs and head (Bury and Holland 1993). Changes in water level can affect the availability of suitable basking sites along the reservoir and river shorelines. Logs that are partially submerged and available for turtles at one flow or pool level could become entirely exposed at lower flows. This would most likely occur in the J.C. Boyle Peaking Reach where daily peaking results in stage changes of several feet in some locations. Because Bury (1995) reported that basking logs are limited in this reach (PacifiCorp 2004c) dewatering of basking structures is important. In the J.C. Boyle Peaking Reach, turtles seem to be restricted to relatively few areas that still have suitable basking habitat especially under varying water levels due to peaking operations (Roninger, personal communication, 2005). It is very likely that western pond turtle populations are lower than historic levels. The survey is needed to define population habitat needs and Project impacts.

For Bureau sensitive species where lands administered or actions authorized by BLM have a significant effect on their status, BLM policy directs that Districts will protect, manage and conserve those species and their habitats such that any Bureau action will not contribute to the need to list any of these species (USDI BLM 2001a). Policy for candidate species applies to Bureau sensitive species: "For those species where lands administered by BLM or actions have a significant effect on their status, manage the habitat to conserve the species." (USDI BLM 2001a - Special Status Species Management) This includes not only inventory at the appropriate time of year in advance of BLM actions (clearances) but also general inventory where needed to determine species distribution and status and monitoring to determine the species' requirements and trends. Bureau sensitive species and their habitat will be considered priority species for inventory, planning, monitoring and management. In addition, "Management plans will be prepared when necessary and active management implemented where needed to prevent listing or to conserve the species. Progress toward meeting species management objectives will be monitored periodically." (USDI BLM 2001a)

Manual 6840 (USDI BLM 2001a) requires management plans for Bureau sensitive (BS) species where BLM lands or actions have a significant effect on their status. Districts are encouraged to review the habitats, biology, status and threats of all special status species and to develop management plans for Federal Candidate, Bureau Sensitive, and State Listed species as needed to conserve the species and habitats. They should also provide adequate information to assist in determining the location and extent of protection; acceptable mitigation (where known); monitoring plan; studies and management actions needed. General guidance may be provided in interim plans, which succinctly describe differences in species management and protection requirements.

Construction and Installation of Western Pond Turtle Basking Structure

The Topsy/Pokegama Landscape Analysis was prepared by the Klamath Falls Resource Area and the USFWS to meet requirements set forth by the Northwest Forest Plan's Aquatic

Conservation Strategy. In this plan, the BLM has been directed to "Place large logs in slow water areas known to be important western pond turtle aquatic habitat." (Bury 1995). Logs could be anchored to shore where they would be partially submerged to provide basking and escape cover…Because of the upstream dams and past harvest activity; these areas may have less instream logs than were present historically."(USDI BLM 1996)

Certain segments of the Project, like the J.C. Boyle Peaking Reach lack suitable basking sites for western pond turtles. This is among the limiting factors to pond turtle habitation of the Project area. Peaking operations for power production are another condition which has likely affected habitat suitability for the species. Peaking operations could have the effect of dislodging basking logs and dislodging logs which are not anchored to the bank or bottom. Daily water level fluctuations also increase the rate of decomposition and may make the logs unsuitable (e.g., either inaccessible due to flooding or exposure) for basking.

Peaking operations may affect pond turtles by periodically widening the distance between the water's edge and shoreline habitat, thus reducing availability of basking sites. Currently, there are few basking structures downstream of the Project facilities. The existing structures receive a high degree of use and should be protected from further degradation. Additional structures located in suitable areas of the J.C. Boyle Peaking Reach should accommodate more turtle basking at different surface water elevations (PacifiCorp 2004a). The number and distribution of these structures would be determined based on known turtle concentrations, location of recreational activity, and suitability of adjacent uplands for nesting and over wintering.

Effectiveness Monitoring of Installed Western Pond Turtle Basking Structure
The Klamath Falls Resource Area RMP requires monitoring as part of the BLM's adaptive management strategy. The direction and guidance set forth in the RMP states that "Monitoring is an essential component of natural resource management because it provides information on the relative success of management. Monitoring results will provide managers with the information to determine whether an objective has been met and whether to continue or modify the management direction." (USDI BLM 1995a, p 85) Effectiveness monitoring is to ensure that actions meet the desired objectives (USDI BLM 1995a, p 85) For Bureau Sensitive species, monitoring is required on lands administered by the BLM or actions have a significant effect on their status (USDI BLM 2001a). BLM policy further requires that monitoring be conducted to determine if protection and mitigation implemented in the field achieved management objectives.

Rationale – Threatened, Endangered, Sensitive, Special Status Species

Surveys, Habitat Protection and Improvement for SS Species on BLM-Administered Lands
The largest number of TES plant and animal species were documented in the J.C. Boyle Peaking Reach; most of the TES avian species were found in association with riparian, wetland or open water habitats. All TES herptile species, western pond turtles and TES mammals (including bats) rely on wetland and riparian habitat during some stage of their life cycle. The extent and suitability of riparian habitat would be adversely affected by proposed Project operations (PacifiCorp 2004c, 5-83 through 5-85).

The species that are likely to be affected by the increased inter-riparian shoreline distances and patchy riparian plant distribution include species that are closely tied to riparian habitat during all or part of their life history. Several amphibian species as well as small mammals, aquatic

furbearers, and some reptiles use riparian habitats for breeding, foraging or cover. Several TES and riparian focal species (RFS) including the yellow warbler (*Dendroica petechia*), song sparrow (*Melospiza melodia*), willow flycatcher (*Empidonax traillii*), black crowned night heron (*Nycticorax nytcticorax*), yellow rail (*Coturnicops noveboracensis*),western yellow-billed cuckoo (*Coccyzus americanus*), purple martin (*Progne subis*), yellow breasted chat (*Icteria virens*), foothill yellow-legged frog (*Rana boylii*), Oregon spotted frog (*Rana pretiosa*), and western toad (*Bufo boreas*), also use riparian habitats substantially more often than upland habitats. Continued water fluctuations in reservoir and riverine habitat will negatively affect amphibians (PacifiCorp 2004c, 4-84). Floodplain woodlands support higher densities of breeding birds than upland woodland or herbaceous habitats (Stauffer and Best 1980). Although birds are highly mobile, there has been some documentation that riparian connectivity plays an important role especially during dispersal. Juvenile birds are often more dependent on continuous riparian habitat for dispersal than are adults of the same species (Machtans et al 1996). The distribution of riparian habitat may have a major impact on the distribution and abundance of riparian dependent bird species. The Klamath Bird Observatory's long-term monitoring has indicated that the riparian areas are important not only for breeding, but also during fall migration (PacifiCorp 2004c, 6.8.1.3, page 6-56). Therefore, the greatest effect of the Project on passerine birds is the effect on the distribution and connectivity of riparian and wetland habitat.

Preservation of Klamath River aquatic systems and associated peripheral wetland and riparian habitat will be critical to the maintenance of wildlife populations currently existing in and around the study area. If unprotected, wetland and riparian habitat along shorelines is likely to decline in the future. Depending on which combination of water level management, wave action, and adjacent land uses (e.g., grazing and agriculture) continues to occur, habitat along Project reservoirs likely will continue to be relatively thin and botanically non-diverse without management actions specifically targeting enhancement of these areas (PacifiCorp 2004c, 7.8.2, page 7-43). Without active management, it is unlikely that riparian habitat conditions will substantially improve in the Project area even with the proposed changes in the J.C. Boyle minimum flow releases and powerhouse ramp rates. Recreation use and reservoir fluctuation regimes are Project related effects (PacifiCorp 2004a, Exhibit E, page 5-128)

The BLM special status species management requires each Field Office to: to conduct and maintain current inventories for SS species on public lands, provide for the conservation of SS species, and ensure all actions are evaluated to determine if special status species objectives are being met (USDI BLM 2001a, pages 5-6).

For all TES and SS species and their habitats it is necessary to conduct protocol surveys through the life of the new license for habitat disturbing activities on BLM-administered lands in order to evaluate the continuing impacts and maintain current inventories. Surveying initially would supplement the baseline data and subsequent surveys would allow PacifiCorp and the BLM to evaluate the impacts to TES and SS species over time. This would meet the BLM SS species policy to maintain current inventories for SS species and their habitats.

Surveys would be used to identify SS species habitat that would need protection, restoration or mitigation from Project impacts. This is consistent with current RMP direction that states that the BLM should "study, maintain or restore community structure, species composition and ecological processes of special status plant and animal habitat." and consistent with the BLM

Special Status Species Policy (USDI BLM 2001a) which states monitor and evaluate ongoing management activities to ensure conservation objectives for listed species are being met.

The Klamath Falls RMP objectives for Special Status species are to "…manage for the conservation of Federal Candidates and Bureaus Sensitive Species and their habitats so as far as not to contribute the need to list and to recover the species." (USDI BLM 1995a, page 36) The RMP also states that the BLM should "…study, maintain or restore community structure, species composition and ecological processes of special status plant and animal habitat." (USDI BLM 1995a, page 36) In order to fully evaluate the impacts from the Project an appropriate survey effort of Special Status species and their habitat is needed over the long-term to address those impacts that are on-going as a result of the Project. The surveys conducted, in preparation of the License application, in some cases did not meet BLM protocols, RMP direction, Northwest Forest Plan requirements or the policies in the BLM Special Status Species Manual. Survey protocols for most species are conducted over multiple years to increase the chances of detection.

Surveys for Survey and Manage (S&M) Aquatic and Terrestrial Mollusks are required for habitat disturbing actions under the Northwest Forest Plan (USDA USDI 1994) and subsequent 2001 Record of Decision (USDA USDI 2001). The Project has and will continue to impact suitable habitat for terrestrial and aquatic mollusks listed under the S&M species list for the Klamath Falls Resource Area. These surveys should be conducted for those species and according the S&M survey protocol. The current S&M mollusk surveys (PacifiCorp 2004c) were not conducted to Northwest Forest Plan standards (USDA USDI 2001) as stated in the FLA (PacifiCorp 2004a, Exhibit E, page 5-117).

Seasonal Restrictions for TES and SS Species

The Klamath Falls Resource Area RMP/ROD (USDI BLM 1995a, pages 34 and 38-39) provides seasonal restrictions (time of year and/or distance from sensitive area) for management activities on or adjacent to BLM-administered lands that may disturb species during critical periods of their reproduction. Those species include bald and golden eagles, peregrine falcons, Townsend's big-eared bat, northern goshawk, northern spotted owl, and osprey. The BLM condition is proposed to ensure that sensitive avian species continue to be managed consistent with BLM management objectives for these species. In the absence of BLM policy, State and Federal laws and/or regulations include provisions for such protections.

Condition No. 9 – Reservation of Section 4(e) Authorities

Authority is reserved to the Commission to require the Licensee to implement such conditions for the protection and utilization of BLM reservations as may be provided by the Secretary of the Interior, pursuant to Section 4(e) of the Federal Power Act, 16 U.S.C. § 797(e).

Rationale

This general reservation of authority allows the Secretary to consider additional data as it becomes available, to respond to changed circumstances, and modify the existing section 4(e) conditions as may be necessary. The Secretary's reservation of mandatory authorities under the FPA has been accepted by the Commission and judicially affirmed. *Wisconsin Public Services Corp.*, 62 FERC ¶ 61,905 (1993), *aff'd*, *Wisconsin Public Serv. Corp. v. FERC*, 32 F.3d 1165 (7th Cir. 1994).

The Klamath Tribes of Oregon hold treaty-protected property rights, including fishing and water rights, in the upper Klamath Basin. The United States and the Klamath Tribes have jointly filed claims in the State of Oregon's water rights adjudication for the surface waters of the Klamath Basin in Oregon, including instream flow claims within the Project area (from Link River Dam to the Oregon-California border), to protect the Tribes' fishing and water rights reserved to them pursuant to their 1864 Treaty with the United States. In addition, the Hoopa Valley and Yurok Tribes have confirmed reserved fishing rights in the lower Klamath Basin, and the water necessary to protect those rights may likewise be determined in a subsequent proceeding.

Any condition or prescription required for this Project's license, including those to protect federal interests, must be consistent with these reserved rights. Additional data or other information, including a binding decree resulting from the State of Oregon's water rights adjudication, may require modification to the license conditions. Thus, the Department is submitting these reservations of authority. The Department's other recommendations do not ask FERC to take any action or otherwise engage in the issues being addressed in the water rights adjudication.

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(36 CFR) Title 36--Parks, Forests, and Public Property, Chapter VIII--Advisory Council On Historic Preservation, Part 800--Protection Of Historic Properties

Section B: U.S. Department of Interior Preliminary 4(e) Conditions – Reclamation Reservation

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Section B: U.S. Department of Interior Preliminary 4(e) Conditions – Reclamation Reservation

Bureau of Reclamation's Reservations

The U.S. Department of the Interior, through the Bureau of Reclamation (Reclamation) has developed conditions pursuant to Section 4 (e) of the Federal Power Act for the protection and utilization of Reclamation-administered reservations. These conditions are in support of the Klamath Reclamation Project (Reclamation Project) that uses water from the Klamath River, as well as the Lost River, to irrigate over 200,000 acres of agricultural land and provide water to two National Wildlife Refuges located wholly within the Reclamation Project's boundaries. The Reclamation-administered lands include those lands that support the diversion and drainage facilities that allow the Reclamation Project to deliver water to those agricultural lands and Refuge lands, provide for flood control and return waters previously diverted to the Klamath River. These Reclamation-administered lands are within and near the project boundaries of the Klamath Hydroelectric Project that are "reservations" as defined by the Federal Power Act.

Section 4(e) of the Federal Power Act (FPA) gives the Secretary of the Interior (Secretary) authority to impose conditions on licenses issued by the Commission for hydropower projects located on "reservations" under the Secretary's supervision. *See* 16 U.S.C. §§796(2), 797(e); *see also Escondido Mut. Water v. La Jolla Band of Mission Indians*, 466 U.S. 765 (1984). Specifically, Section 4 (e) provides:

> That licenses shall be issued within any reservation only after a finding by the Commission that the license will not interfere or be inconsistent with the purpose for which such reservation was created or acquired, and shall be subject to and contain such conditions as the Secretary of the department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservations.

The Federal Power Act (FPA), 16 U.S.C. § 796(2) defines reservations as follows:

> … "reservations" means national forest, tribal lands embraced within Indian reservations, military reservations, and other lands and interests in lands owned by the United States, and withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws; also lands and interests in the lands acquired and held for any public purposes; but shall not include national monuments or national parks; . . .

The Reclamation Project lands within the Klamath Reclamation Project are located within the existing project boundary of the Klamath Hydroelectric Project (Project No. 2082) are shown on the enclosed map. Keno Dam and both of the power plants at Link River Dam are currently within Project No. 2082 and are within Reclamation supervised lands. PacifiCorp owns Keno Dam and both power plants located at Link River Dam. The United States owns Link River Dam, which is the primary storage and control

feature of the Klamath Reclamation Project. PacifiCorp operates Link River Dam under contract with the United States to the benefit of Project No. 2082. PacifiCorp's operation of Keno Dam, both power plants at Link River Dam and Link River Dam itself affect the operation of the Klamath Reclamation Project. PacifiCorp proposes to exclude Keno Dam and both Link River Dam power plants from its proposed new license. The Department addresses these proposed boundary changes elsewhere in this filing, and has shown that the Commission must keep Keno Dam within the project boundary of any new license.

Thus, because Keno Dam is part of Project No. 2082 and is located on Reclamation supervised lands any license for the continued operation of Project No. 2082 will therefore "be issued within [these] reservation[s]," the license will be subject to conditions that the Secretary of the Interior, acting through Reclamation "shall deem necessary for the adequate protection and utilization of [these] reservation[s]." 16 U.S.C. §797(e).

As explained in greater detail below, Project No. 2082 affects resources within these Reclamation-managed "reservations." These resources include water developed under pre-1909 water rights for Klamath Reclamation Project purposes and the ability to deliver that water to meet the Project's operational needs and legal obligations. Reclamation has developed conditions for the license that are necessary for the adequate protection and continued utilization of these reservations and the resource values for which those reservations are managed. Therefore, the conditions listed below, covering specific requirements for protection and utilization of these federal lands, shall be included in any license issued for the Klamath Hydroelectric Project.

Background

The Klamath Reclamation Project lies within two primary watersheds, the Upper Klamath Basin and the Lost River Basin. Third Annual Report of the Reclamation Service, 1903-04, 58th Congress, 3rd Session, Document No. 28, pp. 202-03. Prior to the development of the Klamath Reclamation Project, the two major watersheds were linked by a flood channel that allowed water from the Klamath River to enter the Lost River and flow to Tule Lake during high run-off conditions.[1] The two watersheds are still linked but in a manner that facilitates the use of water by the Klamath Project for domestic, irrigation, and Refuge beneficial uses,[2] and provides for significant quantities of return flow water to be added to the Klamath River for the generation of power and other uses downstream of Keno Dam. The Lost River is recognized as a tributary to the Klamath River as a result of Project development. Consent to Negotiate Klamath River Compact, Act of August 9, 1955, 69 Stat. 613.[3] The Project is operated so that flows of the Lost River and Klamath River are completely controlled except in some flood periods. Water

[1] Klamath Project History, 1903-1912; p. 111
[2] Klamath Project History, 1903-1912; pp. 1-2
[3] Direct Testimony of Cecil Lesley, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00010015, pp. 12-25, February 23, 2004

is reused several times before it returns to the Klamath River. The Project was designed based on this reuse of water.[4]

Major Project features of the Klamath Reclamation Project include: Link River Dam on Link River at the head of the Klamath River which regulates the flow from Upper Klamath Lake; Lost River Diversion Dam on the Lost River in Oregon that diverts excess water to the Klamath River through the Lost River Diversion Channel; Tule Lake tunnel that conveys return flow water from Tule Lake to the Lower Klamath Lake; Clear Lake Dam and Reservoir located on the Lost River in California; and Gerber Dam and Reservoir located on Miller Creek, a tributary of the Lost River in Oregon; and Malone Diversion Dam on Lost River downstream from Clear Lake Dam.[5] All of the facilities and works described in this section were constructed by the United States and are currently owned by the United States, except where noted otherwise.[6]

In 1902, Congress enacted 1902 Reclamation Act. Act of June 17, 1902, Ch. 1093, 32 Stat. 388. The Klamath Project was authorized under the provisions of this act in May 1905.[7] Preliminary reconnaissance for the Klamath Project area was made by John T. Whistler in October 1903. [8] In his report, Whistler identified some of the features that would later comprise the Klamath Project, including storage of water in Upper Klamath Lake and reclaiming Lower Klamath Lake and Tule Lake. In the following year, Whistler established gaging stations on the major streams in the Klamath Project area. Also in October 1903, H.E. Green conducted a reconnaissance study of the Klamath Project area. His report remarked on many of the same features as Whistler as well as the use of Horsefly Reservoir site and Clear Lake in the Lost River drainage for project storage.[9]

As a result of these reconnaissance studies, it was determined that further investigation was warranted. T.H. Humphreys and J.B. Lippincott conducted a number of surveys of the area to examine the feasibility of lowering or draining certain lakes and to determine whether any of the existing canals in the area could be utilized in the development of a major Reclamation project.[10] It was found that Upper Klamath Lake could be used for irrigation of a large area of land of approximately 300,000 acres lying almost equally in Oregon and California.[11]

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[4] Direct Testimony of Cecil Lesley, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00010015, p. 13, February 23, 2004
[5] Direct Testimony of Cecil Lesley, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00010015, pp. 12-25, February 23, 2004; Klamath Project Map.
[6] Direct Testimony of Cecil Lesley, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00010015, pp. 9, 62-64, February 23, 2004
[7] Letter from E.A. Hitchcock, Secretary of the Interior, to Director of Geological Survey, Dated May 15, 1905 (pp. 00009-00011)
[8] Klamath Project History, 1903-1912; p. 5
[9] Klamath Project History, 1903-1912; p. 6
[10] Klamath Project History, 1903-1912; p. 8
[11] House Report no. 3764,January 20, 1905

Shortly thereafter, in January and February 1905, the States of Oregon and California, respectively, passed legislation ceding to the United States, to aid in the operations of irrigation and Reclamation, title to lands that would be uncovered by draining certain lakes in the Project area.[12] Under the Oregon Act, the United States was given control of Upper Klamath Lake for storage of water in aid of reclamation. Congress then authorized the Secretary of the Interior to control the levels of the various lakes and dispose of any land uncovered in the process of reclamation under the terms of the federal Reclamation Act. Act of February 9, 1905, 33 Stat. 714.

Based on the recommendations of the Board of Consulting Engineers, the Secretary formally authorized the Klamath Project on May 15, 1905.[13] The Klamath Project was authorized by the Secretary on May 15, 1905, in accordance with the Reclamation Act of 1902 (43 U.S.C. section 372 et seq, Act of June 17, 1902, 32 Stat. 388).[14] The 1902 Reclamation Act authorized the Secretary of the Interior to examine, survey, locate, and construct irrigation works for the storage, diversion, and development of waters. 1902 Reclamation Act, section 2. The projects to be authorized would be built on federal land with the actual construction and operation in the hands of the Secretary. California v. United States, 438 U.S. 645, 664, 98 S. Ct. 2985, 2995, 57 L.Ed.2d 1018 (1978).

Pursuant to this authorization and that the Secretary's determination that Reclamation Projects would benefit the basin, in 1905 Reclamation filed claims to cover all of the water not previously claimed on the upper Klamath River.[15] At that time Reclamation initiated a program of acquisition of senior water rights claims and previously developed irrigation projects. Reclamation developed plans and, with the support of the Secretary of the Interior, began development of the Klamath Reclamation Project. To facilitate the appropriation of water for the Klamath Reclamation Project, in 1905 the Oregon legislature enacted that a statute that authorized the Secretary to appropriate all unappropriated water for reclamation projects under the term so the act. Act of February 22, 1905, Ch. 5, title 43, L. O. L., Section 2 (section 6588, L. O. L.) See Ex. 10008, Fourth Annual Report of the Reclamation Service, 1906, pp.306-308. That Act states in pertinent part:

> Whenever the proper officers of the United States, authorized by law to construct works for the utilization of water within this State, shall file in the office of the State Engineer a written notice that the United States intends to utilize certain specified waters, the waters described in such notice and unappropriated at the time of the filing thereof shall not be subject to further appropriation under the laws of this State, but shall be deemed to have been appropriated by the United States.

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[12] Klamath Project History, 1903-1912; p. 22

[13] Letter from E.A. Hitchcock, Secretary of the Interior, to Director of Geological Survey, Dated May 15, 1905 (pp. 00009-00011)

[14] As a formality, the Klamath Project authorization was approved by the President on January 5, 1911, in accordance with the Act of June 25, 1910, 36 Stat. 835.

[15] Filings by T. H. Humpherys with the Oregon State Engineer, Dated May 17, 1905

The Oregon Supreme Court affirmed the right of the United States to so appropriate waters in the state in developing reclamation projects under the national Reclamation program. In Re Umatilla River, 88 Ore. 376, 168 P. 922 (1917). The United States followed the procedure under the 1905 Oregon Act and became vested with title to all of the then un-appropriated water of the Klamath River with a priority dating from the date of the notice filed in accordance with the Act.

The irrigable area of the lower project was to be 188,045 acres based on preliminary surveys in the Klamath and lower Poe Valleys. The lower project would also include about 15,000 acres of land that would be served by pumping water. Third Annual Report of the Reclamation Service, 1903-04, 58th Congress, 3rd Session, Document No. 28, pp. 204-05; Fourth Annual Report of the Reclamation Service, 1904-05, 59th Congress, 1st session, Document No. 86, p. 82. These lands extend from the upper end of the Klamath Valley, at Klamath Falls, to Keno, Oregon, and include lands on either side of the Klamath River.[16] Also included are lands within Lower Klamath and Tule Lake that extend into California. The water supply for these lower lands is Upper Klamath Lake.

The water supply for the lower project was projected to be diverted from Upper Klamath Lake at the head of the Link River with a main canal being carried down either side of the valley. Various branches from the main canal would carry water to the lands in the lower project, including those in Tule Lake. Third Annual Report of the Reclamation Service, 1903-04, 58th Congress, 3rd Session, Document No. 28, pp. 207-08, and the accompanying map showing the proposed canal system.[17] Other than relatively minor adjustments, the development of the Klamath Project occurred in accordance with this original design and intent.[18] In general, for private lands using water for irrigation or domestic uses, the United States entered into perpetual contracts with landowners, districts or companies, or both landowners and districts, which provide for delivery of water through Klamath Project and related facilities.[19]

The United States also acquired the Keno Canal belonging to the Moore Brothers.[20] The United States purchased two small canals constructed to divert water from the west side of Link River for power and irrigation purposes.[21] The purchase of these facilities and associated riparian and vested rights was in consideration of 205 cfs to be retained by the Moore Brothers and delivered from the Keno Canal. This 205 cfs right is now owned by PacifiCorp for power generation on Link River.

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[16] Klamath Project History, 1903-1912; p. 22
[17] General Map of Proposed Klamath Project, 1905
[18] Direct Testimony of Cecil Lesley, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00010015, p. 32, February 23, 2004
[19] Contracts with Water users and Districts, pp. 00443-003137
[20] Direct Testimony of Stephen R. Wee, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00040049, pp. 26-28, and Direct Testimony of Rand F. Herbert, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00040048, pp. 20-21
[21] Klamath Project History, 1903-1912; p. 31; Direct Testimony of Stephen R. Wee, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00040049, pp. 10-13

Reclamation saw the benefit that could accrue to the project with the addition of hydroelectric power, and a number of filings were made to claim the right to produce power[22] in addition to the use of the water for irrigation purposes, with the waters of the Klamath River. Before Reclamation could exercise its claim for power, Copco, now PacifiCorp, proposed to develop hydroelectric power in the canyon below Keno, Oregon. For certain considerations, Reclamation relinquished its claim on the falling water, and allowed Copco to develop the now existent power infrastructure in the Klamath Basin.

To benefit both parties, Copco proposed development of Link River Dam as a feature of the Klamath Reclamation Project. Reclamation agreed to the project, and in 1917 the parties entered into a contract for Copco to build the dam and transfer it to Reclamation. In addition to transfer of the dam, Copco was to provide electric power to Reclamation and its Project water users at a fixed rate for the term of the contract.[23] This agreement benefited both parties in providing additional firm water supply for irrigation purposes with electric power for drainage pumping, and additional water at all times for power generation, both at Link River and at the Copco 1 and 2 facilities, with a firm electric customer base to pay for development of necessary infrastructure.[24] In 1919, a temporary dam was constructed on Link River at the outlet of Upper Klamath Lake by Copco. In 1920, Copco initially began construction of the permanent Link River Dam at the outlet of Upper Klamath Lake. In 1921, Link River Dam was completed.[25]

In 1951, Copco proposed development of additional facilities downstream of Keno (Big Bend No. 2, the original Project No. 2082). Reclamation through the Department of the Interior intervened in the Federal Power Commission proceedings with the current 1956 contract between PacifiCorp and Reclamation the outcome of the settlement between the parties.[26] This contract allows PacifiCorp to continue operation and maintenance of Link River Dam, and provides for power rates for Reclamation and its water users at rates similar to those in the 1917 contract.[27] The development proposed in the Big Bend No. 2 project would provide additional power for the customers in the Klamath Basin.[28] This contract had to be ratified by both the Oregon and California Public Utility Commissions to become effective.[29] The current contract, if not extended, expires April 16, 2006. The Klamath River Compact confirmed the rights of the Klamath Reclamation Project to use the water of the Klamath River, while encouraging power production and other uses of those resources. Additionally, it provided that the power produced from these resources should provide the "lowest power rates which may be reasonable for irrigation and

[22] Filings by J. B. Lippincott with the Oregon State Engineer, Filed January 5, 1905 (p. 000003)
[23] Bureau of Reclamation Contract No. I1r-406, Dated February 24, 1917
[24] Letter from Herbert D. Newell to Klamath Chamber of Commerce, Dated November 16, 1920; Evening Herald Article, Dated January 9, 1919; Copco letter to Chamber of Commerce, Dated November 15, 1920.
[25] Klamath Project History, 1921; p. 42
[26] Letter from Secretary of Interior, Oscar L. Chapman, Dated October 10, 1951; Copco letter October 26, 1951.
[27] Bureau of Reclamation Contract No. 14-06-200-5075, Dated January 31, 1956
[28] Copco letter May 18, 1953.
[29]Protest of Klamath Irrigation District to Hydroelectric commission.

drainage pumping, including pumping from wells," for those power users in the Klamath Reclamation Project.[30]

Unlike most Reclamation Projects, the Klamath Project is essentially a drainage project, not a large water storage project. Lands were developed for irrigation by draining Lower Klamath Lake and Tulelake.[31] To accommodate this, Reclamation developed Clearlake and the Lost River Diversion Channel to reduce flows to Tulelake to allow evaporation of the lake and development of the lakebed as irrigated agricultural lands.

In 1910, Clear Lake Dam was completed. Also in 1910, contracts were let for construction of Lost River Diversion Channel and Lost River Diversion Dam (also known as Horseshoe Dam and Wilson Dam).[32]

In 1911, construction began on the Lost River Diversion Channel and Lost River Diversion Dam. In 1912, the Lost River Diversion Dam and the Lost River Diversion Channel were completed.[33] The Lost River Dam was constructed upstream of Tule Lake to divert Lost River water to the Klamath River and prevent as much water as possible from entering the Lake.[34] The Lost River Diversion Channel was constructed along the same course as the Lost River Slough to control the flows of the Klamath River into Tule Lake and the flow of Lost River into either Tule Lake or the Klamath River.[35] Also in 1912, the Klamath Straits between Klamath River and the Lower Klamath area was closed.[36] In 1914, gates were installed in the Klamath Straits at Ady.[37]

In 1938, a report was released by Reclamation on the development of the Modoc Unit, identifying facilities affecting Tule Lake Sump and lands within the Tule Lake and Lower Klamath National Wildlife Refuges.[38] The plan identified, among other things, construction of a pump (Pumping Plant D) on the west side of the sump and a tunnel (Tule Lake tunnel) through Sheepy Ridge, with water pumped from the Sump through the tunnel to P-Canal and the Lower Klamath area. These facilities would provide improved flood control at the Sump and assist in maintenance of water levels in the Sump. In addition, the pumped water would provide a source to users on the P-Canal, ameliorate dust problems that existed on areas of the current Lower Klamath Refuge, and provide waterfowl benefits on that area. The Modoc Unit, which later came to be included in the Tule Lake Division, was then undertaken. Id.

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[30]Letter from Secretary of Interior Douglas McKay to Klamath River compact commission, dated October 26, 1953; Letter from Klamath River Compact Commission to Secretary of the Interior, Dated December 17, 1954.
[31] Cessions Act, 33 Stat. 174, Dated February 9, 1905
[32]Klamath Project History, 1903-1912.
[33] Klamath Project History, 1903-1912, p.172.
[34] Direct Testimony of Dr. Timothy D. Mayer, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00015001, p. 19
[35]Klamath Project History, 1903-1912, p. 97.
[36] Klamath Project History, 1903-1912; p. 166
[37] Klamath Project History, 1914; p. 3
[38]Supplemental Estimates-Department of the Interior, 76 Congr., 3d Sess., Document No. 169, March 21, 1940.

In 1940, construction was begun on Pumping Plant D and the Tule Lake tunnel. Also, in 1940, Reclamation and the Service (Biological Survey at the time) entered an agreement concerning the Modoc Unit and management of the Refuges.[39]

In 1942, Reclamation and the Service entered an agreement concerning wildlife operations within the Klamath Project pursuant to the Modoc Unit development.[40] In 1940 and 1943, the Secretary, on behalf of the Service, and Klamath Drainage District (KDD) entered agreements for, among other things, enlargement of the Ady Canal and service by KDD to California Lower Klamath lands within the Refuge.[41] In 1941, Tule Lake tunnel was completed. Also, the P-Canal was completed.[42] In 1942, Pumping Plant D was completed and placed into operation.[43]

Clearlake was developed as an evaporation sump to reduce annual flows in the Lost River to Tulelake, and the Lost River Diversion Channel was developed to divert flood flows and excess irrigation flood flows from the Lost River to the Klamath River to reduce flooding in Tulelake.[44]

The construction of the Straits Drain allowed development in the Lower Klamath Lake area. When the railroad laid their track into Klamath Falls, they had to build a berm over the marsh lands between Lower Klamath Lake and the Klamath River.[45] To allow water to exit the area, the Klamath Straits was developed into a drain with two pumping stations to lift the water from the lower portions of Lower Klamath Lake to the level of the Klamath River as it flows through Lake Euwana. The Straits Drain delivers accumulated agricultural drainage and flood waters to the Klamath River, allowing irrigated agriculture in the Lower Klamath Lake area, as well as maintaining operational levels in the Lower Klamath Lake National Wildlife Refuge.

Another feature provides additional water to the Klamath River from the Project. The D Pumping Plant pumps the water accumulated in the Tulelake sumps through Sheepy Ridge to the P Canal system where it is carried to and through the Lower Klamath National Wildlife Refuge to the Straits Drain, and eventually back to the Klamath River. The water that accumulates in the sumps is the side flow from the Lost River basin below the Lost River Diversion Dam in the winter, and drainage return flows from the Klamath Reclamation Project in the irrigation season.

These drainage features developed by the Klamath Reclamation Project have increased the water available to the Hydroelectric Project by a substantial quantity. Coupled with the additional storage provided by Link River, Gerber and Clearlake dams, control and

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[39] Agreement between Bureau of Reclamation and Bureau of Biological Survey, dated January 14, 1940
[40] Agreement between Bureau of Reclamation and Fish and Wildlife Service, dated January 8, 1942
[41] Contracts between Bureau of Reclamation and Klamath Drainage District, dated May 25, 1940 and April 28, 1943
[42] Direct Testimony of Cecil Lesley, Klamath Water Rights Adjudication, EXHIBIT NO. 003E00010015, p. 53-62, February 23, 2004
[43] Klamath Project History, 1942; pp. 15-16
[44] Letter from D. C. Henry to Oregon State Engineer, Dated May 1, 1908
[45] Agreement between United States and railroads, dated October 24, 1907

firm water supply are provided to the Hydroelectric Project that would not be available without the Reclamation Project.

Integral to the operation of Project facilities and the delivery of water to Project lands is the use of return flows.[46] Both the Klamath Irrigation District (KID) and Tulelake Irrigation District (TID) systems rely on these return flows in their operation and delivery of water.[47] Most of the water that is in Tule Lake during the irrigation season is return flow (estimated as over 90%).[48] In addition, to ensure that this water remains available to all lands within the Project, the United States retains control of this return flow through contract.[49]

Water from the Klamath River in the reach between Link River and Keno Dam is diverted for direct use on the irrigated lands.[50] These diversions include Modoc Lumber Co, Pioneer District Improvement Company, Ady District Improvement Company, Reames Golf & Country Club, Inc., Don Johnson & Son, Plevna District Improvement Company, Collins Products, LLC, and other Project water users.

Klamath River Basin Compact

The Klamath River Basin Compact (Compact) was negotiated and entered into between the states of California and Oregon and consented to by an act of Congress. Negotiation of the Compact between states of Oregon and California was granted by Congress by the Act of August 9, 1955, 69 Stat. 613. Congress consented to the Compact itself by the Act of August 30, 1957, Public Law 85-222, 71 Stat. 497. The consent of congress to negotiate the Compact was given as follows:

> The consent of the Congress is hereby given to the States of Oregon and California to negotiate and enter into a compact, providing for an equitable apportionment between the said States of the waters of the Klamath River and its tributaries, including Lost River which is not naturally tributary to the Klamath River but which is an interstate stream. within the Klamath Basin constructed by the Bureau of Reclamation, United States Department of the Interior, and for matters incidental thereto, upon the condition that one qualified person, not a resident of either Oregon or California, who shall be appointed by the President of the Unites States, and shall participate in said negotiations as a representative of the United States and shall make a report to the President and the Congress of the proceedings and of any compact so negotiated. Said compact shall not be binding or obligatory upon any of the parties thereto unless and until the same shall have been ratified by the legislature of each of the States aforesaid and consented to by the Congress of the United States.

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[46] Oregon PUC, UE-170, TP pp.163-199 (cross examination of Cecil Lesley, April 7th, A.M.)
[47] Oregon PUC, UE-170, TP 2047, 2061-2062 (Danosky April 20th P.M.), 2531-2533 (cross examination of David Solem, April 22 A.M.).
[48] Oregon PUC, UE-170, TP, pp.1690-1691, 1710 (cross examination of Dr. Timothy D. Mayer, April 19th, A.M.)
[49] Oregon PUC, UE-170, TP pp.190, 199 (cross examination of Cecil Lesley, April 7th, A.M.)
[50] Points of Diversion Tables.

Act of August 9, 1955, ch. 676, 69 Stat. 613.[51]

As provided in Article III A, the Compact recognizes and protects the water rights of the entire Klamath Project. Article III A states in full as follows:

> There are hereby recognized vested rights to the use of waters originating in the Upper Klamath River Basin validly established and subsisting as of the effective date of this Compact under the laws of the State in which the use or diversion is made, including rights to the use of waters for domestic and irrigation uses within the Klamath Project. There are also hereby recognized rights to the use of all waters reasonably required for domestic and irrigation uses which may hereafter be made within the Klamath Project.

Klamath River Basin Compact, Article III, A, Pub. L. 85-222, 71 Stat. 497, Section 1 (1957).

The area covered by the Compact includes the "Upper Klamath River Basin" which includes the drainage area of the Klamath River as well as the closed basin of the Lost River Valley. Compact Article II B. The Compact also recognizes that water diverted for use within the Project is derived from sources within both Oregon and California and that waters originating in both states are used to irrigate lands in both states. Compact Article III. The Compact also defines the Klamath Project consistent with the place of use claimed by the United States in Claim nos. 293-299 and 312 and 317. Compact Article II D. The Compact is binding on Oregon and California by virtue of their ratification of the Compact and the consent of the Compact by the Congress. El Paso County Water Improvement District No. 1 v. City of El Paso, 133 F.Supp. 894, 907 (1955) (citing Hinderlider v. La Plata River & Cherry Creek Ditch Co., 304 U.S. 92, 58 S.Ct. 803, 82 L.Ed. 1202 (1937)).[52] A compact is a contract that must be construed and applied in accordance with its terms.[53] West Virginia ex rel. Dyer v. Sims, 341 U.S. 22, 28 (1958).

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[51] The Compact was approved by the Klamath River Commissions of the States of Oregon and California on November 17, 1956, at Klamath Falls, Oregon and ratified by the state of Oregon by chapter 142, section 1 (ORS 542.610), 1957 and by the state of California by ch. 113, 1957.

[52] Once congressional consent is given, a compact is transferred into a law of the United States and the courts have no power to alter the apportionment chosen by Congress. Texas v. New Mexico, 462 U.S. 554, 564 (1983); Compact Clause of the Constitution, Art. III $ 2 cl.2. The bearing of the Compact on any water rights considered by the Compact is a federal question. See City of El Paso, supra at 910.

[53] The Compact in Article XII - General Provisions provides that:

> Nothing in this Compact shall be construed to limit or prevent either State from instituting or maintaining any action or proceeding, legal or equitable, in any court of competent jurisdiction for the protection of any right under this Compact or the enforcement of any of its provisions.

Article IV of the Klamath River Basin Compact (Compact) directs Oregon (and California) to "provide for the … lowest power rates which may be reasonable for irrigation and drainage pumping, including pumping from wells" from the use of water from the Klamath River Basin. Act of August 30, 1957, Pub. Law 85-222, 71 Stat. 497; ORS 542.620, Article IV- Hydroelectric Power. This directive sets apart the Klamath Basin irrigators from other irrigators in the Klamath Basin or elsewhere in PacifiCorp's service area.

Article IV provides in full as follows:

> It shall be the objective of each State, in the formulation and the execution and the granting of authority for the formulation and execution of plans for the distribution and use of the water of the Klamath River Basin, to provide for the most efficient use of the available power head and its economic integration with the distribution of water for other beneficial uses in order to secure the most economical distribution and use of water and the lowest power rates which may be reasonable for irrigation and drainage pumping, including pumping from wells.

In reviewing Article IV of the Compact, it is clear that the Compact identifies that power is to be made available for irrigation and drainage pumping at the cost of that service to the Klamath Project. The Compact speaks directly to the use of Klamath River water for the generation of power to provide the "lowest power rates which may be reasonable" through the use of the "available power head" from the waters of Klamath River.

This issue of the appropriate use of water in the Klamath Basin for the generation of power was discussed in 1954 by the Klamath Compact Commission in formulating the Compact. The Compact Commission viewed the use of water for irrigation and for power to be part of a comprehensive plan for development in the basin.[54] The Compact Commission noted that the decision regarding the development of hydroelectric power on the Klamath River between Keno and Copco Lake was a key consideration in formulating the Compact. Id. The Compact Commission requested the Secretary of the Interior to withhold approval of any contract with the power company until it could be "formulated as an integral part of the draft of an interstate compact." Id.

The Bureau of Reclamation began the development of the Klamath Reclamation Project in 1905, at which time it made filings to secure all of the unappropriated water in the Upper Klamath River Basin for use within the Project for irrigation, power and other uses.[55] Reclamation was also given control of Upper Klamath Lake by the State of Oregon for use in developing the reclamation project. Id.; General Laws of Oregon, January 20, 1905. PacifiCorp's predecessor, Copco, required the use of this water, including the water stored in Upper Klamath Lake, for its power development

[54] Letter from Klamath River Compact Commission to Secretary of the Interior, December 17, 1954.
[55] Notice, May 17, 1905; Water Right Filing, January 5, 1905; Letter from Herbert Newell to Klamath County Chamber of Commer, November 16, 1920.

projects.[56, 57] It is this integration of the use of water for power and irrigation that was critical in the formation of Article IV of the Compact. This integration was critical because the development of power in the Basin was dependent on the established irrigation practices in the Upper Klamath Basin, including those within the Klamath Reclamation Project.

Water from the Upper Klamath River Basin, including the Klamath Reclamation Project, is necessary for PacifiCorp's power development downstream and the use of low rate power is necessary to the irrigation and drainage of those lands that use the irrigation water that provides the benefits to PacifiCorp's power development.[58] The language of the Compact provides a reasonable basis for establishing Klamath Project cost based power rates for irrigation and pumping associated with the Klamath Reclamation Project.

Reclamation's Management Direction for "reserved" lands

Reclamation manages its federal lands in accordance with a variety of statutory mandates which include but are not limited to: the Reclamation Act; Endangered Species Act; Fish and Wildlife Coordination Act; National Environmental Policy Act; Flood Control Act; Federal Land Policy and Management Act; National Historic Preservation Act; Native American Graves Protection and Repatriation Act; Federal Water Project Recreation Act; and the Minerals Management Act. A more comprehensive list of statutory control of Reclamation land can be found in the attached policy documents.

Reclamation implements its statutory mandates through a variety of planning and policy guidance documents, including but not limited to: Floodplain Management Policy, Hazardous Waste and Materials Management Policy, Pest Management Policy, National Environmental Policy Act Policy, Reclamation Consultation Under the Endangered Species Act Policy, Emergency Management Policy, Decisions Related to Dam Safety Issues Policy, Hydroelectric Power Policy, Cultural Resources Management Policy, Wetlands Mitigation and Enhancement Policy, Recreation Management Policy,

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[56] Letter from Copco to Klamath County Chamber of Commerce, November 15, 1920; Opinion and Order, Public Utilities Commission of the State of California, March 27, 1956; See Supplemental Opinion and Order Amending Order Issuing License, In the Matter of the California Oregon Power Company, Project No. 2082, 15 FPC 14, February 28, 1956.

[57] In the Federal Power Act license proceeding for PacifiCorp's hydroelectric project, the Federal Power Commission (now FERC) also found that the construction and operation of Project No. 2082 was not economically feasible without the use of the water stored behind Link Dam and the regulation of the dam as provided in the Link Dam agreement (1956 contract). The Commission confirmed these findings in a later order stating that "[t]he evidence in this case shows that the Big Bend development [now J.C. Boyle] and all of the existing and proposed developments rely for their operations on water releases from Link River Dam, a Government dam located upstream from all the developments. Such water releases are made pursuant to an agreement between the United States and Copco for a fifty-year term terminating in the year 2006 which corresponds with the term of the license for Project No. 2082." Order Adopting Initial Decision of Presiding Examiner, The California Oregon Power Company, Project No. 2082, 23 FPC 59, 4-5 (January 13, 1960).

[58] See 23 FPC 59 (presiding examiners decision for Project No. 2082, January 13, 1960); Letter from Copco to Reclamation, May 18, 1953; Letter from Copco to Klamath County Chamber of Commerce, November 15, 1920; Federal Power Commission, Decision of Presiding Examiner, Project No. 2082, October 2, 1953, p.14-17.

Occupational Safety and Health Program Policy, and Use of Excess Capacity in Reclamation Projects for the Impoundment, Storage and Carriage of Non-Project Water Policy. A comprehensive list of Reclamation Policies as well as Directives and Standards for implementation of those policies can be found at: HTTP://www.usbr.gov/recman/.

Reclamation's Preliminary 4(e) Conditions:

1. The Licensee shall enter into new or amended contract with Reclamation for the operation and maintenance of Link River and Keno Dams under terms and conditions satisfactory to the Secretary of the Interior. Such terms shall be substantially similar to the terms of the current contract and shall specifically include the following terms necessary for the protection of Klamath Reclamation Project operations:

   A. The Licensee shall continue to operate and maintain Link River Dam. Such operation shall be consistent with the Klamath Reclamation Project Annual Project Operations Plans.

Justification:

PacifiCorp has operated and maintained Link River Dam under contract with the United States since 1917. During that time, the operation and management of Link River Dam has been critical to PacifiCorp's power generation for Project No. 2082. According to Reclamation's calculations this has not changed. Project No. 2082 continues to rely and will continue to rely during any new license period on the use and control of storage in Upper Klamath Lake. Such storage is vital to the purposes of the Klamath Reclamation Project as well as to Project No. 2082. Since PacifiCorp has in place the necessary infrastructure and expertise to continue to operate and maintain Link River Dam and because such operation is essential to its power generation, PacifiCorp shall continue to operate and maintain Link River Dam under contract with the United States during any new license period.

Additionally, because Reclamation is mandated to meets its obligations under the Endangered Species Act and Tribal Trust, in addition to delivering Klamath Project water under contract, PacifiCorp shall operate Link River Dam consistent with the Klamath Project Annual Operations Plans. This is necessary to allow Reclamation to adequately protect its resources as required by the statutes and policies listed above, and fulfill its responsibilities under the ESA and within its contractual obligations. Reclamation must work closely with PacifiCorp to manage Link River Dam in conjunction with the facilities in Project 2082. This is necessary to provide an appropriate water level in Upper Klamath Lake to protect the endangered suckers, and allow for full water deliveries at A Canal; control necessary to maintain Lake Ewauna at an elevation appropriate to provide the necessary head to make deliveries in the Lost River Diversion Channel and North

and Ady Canals; and to provide the required flows at Iron Gate Dam to meet Reclamation's responsibilities under its Biological Opinion from NOAA Fisheries.

B. For the period of the contract the Licensee would agree to furnish electric power for the purposes of pumping Klamath Water for use on Project Land and for drainage of Project Land at rates no higher than the cost of service from Project 2082.

Justification:

It is also necessary for the adequate protection and utilization of the Klamath Reclamation Project to maintain Klamath Project cost-based rates in the basin to provide pumping of return water from the irrigation project to the Klamath River for downstream uses and power generation by PacifiCorp. These cost-based rates allow Reclamation to return a substantial quantity of water to the Klamath River for use by PacifiCorp for power production below Keno (see attached spreadsheets on Reclamation return flows from Lost River Diversion Channel, D Plant, and Pumping Plants F and FF). Reclamation provides an average of over 200,000 acre-feet annually in returns to the Klamath River from Project facilities.

The Reclamation Project provides a positive effect for the Hydroelectric Project. Storage in Reclamation facilities allow for increased flows in the river during the late summer months when there would otherwise be limited ability to produce electricity (the river sometimes went dry below the current Link River Dam before the project.) Klamath Reclamation Project storage also provides flood control which reduces power outages due to high flow conditions in the winter months. Both of these periods of positive effect from storage are prime periods for power sales, due to high demand in the winter for heating and in the summer for air conditioning.

At least as important is the increased water availability from the Reclamation Project Drainage facilities. The Lost River Diversion Channel provides an average of 165,200 acre-feet annually to the Klamath River to augment power production, the Straits Drain provides an average of 106,630 acre-feet annually. An average annual increase of water available to the Hydroelectric Project of over 270,000 acre-feet, almost 23 percent of the flow that passes Keno; See attached Tables 1, 2, and 3 (KSD @ Pump F and FF; D Plant; Total Flow-Lost River Diversion Channel).

The additional water made available from the Reclamation Project, especially from the Straits Drain, depends on pumping to provide the ultimate benefit to the Hydroelectric Project. The pumps that develop this benefit are those large federally owned pumping plants that ultimately push the accumulated water from the sumps through the Straits Drain to the Klamath River, drainage pumps that are federally owned and operated by irrigation districts under contract, drainage

pumps that area owned and operated by irrigation districts, and drainage pumps owned and operated by individual irrigators. Without this integrated system, there would be a substantial reduction in water available for power production.

C. The Licensee shall, at its own expense, maintain the approach channel to the "A" Canal of the Klamath Reclamation Project to the satisfaction of Reclamation so far an may be necessary to carry a flow of not less than 1200 cfs into the "A" Canal with the water of Upper Klamath Lake at an elevation of 4137 (USBR datum).

Justification:

As part of PacifiCorp's operation and maintenance of Link River Dam as described in 1. A. above, PacifiCorp must ensure that the primary diversion facility for the Klamath Reclamation Project is not affected by PacifiCorp's operation for power generation. The intake for the 'A" Canal is just upstream from Link River Dam and the operations of Link River Dam can affect diversions to the "A" Canal if not properly monitored and maintained. Any adverse affect to the "A" Canal approach channel will likewise adversely affect the ability of Reclamation to deliver water to the lands within the Reclamation Project.

D. The Licensee shall assume any and all liability for damages resulting from operation of the Link River Dam by the Licensee or resulting from its regulation and control of the water levels of Upper Klamath Lake. The Licensee would undertake to hold the United States harmless from any and all liability for damage arising out of the operation by the Licensee of Link River Dam and the regulation and control by the Licensee of Upper Klamath Lake provided for in the contract.

Justification:

PacifiCorp would be operating and maintaining Link River Dam primarily for the benefit of power generation so should assume all liability related to that operation.

E. Nothing in the contract shall curtail or in anywise be construed as curtailing the rights of the United States to Klamath Water or to the lands along or under the margin of Upper Klamath Lake. No Klamath water shall be used by PacifiCorp when it may be needed or required by the United States or any irrigation or drainage district, person, or association obtaining water from the United States for use for domestic, municipal, and irrigation purposes on Project Land.

Justification:

Reclamation holds water rights for the Klamath Reclamation Project that are senior to the water rights for PacifiCorp's Project No. 2082 except for a 205 cfs

water right of PacifiCorp's for power generation from Link River. Further, as explained above, Reclamation has by statute the right to store water in Upper Klamath Lake for Reclamation Project purposes and any operation by PacifiCorp shall not interfere with that right to the extent that right is exercised for the benefit of the Klamath Project.

F. PacifiCorp shall operate Keno Dam so that the upstream water level will not be below the minimum normal objective operating height of elevation 4085.0 (USBR Datum), at or near the location of the present Highway No. 66 bridge at Keno, Oregon.

Justification:

This specific control is necessary to maintain Lake Ewauna at an elevation appropriate to provide the necessary head to make deliveries in the Lost River Diversion Channel and North and Ady Canals which are essential to the proper operation of the Klamath Project for both agricultural lands and lands within the National Wildlife Refuges.

G. PacifiCorp shall operate Keno Dam to accommodate the discharge of three thousand (3,000) cubic feet per second from the Lost River Diversion Channel, and six hundred (600) cubic feet per second from the Klamath Straits Drain.

Justification:

This requirement is to facilitate the flood control operation of the Klamath Project which is essential to the proper operation and management of the Project to meets its obligations.

2. The Licensee, in consultation with Reclamation, shall develop operating criteria that provides for coordination with the operations of Link River Dam and Iron Gate Dam, or the most downstream dam within Project No. 2082 to allow Reclamation to meet its responsibilities.

Justification:

Reclamation's responsibilities under the ESA as well as its responsibilities for Tribal Trust require that measured flows be provided into the Lower Klamath River (currently below Iron Gate), while specific water levels are maintained in Upper Klamath Lake. To adequately protect its resources, Reclamation must work in coordination with PacifiCorp to meet these requirements on a sustained basis. Coordinated operations should also minimize and mitigate impacts to salmonids and suckers from low flows and flow fluctuations caused by Project operations at Eastside and Westside facilities. Without coordinated operations, flow variations could have a deleterious effect on threatened species, or other resources valuable to downstream and upstream tribes. Ramping rates and flow

variations that are currently under the control of PacifiCorp could cause stranding, or crowding of fish that could lead to disease, or death if these facilities are not operated in a coordinated manner to fulfill the responsibilities and needs of all parties. Further, if these operations are not coordinated for the purposes stated above, the operations of the Klamath Reclamation Project would be adversely affected. This could result in curtailment of irrigation deliveries or deliveries of water to the National Wildlife Refuges. This is so, because operational adjustments that Reclamation must make in Klamath Reclamation Project operations independent of PacifiCorp operations to meet ESA or tribal trust resource obligations that it would not otherwise have to make if the Reclamation Project operations were properly coordinated with the Project's operations could result in additional water releases to the Klamath River or water remaining in Upper Klamath Lake that otherwise would be diverted for Reclamation Project purposes.

3. The Licensee, in consultation with Reclamation, shall develop operating criteria that provides for coordination with the operations of Keno Dam and Iron Gate Dam, or the most downstream dam within Project No. 2082, as in Attachment 2.

Justification:

In addition to the justification in 2 above, management of operations at Keno is critical to delivery of water to Project lands along Link River to Keno reach, in the Lower Klamath Lake area and to the Lower Klamath Lake Wildlife Refuge. Approximately 41 percent of the lands irrigated by the Klamath Irrigation Project and the Lower Klamath Lake National Wildlife Refuge receive their water directly or indirectly by gravity flow from the Link River to Keno reach. Coordination of these operations to meet the criteria listed in the attachment are necessary to meet minimum elevations for charging North and Ady Canals to meet demands throughout the year, as these facilities are operated year round. In addition, coordinated operations should minimize impacts to salmonids and suckers from low flows and fluctuations by Project operations at Keno Dam.

4. The Licensee shall provide Reclamation with area capacity curves for all facilities within Project No. 2082, and will provide Reclamation with real time access to reservoir elevations and releases for facilities within Project No. 2082.

Justification:

This information is necessary to allow Reclamation to adequately protect and utilize its facilities in light of the FERC-licensed operations of PacifiCorp's Project No. 2082. Without the area capacity curves and real time operational data, Reclamation would have no usable information to plan for releases from the Lost River Diversion or from the Straits Drain to coordinate efforts and manage the limited resources of the basin in the best manner possible. It is impossible at this time to determine the source of water that PacifiCorp uses to refill its facilities when it has made deliveries downstream that may be required under re-licensing or reduced storage for maintenance of facilities requiring refill. With

this information, Reclamation will be able to determine if the water used for refill and generation is indeed PacifiCorp's water or Reclamation's Project water.

5. Any operations or modifications to Project No. 2082 that could affect the federal Klamath Reclamation Project are prohibited unless approved by Reclamation.

Justification:

Changes in operations or modifications to Project No. 2082 could impact Reclamations ability to meet its contractual responsibilities within the Reclamation Project, as well as its ESA and Tribal Trust responsibilities downstream.

6. The licensee shall have no claim against the United States arising from the effect of any changes in releases from, operations of, or elevation changes in Upper Klamath Lake or Lake Ewauna related to the federal Klamath Project operations or use of water for the Upper Klamath, Lower Klamath or Tule Lake National Wildlife Refuges.

Justification:

PacifiCorp's Project No. 2082 has limited water rights, and is a subsequent user of surplus water from the Klamath Reclamation Project. Reclamation has no responsibility for delivery of water to Project No. 2082 beyond those limited water rights that are senior to Reclamation's water rights. Any operation of the Klamath Project is senior to operations of Project No. 2082, and has precedence over its operations.

7. Authority is reserved to the Commission to require the Licensee to implement such conditions for the protection and utilization of Reclamation reservations as may be provided by the Secretary of the Interior, pursuant to Section 4(e) of the Federal Power Act, 16 U.S.C. § 797(e).

Justification:

This general reservation of authority allows the Secretary to consider additional data as it becomes available, to respond to changed circumstances, and modify the existing section 4(e) conditions as may be necessary. The Secretary's reservation of mandatory authorities under the FPA has been accepted by the Commission and judicially affirmed. *Wisconsin Public Services Corp.*, 62 FERC ¶ 61,905 (1993), *aff'd*, *Wisconsin Public Serv. Corp. v. FERC*, 32 F.3d 1165 (7th Cir. 1994).

The Klamath Tribes of Oregon hold treaty-protected property rights, including fishing and water rights, in the upper Klamath Basin. The United States and the Klamath Tribes have jointly filed claims in the State of Oregon's water rights adjudication for the surface waters of the Klamath Basin in Oregon, including instream flow claims within the Project area (from Link River Dam to the Oregon-California border), to protect the Tribes' fishing and water rights reserved

to them pursuant to their 1864 Treaty with the United States. In addition, the Hoopa Valley and Yurok Tribes have confirmed reserved fishing rights in the lower Klamath Basin, and the water necessary to protect those rights may likewise be determined in a subsequent proceeding.

Any condition or prescription required for this Project's license, including those to protect federal interests, must be consistent with these reserved rights. Additional data or other information, including a binding decree resulting from the State of Oregon's water rights adjudication, may require modification to the license conditions. Thus, the Department is submitting these reservations of authority. The Department's other recommendations do not ask FERC to take any action or otherwise engage in the issues being addressed in the water rights adjudication.

Table 1. KSD @ Pump F and FF (TAF/Mo)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
1961	7.78	12.62	13.82	8.24	16.48	14.73	7.69	17.8	6.73	2.59	2.52	1.49	112.49
1962	3.84	14.01	15	1.67	7.96	18.26	12.45	4.09	2.77	3.5	4.37	1.94	89.86
1963	10.99	18.41	18.97	12.44	14.15	18.82	9.28	6.95	1.59	1.5	2.32	1.36	116.78
1964	7.03	17.56	7.24	8.06	13.99	18.39	6.42	4.55	10.59	4.21	3.88	3.33	105.25
1965	0.91	12.64	8.39	17.34	16.23	18.8	18.77	17.3	10.14	13.6	15.31	8.1	157.53
1966	6.12	14.68	13.82	2	11.7	16.85	5.54	3.15	4.21	6.83	5.64	5.36	95.9
1967	1.45	8.14	15.65	15.22	12.01	17.39	7.28	17.96	4.34	2.89	4.5	6.55	113.38
1968	7.2	8.8	6.13	9.1	13.08	45.35	3.34	2.7	4.42	4.85	7.73	9.45	122.15
1969	3.79	15.11	11.14	9.14	16.71	18.61	12.34	13.13	7.38	13	10.37	10.17	140.89
1970	15.19	11.03	11.69	18.84	17.09	18.63	10.3	17.18	10.58	13.88	4.73	9.01	158.15
1971	10.75	17.83	18.21	8.88	13.89	13.59	4.11	15.72	8.19	6.06	5.74	8.19	131.16
1972	11.94	17.71	15.44	10.44	17.17	18.66	9	11.28	4.18	5.49	7.61	10.97	139.89
1973	1.53	14.84	16.98	14.68	12.6	10.44	2.58	8.97	5.24	5.8	10.64	10.79	115.09
1974	4.6	2.92	18.94	18.26	15.13	17.71	7.64	8.95	5.18	7.42	10.66	7.89	125.3
1975	6.25	12.05	7.57	11.84	16.62	18.58	16.98	13.58	6.25	5.55	8.17	12.72	136.16
1976	7.79	8.45	13.92	17.19	11.29	12.26	2.97	3.88	6.71	6.3	14.61	14.75	120.12
1977	12.94	15.87	6.31	5.66	8.05	17.28	8.45	13.5	17.7	5.25	8.81	3.31	123.13
1978	4.22	3	8.12	12.09	13.31	12.66	12.08	4.89	3.54	6.11	7.28	0	87.3
1979	5.88	3.4	12.21	15.09	10.1	17.07	3.44	5.68	3.64	5.8	7.86	9.5	99.67
1980	4.37	11.24	16.27	13.78	16.81	22.65	6.34	6.15	6.9	7.5	4.83	10	126.84
1981	4.88	8.9	5.89	10.02	10.77	10.15	4.31	6.58	4.59	4.99	3.58	3.7	78.36
1982	4.07	9.75	15.76	20.09	23.61	27.76	7.4	3.91	6.66	11.91	7.11	7.72	145.75
1983	4.87	10.32	6.29	7.45	24.68	25.95	9.26	7.58	7.24	8.94	9.87	9.99	132.44
1984	6.3	11.49	20.47	23.49	30.03	23.43	6.91	5.9	8.86	5.73	4.74	12.98	160.33
1985	6.66	15.76	12.82	3.71	4.57	20.67	7	6.22	8.41	4.51	11.02	8.51	109.86
1986	5.03	6.04	6.87	10.88	18.4	27.96	9.57	11.85	7.13	5.92	9	7.44	126.09
1987	3.15	9.29	4.55	8.93	11.93	15.75	6.76	5.52	7.52	8.22	11.81	7.39	100.82
1988	2.72	2.94	8.55	6.19	11.78	18.65	12.01	9.6	9.39	4.95	8.03	5.39	100.2
1989	2.48	4.06	6.43	4.77	6.46	26.9	16.65	15.01	7.13	4.87	7.7	9.75	112.21
1990	4.48	7.81	3.74	7.27	6.12	19.41	10.7	8.9	11.81	6.4	7.92	8.23	102.79
1991	3.49	7.11	4.6	4.4	6.18	17.59	8.59	10.22	7.59	5.39	3.07	5.86	84.09
1992	0.28	0.35	0.69	0	0.32	2.41	0.74	1.2	0.13	0	0	0	6.12
1993	0.63	0.59	0.64	1.67	2.84	24.36	23.57	11.5	11	5.95	5.04	3.58	91.37
1994	1.81	1.36	2.04	4.68	10.17	8.28	8.29	10.42	5.98	5.3	3.37	1.38	63.08
1995	0.73	0.66	1	1.13	6.98	24.68	12.79	11.26	8.02	5.4	3.65	3.05	79.35
1996	1.17	1.69	4.52	20.46	27.39	23.06	10.49	13.56	8.61	6.02	5.08	3.14	125.19
1997	1.55	3.92	9.16	20.07	22.63	7.7	5.51	8.33	7.56	5.4	3.63	3.28	98.74
1998	2.5	5.44	7.63	11.29	17.88	11.91	18.66	18.18	13.14	5.16	4.73	3.47	119.99
1999	3.91	8.15	12.06	9.28	18.75	22	15.03	10.92	5.94	6.6	11.87	4.63	129.13
2000	2.26	1.52	3.22	4.67	10.14	11.52	6.75	14.45	8.38	7.6	4.91	5.09	80.52
2001	1	1.44	1.61	2.27	2.43	6.93	2.09	0.21	0	0	2.37	0.72	21.09
2002	0.1	0.34	0.98	4.27	9.13	13.13	7.09	8.15	6.96	6.19	12.2	6.6	75.15
2003	1.68	1.48	2.97	3.68	8.21	12.57	7.86	8.97	7.87	3.83	3.37	3.18	65.66
2004	1.89	1.5	1.67	2.05	12.6	13.68	6.44	6.11	8.49	4.04	3.91	4.15	66.53
Avg	4.6	8.23	9.09	9.61	13.14	17.8	8.9	9.36	7.02	5.94	6.72	6.23	106.63
Min	0.1	0.34	0.64	0	0.32	2.41	0.74	0.21	0	0	0	0	6.12
Max	15.19	18.41	20.47	23.49	30.03	45.35	23.57	18.18	17.7	13.88	15.31	14.75	160.33

Table 2. D Plant (TAF/Mo)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
1962	7.99	15.37	16.04	0.31	7.99	5.88	0	6.82	1.03	2.42	6.08	0.54	70.47
1963	13.89	18.21	18.41	2.93	4.91	0	1.4	9.32	0.08	4.56	5.48	3.23	82.42
1964	9.55	15.4	11.52	1.63	0	3.36	0	5.84	11.67	2.09	6.82	3.9	71.78
1965	5.94	15.94	15.56	18.53	17.13	15.49	10.64	8.48	6.78	13.4	13.19	4.18	145.26
1966	8.22	14.76	12.78	0.94	4.3	0	0	5.16	3.69	7.07	7.76	6.83	71.51
1967	7.99	16.7	18.73	11.79	0	1.43	5.18	17.28	5.24	1.27	8.33	6.19	100.13
1968	12.97	13.06	10.66	3.05	0	3.61	3.18	7.29	6.16	3.49	12.08	11.12	86.67
1969	8.8	16.39	15.1	9.95	13.23	2.99	1.71	8.77	5.28	9.16	7.8	9.91	109.09
1970	16.14	15.97	15.11	11.54	11.15	6.8	0	15.14	6.86	13.38	5.29	7.7	125.08
1971	11.98	16.36	16.42	2.69	0.42	6.13	2.09	15.6	11.88	6.05	4.49	8.51	102.62
1972	13.6	15.86	10.6	4.84	9.41	11	0.73	11.1	1.63	2.1	8.25	11.72	100.84
1973	13.35	16.58	7.69	0	0.42	1.23	2.71	9.11	2.13	2.91	7.59	11.23	74.95
1974	8.92	13.62	17.08	7.19	1.08	0	2.06	10.58	2.08	5.57	10.3	6.75	85.23
1975	8.76	14.85	11.94	0	5.4	8.2	2.71	8.34	2.91	7.91	6.86	14.1	91.98
1976	10.87	15.23	9.73	1.04	0.8	0	0	2.84	7.14	2.55	17.34	16.77	84.31
1977	16.54	16.08	4.02	0	1.25	0.29	1.82	14.99	6.72	1.27	5.86	7.62	76.46
1978	12.66	4.47	11.49	15.86	5.11	0	8.05	5.13	3.44	3.68	7.7	12.15	89.74
1979	7.24	13.24	9.99	0	0.63	0	4.88	5.86	7.71	7.92	7.26	12.45	77.18
1980	10.69	15.83	17	12.73	8.32	4.62	0	8.26	7.17	5.02	4.97	10.31	104.92
1981	13.76	15.04	5.71	0	0	0	1.01	7.92	6.77	4.18	5.02	8.72	68.13
1982	12.48	14.79	15	15.12	10.64	7.76	0	4.82	6.92	12.25	8.22	12.11	120.11
1983	11.35	14.92	10.22	2	13.02	10.98	0	7.72	7.02	11.64	11.86	10.79	111.52
1984	11.47	13.12	16.47	16.82	9.11	3.33	0	7.05	11.18	7.98	8.19	15.64	120.36
1985	13.63	16.3	12.7	3.73	1.89	1.59	1	8.13	10.56	3.81	13.28	16.66	103.28
1986	12.97	16.84	6.69	0	5.84	10.24	0.62	13.1	6.56	7.89	9.66	14.14	104.55
1987	13.1	16.6	5.99	0	0	0	1.52	9.5	8.01	10.3	17.79	14.08	96.89
1988	9.71	16.26	10.86	0	1.98	1.6	3.81	12.41	11.01	5.91	9.47	10.78	93.8
1989	11.96	16.49	8.47	0	0	11.63	4.09	12.13	5.56	4.28	9.85	15.46	99.92
1990	12.96	17.01	6.51	0.07	0.96	3.68	2.03	10.14	11.54	6.24	11.43	14.28	96.85
1991	13.46	16.13	6.06	0	0	0	0	11.02	5.47	4.9	6.3	11.56	74.9
1992	8.65	15.77	8.85	0	0	0	0	0	0	0.25	0	8.1	41.62
1993	5.79	8.58	5.37	4.36	2.77	14.75	6.68	8.11	10.36	5.27	7.59	9.15	88.78
1994	13.55	9.34	4.03	0.04	0	0	0.49	13.26	4.26	0.66	0.99	2.83	49.45
1995	2.1	12.5	0	7.95	3.66	14.38	7.47	10.63	9.4	4.35	4.36	9.33	86.13
1996	8.23	11.99	5.14	12.08	17.03	12.51	7.88	15.67	4.51	6.56	4.68	9.08	115.35
1997	9.22	13	3.96	15.17	10.03	0	2.42	7.02	7.89	5.73	4.91	10.52	89.87
1998	10.4	11	4.76	6.03	6.94	0.43	10.38	16.28	12.36	5.19	4.84	8.53	97.14
1999	12.95	12.83	11.62	2.87	7.94	9.36	5.07	11.11	7.98	4.46	11.18	12.23	109.58
2000	9.57	12.24	1.93	6.48	1.65	1.43	5.63	12.23	5.84	7.65	5.41	9.22	79.27
2001	11.02	7.17	0.58	0	0	0	0	0	0	0	0	5.07	23.84
2002	9.72	7.19	6.76	7.73	3.72	2.98	1.18	9.76	4.6	3.68	9.31	10.66	77.29
2003	7.84	3.76	2.56	3.5	3.91	1.93	11.48	10.32	1.49	0.13	8.06	6.49	61.47
2004	4.93	4.05	3.28	4.03	5.34	1.98	1.24	9.26	1.97	3.57	2.62	9.04	51.33
2005	11.81	9.75	4.02	4.7	1.33	0	1.61	13.62	3.65	0.37	4.96	9.27	65.09
Average	10.76	13.88	9.76	4.98	4.59	4.28	2.86	9.39	6.16	5.36	7.76	9.78	89.54
Minimum	2.1	3.76	0	0	0	0	0	0	0	0	0	0.54	23.84
Maximum	16.54	18.21	18.73	18.53	17.13	15.49	11.48	17.28	12.36	13.4	17.79	16.77	145.26

Table 3. Total Flow -- Lost River Diversion Channel (TAF/Mo)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
1961	9.35	7.69	11.88	8.3	12.72	11.13	7.09	11.02	10.24	10.16	10.82	11.13	121.53
1962	9.94	8.17	12.32	8.45	22.11	16.45	10.3	12.12	3.8	8.33	11.69	10.07	133.75
1963	40.03	10.35	15.97	8.13	20.94	7.86	13.95	11.23	9.04	9.69	10.24	13.21	170.64
1964	10.95	9.47	8.04	10.05	8.08	20.67	16.11	10.66	13.82	7.29	15.44	12.58	143.16
1965	11.83	8.42	50.94	69.97	45.17	14.67	11.12	14.28	17.22	13.27	16.48	13.97	287.34
1966	11.89	8.25	8.52	12.43	8.43	17.03	7.53	9.96	12.37	12.78	14.52	13.58	137.29
1967	10.66	8.37	17	14.8	14.02	20.6	15.18	12.47	10.14	9.19	13.75	13.44	159.62
1968	12.92	6.69	7.19	9.68	13.56	7.99	5.27	12.88	9.48	13.27	18.01	13.27	130.21
1969	12.7	7.92	10.36	22.85	20.45	34.83	26.6	15.2	17.91	12.81	16.07	15.66	213.36
1970	14.91	8.51	21.17	59.6	30.63	23.76	13.31	16.88	15.4	11.17	13.47	16.21	245.02
1971	14.1	12.5	18.5	25.94	12.17	47.15	55.3	22.33	17.42	19.18	34.15	46.09	324.83
1972	20.28	9.8	11.2	31.03	28.62	82.29	14.84	16.76	18.32	20.02	22.07	23.5	298.73
1973	14.67	9.41	12.4	12.4	13.05	11.28	7.28	13.39	14.25	11.95	15.4	17.69	153.17
1974	12.67	14.24	19.64	19.25	10.87	29.37	41.54	19.03	10.78	14.81	15.7	16.83	224.73
1975	15.37	8.39	8.97	8.83	16.85	28.14	16.92	15.28	13.83	17.01	20.08	20.09	189.76
1976	16.5	10.22	10.15	9.92	9.9	13.84	7.15	13.8	15.51	13.39	19.46	17.88	157.72
1977	14.45	7.15	7.43	7.02	7.17	5.96	6.77	10.97	11.33	9.03	11.12	13.47	111.87
1978	10.49	8.27	21.47	23.23	12.11	19	21.46	12.44	12.74	13.17	14.98	16.9	186.26
1979	12.65	7.94	8.35	10.83	6.79	11.66	5.56	6.73	5.36	5.91	8.88	6.62	97.28
1980	9.55	10.08	10.7	24.89	20.38	11.34	6.3	7.1	8.71	5.06	8.27	11.15	133.53
1981	8.85	4.89	6.58	5.72	9.24	9.1	5.53	5.88	3.51	4.63	4.53	7.3	75.76
1982	8.9	16.09	33.19	10.15	53.43	19.05	53.85	9.23	10.76	11.21	11.62	15.11	252.59
1983	9.75	8.15	13.68	19.91	53.8	66.88	35.26	23.13	13.83	10.32	14.94	13.23	282.88
1984	14.57	10.25	53.77	37.88	17.73	27.82	30.4	17.34	15.3	9.09	18.34	29.46	281.95
1985	32.65	17.09	11.66	7.88	12.65	14.32	17.19	10.54	9.27	8.01	11.73	13.25	166.24
1986	9.71	6.03	6.72	10.7	37.44	41.9	9.45	11.34	7.19	8.17	11.44	15.16	175.25
1987	7.27	5.18	5.65	6.69	9.47	8.74	3.98	9.57	8.19	9.79	5.98	10.41	90.92
1988	8.01	4.48	5.55	8.41	13.08	8.81	5.8	6.58	6.36	3.06	5.43	8.98	84.55
1989	7.36	7.27	6.15	5.24	13.53	34.81	11.85	7.53	6.34	5.59	8.81	14.01	128.49
1990	9.46	4.9	5.11	11.91	7.22	13.59	5.17	8.81	5.76	4.4	8.22	8.25	92.8
1991	8.36	4.77	3.71	5.33	4.34	5.94	1.69	3.74	1.85	1.71	0.94	1.28	43.66
1992	4.75	2.88	2.89	2.99	2.74	2.41	0.5	0.83	0.75	0.68	0.5	0.87	22.79
1993	0.95	1.09	1.23	2.4	7.41	61.17	12	4.45	5.4	1.85	5.64	7.15	110.74
1994	7.72	3.82	5.22	4.76	4.03	4.18	0.97	2.8	2	0.72	0.61	0.99	37.82
1995	2.56	2.05	3.65	20.66	11.19	38.34	15.25	17.27	6.1	3.28	3.82	7.5	131.67
1996	8.79	3.96	12.3	14.06	81.71	38.94	17.95	14.36	4.7	2.58	3.81	9.58	212.76
1997	7.86	6.05	17.34	57.26	39	11.45	7.65	5.96	6.67	4.98	6.6	10.19	181.02
1998	8.6	5.98	6.38	27.44	19.91	45.57	67.38	79.84	31.83	6.87	6.81	13	319.61
1999	12.06	12.12	17.85	15.75	37.14	113.35	64.38	14.51	12.17	8.09	14.76	18.97	341.13
2000	15.38	7.86	8.36	20.21	18.06	20.94	11.07	12.33	9.4	9.29	9.17	42.08	184.14
2001	13.99	7.25	8.62	7.51	7.04	8.9	3.27	0	0	0	0	0.9	57.48
2002	0	0	8.27	23.12	11.44	9.16	5.91	9.78	6.97	5.93	8.91	11.8	101.28
2003	9.76	4.7	6.59	14.47	8.62	7	11.82	11.39	7.51	5.1	7.78	13.58	108.31
Average	11.7	7.64	12.62	17.16	18.94	24.36	16.46	12.83	9.99	8.44	11.19	13.87	165.2
Minimum	0	0	1.23	2.4	2.74	2.41	0.5	0	0	0	0	0.87	22.79
Maximum	40.03	17.09	53.77	69.97	81.71	113.35	67.38	79.84	31.83	20.02	34.15	46.09	341.13

Section C: U.S. Department of the Interior Preliminary Section 18 Prescriptions, Klamath Hydroelectric Project - FERC No. 2082

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Section C: U.S. Department of the Interior Preliminary Section 18 Prescriptions

I. INTRODUCTION, BACKGROUND, AND PROCEDURAL CONSIDERATIONS

The U.S. Fish and Wildlife Service and the NMFS hereby submit a joint prescription for the construction, operation, and maintenance of upstream and downstream fishways pursuant to section 18 of the Federal Power Act (FPA). For the sake of grammatical simplicity, a naming convention is adopted in this document. Where language pertains independently to the U.S. Fish and Wildlife Service, the word "Service" (singular) is used. Where language pertains independently to the National Marine Fisheries Service, the acronym "NMFS" is used. Where language reflects the joint position of the Service and NMFS, the term "Services" (plural) is used.

PacifiCorp (Applicant) is seeking a new license from the Federal Energy Regulatory Commission (FERC or Commission) for the continued operation of the Klamath Hydroelectric Project (Project), which consists of five mainstem dams, two developments on the Federal Link River Dam, and one tributary development. The Services and other stakeholders have worked directly with the Applicant throughout the relicensing process. The Services regularly offered technical assistance and participated on technical subgroups. Furthermore, they provided comments and recommendations on the Applicant's Initial Consultation Document, Draft License Application (DLA), the Final License Application (FLA), and on numerous studies filed with the Commission. Nevertheless, the Applicant's proposed Project in the FLA (PacifiCorp 2004a) does not include modifications of existing facilities that would provide passage for anadromous fish (including salmon, steelhead, or Pacific lamprey), or provide a consistent, comprehensive strategy for resident fish passage through Project facilities.

The purpose of these Preliminary Fishway Prescriptions is to identify the engineered facilities, and the operations and maintenance of such facilities, which are necessary to achieve safe, timely, and effective fish passage conditions in all streams of the Klamath watershed impacted by the Project. As the Services describe in greater detail throughout this document, the Project is heavily impacting Klamath River fish populations, including fish listed under the Endangered Species Act (ESA).

At this juncture, the Services' joint prescriptions for fishways are preliminary. The Services developed these prescriptions using the best data and information available. We include specific prescriptive conditions which allow amendments through adaptive management in order to develop final design plans or to correct observed deficiencies. Our preliminary prescriptions require that the Licensee shall develop elements of the prescriptions in consultation with the appropriate fishery agencies and Tribes to ensure safe, timely, and effective fish passage. As the Services describe in greater detail throughout the document, these preliminary prescriptions are

consistent with the life histories and historical distributions of the target species of fish.

The Services anticipate the Commission will find this new license proposal to be a major, Federal action significantly affecting the quality of the human environment. Thus, the Commission will prepare an Environmental Impact Statement (EIS) pursuant to the requirements of the National Environmental Policy Act (NEPA)[1], and in accordance with the Council on Environmental Quality's implementing regulations.[2] The Services recommend the EIS reflect the full range of issues and alternatives identified in the NEPA scoping process, as well as all reasonable comments submitted in response to the Commission's Ready for Environmental Analysis Notice, plus any future Notice soliciting comments on any subsequent Offer of Settlement. Further, the Services support the Commission's intention to examine other fish passage alternatives, including the retirement of additional developments (besides the Eastside and Westside developments) without dams in place. Finally, and most importantly, both Services respectfully request that the Commission, in its draft EIS, identify a preferred alternative that fully incorporates our joint preliminary fishway prescriptions in their entirety as set forth herein.[3]

II. GOALS AND OBJECTIVES

The Commission's Licensing Regulations direct resource agencies to list the resource management goals and objectives that are the basis for recommended protection, mitigation, and enhancement measures (PM&E) to be incorporated into the new License.[4] These resource management goals and objectives also apply to the preliminary prescription of fishways in this document.

In 1986 Congress adopted the Klamath River Basin Fishery Resources Restoration Act (Klamath Act) (Public Law 99-552; codified as needed at 16 U.S.C.§ 460ss et seq.). This law established a Federal-State cooperative called the 'Klamath River Basin Conservation Area Restoration Program' for the rebuilding of the river's fish resources. The Klamath Act also established the Klamath River Basin Fisheries Task Force, and directed the Task Force to assist the Secretary of the Interior in the creation and implementation of "*…a 20 year program to restore anadromous fish populations of the [Klamath River Basin] Area to optimum levels and maintain such levels*." The Klamath Act also created the Klamath Fishery Management Council, and directed the Council to make recommendations to Federal, State, and Tribal agencies for the management of ocean and in-river harvesting that affects Klamath and Trinity anadromous fisheries.

The Klamath Act and the 1988 California Anadromous Fisheries Program Act recognize as the underlying reason for the decline of the anadromous fish resources the loss of habitat due to: 1) the construction and operation of dams; 2) stream diversions; and 3) adverse land use practices (USDI Klamath River Basin Fisheries Task Force 1991). Access of anadromous fish to habitat

[1] 42 U.S.C. §§ 4321 et seq.
[2] 40 C.F.R. Part 1500
[3] Interagency Task Force Report on NEPA Procedures in FERC Hydroelectric Licensing, May 22, 2000.
[4] 18 CFR4.34(e)(2)

in the Klamath River Basin upstream from Iron Gate Dam will assist in reversing the losses due to the construction and operation of dams.

In a letter to PacifiCorp dated March 21, 2001, the Task Force stated its goal that the relicensing of the Klamath Hydroelectric Project will "*result in the successful restoration of anadromous salmonids to their historical range as well as improvements to habitat of the Klamath River below the Project*" (USDI Klamath River Basin Fisheries Task Force 2001). The Services support these goals, with an added emphasis on restoring wild salmonid populations into the Upper Klamath River Basin.

Restoration of anadromous fish to the Klamath River in and above the Project will help meet not only various statutory requirements but also the Federal Trust Responsibilities to the Basin's Indian Tribes. These Tribes hold Federal Reserved fishing rights to take both resident and anadromous fish within their reservations in order to support ceremonial, subsistence, and commercial needs. See, e.g., United States v. Adair, 723 F.2d 1394, 1408-15 (9th Cir. 1984), cert. denied, 467 U.S. 1252; Parravano v. Babbitt, 70 F.3d 539 (9th Cir. 1984), cert. denied, 518 U.S. 1016 (1996); Memorandum from John D. Leshy, Solicitor of the Department of the Interior to the Secretary of the Interior (U. S. Department of the Interior 1993). The loss of fish productivity of the Klamath Basin has led to a substantial diminishment of the harvestable numbers available to these Tribes, and the resulting fish populations have been insufficient for the Tribes to harvest fish in quantities needed that would allow them a moderate standard of living.

NMFS Resource Goals and Objectives

One important NMFS goal is to ensure that the process of negotiation, public consultation, and environmental review results in decisions that provide for full and adequate protection, mitigation, and enhancement of anadromous fish and other resources affected by the Project, in accordance with NMFS statutory obligations under the FPA, the ESA, and other relevant jurisdictional authorities (see: NMFS' 2004 Motion to Intervene). NMFS is also committed to the goals and objectives developed by the Klamath River Basin Fisheries Task Force for restoration of habitat and anadromous fish populations in the Klamath River Watershed.[5]

Resource Goals

1. Protect, conserve, enhance and recover native anadromous salmonids and their habitats by providing access to historical habitats, and by restoring fully functioning habitat conditions.

2. Protect, mitigate or minimize direct, indirect, and cumulative impacts to native anadromous salmonid resources, and to enhance related spawning, rearing, and migration habitats and adjoining riparian habitats.

[5] USDI Klamath River Basin Fisheries Task Force 1991 and USDI Klamath River Basin Fisheries Task Force 2001

Resource Objectives

1. ***Flows -*** Implement scheduled flows in the Klamath River and regulated tributaries to the benefit of native anadromous salmonids and their habitats.
This includes establishing a criteria, range, and schedule of flows to consistently provide:

- optimal habitat structure and function;
- hydraulic stability during spawning and incubation of in-gravel life stages;
- safe, timely, and effective migration of all life stages of fish- including adults, juveniles, and anadromous smolts;
- viable redd selection, placement, and continuous submergence; and
- channel forming processes, riparian habitat protection, and movement of forage communities.

This also includes mitigating impacts of other Project structures or operations that:

- act to displace individuals from their forage or shelter;
- destabilize, scour, or undermine the physical habitat; or
- degrade the chemical or biological quality of habitat.

2. ***Water Quality -*** Modify Project structures or operations as necessary to mitigate direct, indirect, or cumulative water temperature and water quality impacts. Enhance water temperature and quality conditions in salmonid habitat where impaired by the Project.

3. ***Water Availability -*** Coordinate operations with other related projects, programs or initiatives. Use water transfers, water exchanges, water purchases, or other forms of agreements to maximize potential benefits to anadromous salmonids from limited water supplies.

4. ***Fish Passage -*** Provide access to historical spawning, rearing and migration habitats necessary for salmonids to complete their life cycles. Utilize seasonal habitats necessary to contribute to the recovery of coho, steelhead, and Chinook populations (and other species of concern). This includes modifications to Project developments and operations necessary to ensure the safe, timely, and effective passage for:

- upstream migration of adults;
- downstream emigration of juveniles;
- seasonal movement of rearing juveniles to feeding and sheltering habitats; and
- dispersion of adults and juveniles.

5. ***Channel Maintenance -*** Implement flow regimes and non-flow related measures necessary to mitigate and minimize the negative impacts of Project operations native fish populations and the riverine environment that supports them. Reduce or eliminate the direct, indirect and cumulative effects of dam operations on:

- alteration of the natural hydrograph;
- sediment movement and deposition;
- river geometry and channel characteristics;

- stream competence and capacity;
- flood plain conductivity and bank stability;
- extent, duration, and repetition of high flow events; and
- habitat diversity and complexity.

6. ***Hatchery Operations* -** Minimize and mitigate the impact of hatchery developments and operations on native, wild anadromous salmonids. This includes the direct, indirect and cumulative impacts of all hatchery production, and operations on anadromous salmonids and their habitats.

7. ***Predation* -** Minimize and mitigate the impact of Project structures or operations that create suitable habitat for predators, harbor predators, or are conducive to the predation of native anadromous salmonids.

8. ***Riparian Habitat* -** Protect and restore riparian habitat upon which the biological productivity of the riverine environment depends. Enhance riparian habitat and habitat functions as mitigation for the direct, indirect and cumulative impacts of Project developments and operations.

9. ***Flow Ramping* -** Modify Project structures or operations necessary to minimize adverse physical and biological impacts of flow fluctuations, associated with increases or decreases in Project discharges.

10. ***Coordination* -** Include a full range of alternatives for modifying Project and non-Project structures and operations to the benefit of anadromous salmonids and their habitats, while minimizing conflicts with operational requirements and other beneficial uses. This includes developing alternatives for greater coordination with other stakeholders and water development projects to ensure that, at a minimum, Project structures and operations are consistent with on-going and future restoration efforts and potentially enhance these efforts.

A primary goal of NMFS is to establish and maintain self-sustaining anadromous fish runs in the Upper Klamath River Basin to fully utilize the available habitat and production capability. In addition, NMFS' preliminary prescriptions and recommended terms and conditions are intended to serve the public interest and meet our environmental trust responsibilities pursuant to our statutory obligations under the resource laws that we administer, as fully described in our October 5, 2004 Motion to Intervene.

NMFS further intends, through implementation of these prescriptions and recommendations, to help achieve related planning goals and objectives established by the following State and Federal watershed plans: The Klamath River Basin Fisheries Task Force's Long Range Plan; The Long Term Plan for Management of Harvest of Anadromous Fish Population of the Klamath River (The Klamath Fishery Management Council); The Northwest Forest Plan; The Klamath National Forest Land and Resource Management Plan; The Six Rivers National Forest Land Management Plan; Klamath National Forest Wild and Scenic River Responsibilities; The Recovery Plan for Lost River and shortnose suckers (USDI Fish &Wildlife Service 1993);

California Water Quality Control Plan for the North Coast Region; BLM and Klamath National Forest Wild and Scenic River Responsibilities; several Oregon Department of Fish and Wildlife (ODFW) plans to manage fish resources in the Klamath River[6]; Recovery Strategy for California Coho Salmon (California Department of Fish and Game 2004); and the Joint Iron Gate Hatchery Review Committee Report (California Department of Fish and Game and National Marine Fisheries Service 2001). These plans contain provisions which pertain to the protection, mitigation, and enhancement of fish and wildlife resources in the Klamath River Basin, and the Project area.

Service's Resource Goals and Objectives

The Service has active programs in the Basin for the protection and restoration of the aquatic habitat upon which endangered fish, Tribal treaty and federally reserved fishing rights fisheries, and commercial and sports fisheries depend. The Service's goals (USDI Fish and Wildlife Service 2003) regarding relicensing of the Klamath River Project are:

1) Restore native fish populations within the Klamath Basin to provide fishery resources necessary to meet Tribal Trust responsibilities for commercial, subsistence, and ceremonial purposes; and to enhance ocean commercial harvest, recreational fishing, and the economic health of local communities.

2) Restore volitional passage for all life history phases of anadromous and resident fishes throughout their historical range. Provide necessary water quantity, flow regimes, water quality, and other habitat conditions for the recovery and long-term sustainability of native fishes.

3) Recover federally-listed threatened and endangered species in the Basin by avoiding jeopardy, avoiding and minimizing take, and completing recovery actions identified and detailed in recovery plans. Protect and restore habitat for federally-listed and candidate species.

4) Protect, mitigate, and enhance habitat for waterfowl and other migratory birds, terrestrial wildlife, fish, plants, and invertebrates.

5) Enhance ecological function and watershed processes to meet the above goals.

III. REVIEW PROCEDURES

The Energy Policy Act of 2005 (Act) provides parties to this license proceeding the opportunity to request "trial-type hearings" regarding issues of material fact that support the preliminary

[6] Oregon Plan for Salmon and Watersheds (ORS 541.405), Oregon Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000-0025), Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000-0025), Oregon Klamath Basin Fish Management Plan (OARs 635-500-3600 thru -3860), Klamath Basin Fish Management Plan (OARs 635-500-3600 thru -3860)

prescriptions developed under FPA section 18 (fishway prescriptions) and conditions developed under FPA section 4(e) (Federal reservations). Through this document, the Services submit preliminary prescriptions along with the administrative record supporting those preliminary prescriptions. The Act also allows parties to propose alternatives to preliminary prescriptions and conditions. Procedures for requesting a trial-type hearing on an issue of material fact or for proposing alternatives are set forth at 43 C.F.R. Part 45 (Department of Interior regulations) and 50 CFR Part 221 (Department of Commerce regulations). Requests for hearing must be filed within 30 days of the deadline for submission of this document, with each prescribing agency.

IV. NEED FOR FISHWAYS

In order to help achieve success of the many fish management, restoration, and recovery directives, goals and objectives in the Klamath River Basin, safe, timely, and effective fishways must be designed and constructed for all Project facilities that suppress native fish populations. At any particular facility, prospective fishways may need to accommodate upstream and downstream passage of spring and fall-run Chinook salmon, steelhead trout, coho salmon, Lost River and shortnose suckers, rainbow/redband trout, Pacific lamprey, and any other fish to be managed, enhanced, protected, or restored to the Klamath River Basin during the term of the license. The design of all fishways must be compatible with established Federal and State engineering criteria developed for the passage of fish. Fishways must be capable of supporting the life histories (PacifiCorp 2004b) and historical distributions of the named species in the Klamath River (Hamilton et al. 2005). The life history and distribution of these affected species have been previously provided in detail (National Marine Fisheries Service 2003 DLA; National Marine Fisheries Service 2004 FLA).

A. Existing Fishways and Fishways Proposed by the Applicant

As described in greater detail below, neither the existing Project, nor the Applicant's proposed Project, provide for passage of anadromous fish, or a consistent, comprehensive strategy for resident fish passage through Project facilities.

- The lower three Project dams (Iron Gate, Copco 1 and Copco 2) are not equipped with any fish passage facilities, and the Applicant does not propose any modifications (PacifiCorp 2004a).
- The J.C. Boyle Dam has upstream and downstream fishways, but these fishways do not conform to current criteria for resident and anadromous fish (Table 1) (National Marine Fisheries Service 2003; PacifiCorp 2004b). J.C. Boyle Dam was completed in 1958 and currently has an antiquated fish ladder, fish screens, and bypass facilities. Upstream passage of redband trout has declined more than 90 percent from over 5,500 trout in 1959 (Hanel and Gerlach 1964) to 70 to 588 trout in the years 1988-91 (Hemmingsen 1997; Hemmingsen et al. 1992; Oregon Department of Fish and Wildlife 2006a; USDI Fish and Wildlife Service 2004d). The existing fish ladder entrance is difficult for fish to find during spill events (PacifiCorp 2003c). The fish ladder is in poor condition with ineffective hydraulics and does not conform to current ladder criteria (USDI Fish and Wildlife Service 2005). The J.C. Boyle development has a history of fish passage

problems, which may be related to attraction hydraulics, ladder configuration, or the approach to the ladder (USDI Fish and Wildlife Service 2004a; USDI Fish and Wildlife Service 2005). The Applicant proposes only minor modifications to the J.C. Boyle upstream fishway that are already necessary for compliance with the current license and proposes an experimental gulper to replace the existing downstream fishway at J.C. Boyle Dam (PacifiCorp 2004a) that does not meet current criteria.

- The Keno Dam currently has a fishway that conforms to slope and energy dissipation criteria for salmonids, but does not meet current criteria to accomplish lamprey passage and does not meet slope guidelines for sucker passage (Oregon Department of Fish and Wildlife 2006b; USDI Fish and Wildlife Service 2005). Downstream spillway passage at Keno needs to be improved for all species to be consistent with current criteria (see Keno fishway prescription below).
- At the lower end of Upper Klamath Lake, the Bureau of Reclamation has constructed an upstream fishway at Link River Dam to pass endangered suckers that will also allow passage for anadromous fishes. The Applicant's Eastside and Westside power houses receive water diverted at Link River Dam into canals on each side of the river, but they are not equipped with fish screens and bypass facilities. The Applicant is proposing to decommission these facilities (PacifiCorp 2004a).
- The tributary developments at Fall Creek and Spring Creek have no fishways (PacifiCorp 2004b Fish Resources FTR). The Applicant is proposing canal screens and fish ladders for tributary facilities on Fall Creek and Spring Creek.

1. Upstream Fishways

Existing J.C. Boyle Ladder: The J.C. Boyle fish ladder is obsolete and ineffectual. Problems include steep gradient, insufficient attraction flow, hydraulic barriers; in addition problems with entrances limit the passage effectiveness (USDI Fish and Wildlife Service 2005). Studies indicate redband trout are not passing the dam upstream, or if attempting passing, are delayed due to problems with the existing fish ladder. In 2003 and 2004, Oregon Department of Fish and Wildlife (ODFW) radio-tagged 72 adult redband trout in the Klamath River below J.C. Boyle Dam. None of the fish moved up the fish ladder (Bill Tinniswood, ODFW, pers. comm.). In a separate study, one out of 14 radio-tagged redband trout from the bypass reach moved above the dam in 2002, while none of the 28 tagged fish from the peaking reach moved above the dam (PacifiCorp, 2004b). For the one tagged-fish that did migrate above the dam, the data indicate a delay of 3.5 days (PacifiCorp 2004b Fish Resources FTR). Passage problems are related in part to channel degradation near the entrance of the fish ladder which occurred after dam construction. The gradient of the approach to the fishway has not been maintained over the term of the license (USDI Fish and Wildlife Service 2004a; USDI Fish and Wildlife Service 2004d). The J.C. Boyle ladder rises 67 feet through 57 pools resulting in an average rise of 1.2 feet per pool which exceeds current criteria (PacifiCorp 2003c). Typically, 1 ft of rise per pool is recommended for passage of salmon and steelhead, while the recommendation for trout passage is 6 inches of rise per pool (PacifiCorp 2004b). In addition, temperature differences can greatly influence fish selection of alternative paths of upstream movement. According to studies by the Bureau of Commercial Fisheries, adult salmonids avoid temperature changes, prefer to remain in

river water, prefer cooler water when given an alternative, and take longer to pass through the test facility in water heated or cooled compared to river water (Weaver et al. 1976). Below the J.C. Boyle Powerhouse and in the peaking reach, fish encounter either water from J.C. Boyle Reservoir (the powerhouse discharge) or water from the bypassed reach (blended spring and river water) (USDI Bureau of Land Management 2003). There are daily temperature differences of up to 12°C during the middle of the summer between these two water sources as a result of daily peaking events (City of Klamath Falls 1986; PacifiCorp 2005; USDI Bureau of Land Management 2003). Thus, after comparing the findings of the Bureau of Commercial Fisheries study to the similar conditions existing at the juncture of J.C. Boyle's bypass reach and powerhouse flows, the Services conclude that upstream migration may be delayed due to these temperature differences.

Existing Keno Fish Ladder: Keno Dam currently has an upstream fishway conforming to salmonid criteria for slope and energy dissipation, but it does not meet Federal and State slope guidelines for sucker passage (Oregon Department of Fish and Wildlife 2006b; USDI Fish and Wildlife Service 2005). The ladder has 24 pools to ascend a 19-ft rise, resulting in an average rise of over 0.8–ft per pool. The Keno Dam fishway and auxiliary water supply system also have attraction hydraulics and flow regulation problems (USDI Fish and Wildlife Service 2005). Monitoring of fish passage at Keno Dam demonstrated small numbers of fish moving upstream through the existing ladder at Keno Dam (PacifiCorp 1997). While trapping studies indicated some trout and suckers use the ladder, it does not meet current criteria for upstream sucker passage (Oregon Department of Fish and Wildlife 2001; Oregon Department of Fish and Wildlife 2006b).

Proposed Upstream Fishways: With the exception of the Link River ladder and the Keno ladder in regard to salmon and steelhead criteria, none of the existing or proposed mainstem upstream fishways meet the design criteria summarized in Table 1. These criteria form the basis for the Services' Preliminary Fishway Prescriptions in Section V below.

Table 1. Recommended Design Criteria and Guidelines for Upstream Fish Passage.

Parameter	**Criteria**	**Reference**
Upstream Fish Ladders		
Resident Trout Maximum vertical jump Slope	 0.5 foot ~10%	 ODFW 2006b
Salmon and Steelhead Maximum vertical jump Slope	 1.0 Foot ~10%	 NMFS 2003, ODFW 2006b NMFS 2003
Federally listed suckers Maximum vertical jump Slope	 No jump <4.0% (4.5%)	 ODFW 2006b ODFW 2006b (4.5% used at Link River fishway)
Lamprey	Rounded ladder steps and corners	ODFW 2006b

2. Downstream Fishways

The existing J.C. Boyle screens and bypass facilities do not meet current criteria. The proposed gulper to replace the existing screen and bypass system is considered experimental (National Marine Fisheries Service 1994) and its protection would be questionable. The Applicant has not proposed downstream fishways at any of the other facilities (PacifiCorp 2004a). As a result, the proposed Project would entrain (draw in and transport) and kill fish. The likelihood of entrainment through the Project powerhouses is acknowledged by the Applicant (PacifiCorp 2004b Fish Resources FTR). In fact, the Applicant estimates that each of its unscreened hydro developments entrains tens of thousands of fish, with about 10 to 20 percent killed as they pass through each powerhouse (PacifiCorp 2003a; PacifiCorp 2003b). However, no studies of entrainment mortality have been conducted, even though requested by the Services (National Marine Fisheries Service 2003 DLA; National Marine Fisheries Service 2004 FLA; U. S. Department of the Interior 2004; U.S. Department of the Interior 2003; USDI Fish and Wildlife Service 2001). Without site-specific studies, the Services look to studies of entrainment at other hydropower installations to estimate entrainment resulting from the Klamath Project. The Electric Power Research Institute (EPRI) reported average mortality through Francis turbines at about 24 percent for all subject species (Electric Power Research Institute 1987). Francis turbines are utilized at all Project generating stations, except Fall Creek. Projects with higher head may have even greater mortality (e.g. J.C. Boyle at 440 feet of head). For projects with Francis turbines, the EPRI study found a high correlation ($r = 0.77$) between head and fish mortality. Four generating stations greater than 335 feet of head had mortality ranging from 33 to 48 percent (Electric Power Research Institute 1987). The facilities in these studies have comparable or less hydraulic head than the J.C. Boyle development and comparable turbine types. Using the above evidence, the Services conclude that entrainment mortality at J.C. Boyle Powerhouse likely falls in this range rather than the 12 to 36 percent range estimated by the Applicant (PacifiCorp 2004a, Exhibit E 4-113).

Finally, EPRI's studies, along with those of Milo Bell (Bell 1986; Bell et al. 1967), measured entrainment for some of the same species and under similar conditions as exist in the Klamath River. This evidence supports a conclusion that significant entrainment mortality (and injury) of resident fish is occurring presently at each Project development.

Klamath Project hydro-turbines entrain suckers, which are listed under the ESA and are present in all Project reservoirs (Desjardins and Markle 2000). In addition, when upstream fishways are provided for anadromous fish above Iron Gate Dam, and throughout the upper Klamath watershed, out-migrating salmonid smolts (including coho salmon which are listed under the ESA) will be entrained along with the resident fish. Unless downstream fishways and juvenile bypass systems are constructed, a significant portion of these restored fish will be killed or injured during entrainment and turbine passage. Therefore, modern fish screening and bypass facilities, which are consistent with the criteria in Table 2, are needed to prevent entrainment mortality of resident and anadromous fish. The Applicant acknowledges that downstream fish passage facilities will need to be in place to protect/bypass out-migrating fish if anadromous fish are reintroduced above Iron Gate Dam (PacifiCorp 2003a).

Existing J.C. Boyle Downstream Fishway: The fish screening and bypass facilities at J.C. Boyle Dam are ineffective and do not conform to current State or Federal criteria (PacifiCorp 2003c, 2004b). Screen approach velocity is nearly six times the modern anadromous salmonid criteria of 0.4 feet per second (PacifiCorp 2003c). The ineffectiveness of the screen is demonstrated by the large number of unidentified suckers and trout that pass downstream- through or around the fish screens. ODFW counted numerous trout and unidentified suckers in the power canal during fish salvage operations (Oregon Department of Fish and Wildlife 2001; Oregon Department of Fish and Wildlife 2006a). PacifiCorp (1997) also reported tagging a high number of fish as a result of a salvage operation in the canal below the dam. Finally, radio-tracking results showed that one 14-inch trout passed upstream through the J.C. Boyle ladder, and the *same* fish also migrated downstream through the power canal and turbines. It was not excluded by screens (PacifiCorp 2004b Fish Resources FTR, Appendix 5C, page 14). This information indicates both small and large fish are passing through or around downstream screens at J.C. Boyle Dam, and are subject to turbine mortality and injury.

Proposed J.C. Boyle Downstream Fishway: The Applicant proposes a surface collection system (gulper) for the J.C. Boyle Reservoir (also referred to as Topsy Reservoir) to exclude fish from the power intake and to facilitate downstream fish passage (National Marine Fisheries Service 1994). The Services consider gulpers to be experimental technology (National Marine Fisheries Service 1994). They would not provide volitional passage and therefore are not consistent with Service goals (USDI Fish and Wildlife Service 2003) and National Marine Fisheries Service draft guidelines and criteria (National Marine Fisheries Service 2003). We are not aware of any instance where gulpers have been shown to work as well as positive barrier fish screens (David White, NMFS, pers comm.). Gulpers would not lend themselves well to the Klamath River system because of the physical conditions needed for their successful operation. Gulpers and guide nets would have physical problems with the huge amounts of algae and organic debris originating in Upper Klamath Lake and tributaries. Klamath River conditions are very different from other systems, such as the Baker River, where gulpers are the only viable option for downstream passage.

None of the existing or proposed mainstem downstream fishways meet the design criteria summarized in Table 2. These criteria form the basis for the Services' Preliminary Fishway Prescriptions in Section V below.

Existing Keno Dam Downstream Passage: The sluiceway intake is not screened. All other flows go under the radial gates and into shallow areas where redband trout (Oregon Department of Fish and Wildlife 1997) and other predator fish hold. The Services conclude that predation mortality is significant at this location because of these facility characteristics and the concentration of predatory fish.

Proposed Keno Dam Downstream Passage: The Applicant does not propose downstream spillway improvements for fish passage at Keno Dam.

Table 2. Recommended Design Criteria and Guidelines for Downstream Fish Passage

Parameter	**Criteria**	**Reference**
Downstream Fish Screens and Juvenile Bypass Systems		
Resident Trout Square Screen Opening Approach Velocity Sweeping Velocity	 5/32 in. diagonal 0.33 ft/s 0.66 ft/s	CDFG 2000
Salmon and Steelhead Square Screen Opening Approach Velocity Sweeping Velocity	 3/32 in. side 0.33 ft/s >0.33 ft/s	NMFS 2003, 1997
Federally listed suckers	3/32 in. side 0.33 ft/s >0.33 ft/s	(USDI Fish and Wildlife Service et al. 2005).
Lamprey		Not available

B. Benefits of the Services' Fishway Prescriptions

As the Services explain in greater detail below, provision of safe, timely, and effective upstream and downstream fish passage facilities will provide a suite of benefits for resident trout, suckers, and five of the anadromous fish runs currently present in the Klamath River below Iron Gate Dam: Spring and fall-run Chinook salmon (*Oncorhynchus tshawytscha);* coho salmon (*Oncorhynchus kisutch);* summer steelhead (*Oncorhynchus mykiss*); and Pacific lamprey (*Lampetra tridentatus*). Each of the runs uses the mainstem Klamath River and its tributary streams for spawning and rearing. Klamath River resident fish will realize significant benefits resulting from restored connectivity of populations. For anadromous fish, the Klamath River "Project Reach" (Iron Gate Dam to Link River Dam) contains more than 50 miles of suitable habitat for salmon and steelhead (Table 3). The Klamath River "Above Project Reach" (from Link River Dam to the headwaters of Upper Klamath Lake, including the Wood, Williamson, and Sprague rivers) contains more than 360 miles of suitable habitat for salmon and steelhead. These designations demonstrate the fish passage benefits and habitat characteristics in each of these reaches of the Klamath River (Figure 1).

1. Fishway Benefits by Species – Project Reach

The benefits of providing fishways to restore unimpeded migration to historical habitat within the Project Reach are substantial. The Services estimate that the Project Reach, between Iron Gate Dam and Keno Dam, contains approximately 58.9 miles of suitable habitat for anadromous

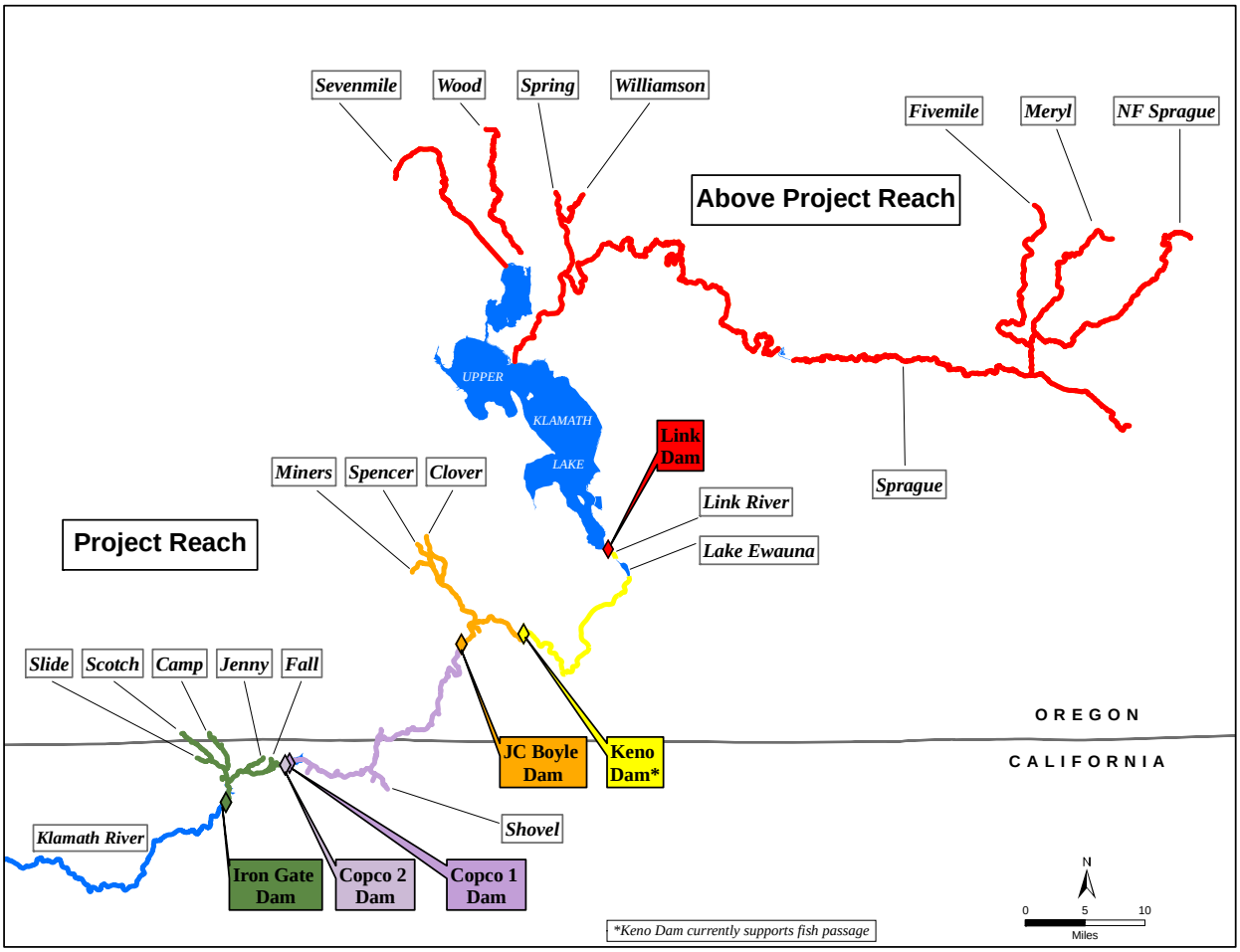

Figure 1. Project Reach and Above Project Reach (in red) designations for the Klamath River above Iron Gate Dam).

fish (Table 3), which compares closely with the estimate of 61 miles of habitat by Huntington (2006) for the Project reach. Fish passage through the Project Reach is also the stepping stone to much larger habitat gains above the Project.

A. Resident trout

For redband trout, a state of Oregon and U.S. Forest Service sensitive species, upstream fishways would restore historical seasonal migration patterns for both adults and immature fish. Upstream fishways would improve access to major spawning areas (such as Shovel and Spencer creeks) (California Department of Fish and Game 2005; Oregon Department of Fish and Wildlife 2006a). In some situations, the Project either blocks or severely impedes the movement of native redband trout. For example, one year after dam construction as many as 5,500 redband trout migrated through the ladder at J.C. Boyle Dam (Hemmingsen 1997). This event was typical of the intra-stream migrations among populations above and below the dam reach under natural conditions (e.g. Frain Ranch reach to Spencer Creek and Upper Klamath Lake) (Fortune et al. 1966). As time progressed, however, the dam's impacts on the native fish runs increased

dramatically. After decades of impacts from the Project the number of fish migrating through the ladder has been reduced by 90 percent or more (Hemmingsen 1997; Hemmingsen et al. 1992; Oregon Department of Fish and Wildlife 2006a; USDI Fish and Wildlife Service 2004d). The average size of fish using the ladder decreased significantly (Hemmingsen 1997; Oregon Department of Fish and Wildlife 2006a) since shortly after dam construction.

B. Federally-listed suckers

The fish ladder at Keno Dam does not meet criteria for sucker passage (USDI Fish and Wildlife Service 2005) and the current success of attempted upstream migration by suckers at Keno is unknown. Suckers currently held in other Project reservoirs are unable to return upstream, either because of intervening riverine reaches or lack of upstream passage facilities at dams. However, because the Project reservoirs are probably inherently unsuitable for the completion of life cycles by the suckers (National Research Council 2003) and few, if any, federally-listed suckers occur below Iron Gate Dam, the Service sees little benefit in prescribing ladders to sucker criteria at the lower five mainstem dams at this time.

Screens and bypass systems at J.C. Boyle, Copco 1 and 2, and Iron Gate Dams would have benefits in guiding federally listed sucker movements downstream. Suckers in the project reservoirs may have utility should future reintroduction efforts be necessary (National Research Council 2003). Because these four dams lack screens and bypass systems, these fish are at risk. Current screen and bypass criteria for suckers are the same as those for salmonids (Table 2). Fishways to these specifications would guide suckers downstream and reduce entrainment related mortality. Because no further measures to protect or provide for suckers are prescribed at these facilities, federally listed suckers are not referred to as a target species (Table 4) or included in the prescriptions below Link River Dam.

Tailrace barriers and spillway prescriptions for resident trout and anadromous species would benefit federally listed suckers as well and specifications would be the same. Because no further measures to protect or provide for suckers are prescribed at these facilities, federally listed suckers are not referred to as a target species (Table 4) or included in the prescriptions below Link River Dam.

C. Coho salmon

The Southern Oregon/Northern California Coast coho salmon (SONCC coho) Evolutionarily Significant Unit (ESU), which includes coho salmon in the Klamath River Basin, was listed as Threatened under the Federal ESA in 1997 (62 FR 24588, May 6, 1997; 70 FR 37160, June 28, 2005). In addition, the Klamath River Basin, excluding habitat above Iron Gate Dam, was designated as Critical Habitat for the SONCC coho (64 FR 24049, May 5, 1999). Project dams prevent coho salmon from migrating between the lower Klamath River and Spencer Creek. Coho salmon were distributed at least this far upstream historically (Hamilton et al. 2005). Coho salmon are also excluded from intermediate spawning tributaries such as Fall Creek and Shovel Creek and from historical mainstem and tributary rearing habitat. The 46.5 miles of coho habitat within the Project represents 6 percent of the total 779 miles of historical coho habitat in the Klamath Basin (Charleen Gavette, NMFS, pers. comm.).

Table 3. Project Reach Habitat for Anadromous Fish

River Reach	Habitat Miles Steelhead	Habitat Miles Chinook and Coho Salmon[2]	Source for Miles of Historical Anadromous Habitat or Potential Anadromous Fish Use
Iron Gate to Copco 2:			
Scotch Creek	5	3.9	Snedaker[1]
Slide Creek	1.4	1.1	Snedaker[1]
Camp Creek	3.7	2.9	Snedaker[1]
Jenny Creek	1.0	0.8	Coots-Wales(1952), Huntington(2006)
Copco No. 2 Bypass	1.4	1.4	PacifiCorp (2004b) Fish Resources FTR
Fall Creek	1	0.8	Wales-Coots (1954), Huntington (2006)
Salt Creek	0.2	0.2	Snedaker[1]
Total Miles:	**13.7**	**11.1**	**N/A**
Copco 1 Dam to Boyle:			
J. C. Boyle Peaking	17	17	PacifiCorp (2004b) Fish Resources FTR
Shovel Creek	2.7	2.1	CDFG (2005), Huntington (2006)
J. C. Boyle Bypass	4	4	PacifiCorp (2004b), Fish Resources FTR
Long Prairie Creek	0.4	0.3	(Coots 1965)
Deer Creek	0.4	0.3	Snedaker[1]
Edge Creek	0.3	0.2	Snedaker[1]
Frain Creek	0.1	0.1	Snedaker[1]
Negro Creek	0.6	0.5	Snedaker[1]
Tom Hayden Creek	1.1	0.9	Snedaker[1]
Topsy Creek	0.3	0.2	Snedaker[1]
Beaver Creek	0.2	0.2	(Coots 1965) and FWS estimate
Total Miles:	**27.1**	**25.8**	**N/A**
Boyle to Keno:			
Boyle Reservoir to Keno Dam	4.7	4.7	PacifiCorp (2004b), Fish Resources FTR (page 2-22)
Spencer Creek	9.2	7.1	Fortune et al (1966), Huntington 2006
Hunters Park Creek	0.8	0.6	Snedaker[1]
Miners Creek	2.4	1.9	Snedaker[1]
Clover Creek	0	0	BLM 1995
Total Miles:	**17.1**	**14.3**	**N/A**
Link River	1	1	PacifiCorp (2004b), Fish Resources FTR
Grand Total "Fish Miles" inside Project:	**58.9**	**52.2**	**N/A**

[1] (Scott Snedaker, BLM, pers. comm.)
[2] Habitat Miles for Chinook salmon = steelhead ("anadromous") fish miles x (0.774) in tributaries (Table 1 in Huntington 2004)

Upper Klamath River coho salmon support the SONCC coho ESU in two primary ways. The Upper Klamath, Scott, and Shasta river coho salmon represent three of the four functionally-independent populations of the Klamath system, excluding the Trinity system (Williams et al. 2005). Functionally independent populations are defined as having minimal demographic influence from adjacent populations and viability in isolation. The SONCC coho ESU also contains 32 smaller dependent populations. These populations do not have a high likelihood of sustaining themselves over a hundred year time period in isolation; they must have sufficient immigration from independent populations in order to persist (Weitkamp et al. 1995). Despite their dependent status, they contribute significantly to the viability of the ESU. Because each of the four functionally independent populations of the Klamath Basin is greatly diminished (Weitkamp et al. 1995), the Upper Klamath system plays an important role in preserving the SONCC coho ESU by consistently providing emigrants to dependent populations over a long-term time scale.

Upper Klamath River coho salmon also support the SONCC coho ESU during short-term droughts. Many of the functionally dependent populations exist in rivers and streams of the Coast Range that are supplied by surface run-off water (Weitkamp et al. 1995). Rivers supplied by surface water are especially vulnerable to periods of drought. Because the Upper Klamath system extends beyond the Coast Range and into the Cascade Mountains, it is a snow-melt supplied system. Larger, snow-melt watersheds have more stable hydrology than smaller, rain dependent watersheds, and are therefore comparatively less vulnerable to drought. The Upper Klamath coho population provides emigrants to the dependent populations, re-populating them after short-term catastrophic events, including droughts.

The threatened status of the SONCC coho ESU was one of the primary constraints on the West Coast 2005 mixed-stock ocean fishery. The NMFS ESA consultation standard requires that the ocean exploitation rate of SONCC coho be no more than 13 percent of the Rogue and Klamath hatchery coho stocks (Pacific Fishery Management Council 2006b). Also, there is currently no retention of coho salmon in commercial and recreational fisheries off California (Pacific Fishery Management Council 2005). In some years, these standards constrain ocean fishing for the more abundant Chinook salmon.

Weitkamp et al (1995) has identified the SONCC coho ESU as likely to become endangered in the foreseeable future if the long-term downward trend persists. The National Research Council (2003) recommended effective passage for coho at dams throughout the Klamath within three years, and that elimination of Iron Gate Dam be seriously evaluated because this structure blocks substantial amounts of coho habitat. Restoring access to the historical coho habitat above Iron Gate Dam will increase numbers of Klamath River functionally-independent coho salmon, which will support the dependent populations and appreciably contribute to the recovery of the SONCC coho ESU (Weitkamp et al. 1995). Blockage of coho migration within the Klamath Basin is inconsistent with ESA regulations on take (National Research Council 2003).

D. Fall-run Chinook salmon

The Project excludes fall-run Chinook salmon from migrating to historical spawning, incubation, and rearing habitats (Hamilton et al. 2005). Although degraded from historical conditions, most of this habitat is suitable for the life history of fall-run Chinook (USDI Bureau of Land Management et al. 1995; USDI Bureau of Land Management 2005; California Department of Fish and Game 2005; Huntington 2006). In the Project reach, there is approximately 52.2 miles of spawning, incubation, and rearing habitat for Chinook salmon (Table 3). Historically, fall-run Chinook used habitat in the Spencer Creek watershed (USDI Bureau of Land Management 2005).

E. Lamprey

The Project excludes Pacific lamprey from migrating to historical spawning habitats in the Project area (Hamilton et al. 2005). Populations have declined substantially in many Oregon rivers (Kostow 2002) and information indicates large population declines of lamprey numbers throughout the Columbia and Snake River systems (USDI Fish and Wildlife Service 2004b). Anecdotal evidence (Larson and Belchik 1998) and preliminary analysis suggest a declining trend for all life stages of Pacific lamprey in the Klamath River (USDI Fish and Wildlife Service 2004b). The upstream limits of their distribution are not well documented, but extended at least as far as Spencer Creek (Hamilton et al. 2005). Pacific lamprey are of great importance to Tribal subsistence and ceremonial fisheries (Kostow 2002; Larson and Belchik 1998; USDI Fish and Wildlife Service 2004b; Wydoski and Whitney 2003).

F. Spring-run Chinook salmon

Spring-run Chinook salmon were once the dominant run type in the Klamath-Trinity River Basin. Most spring-run spawning and rearing habitat was above the Project on the Klamath River. The Project excludes spring-run Chinook from historical spawning habitats in and above the Project area (Hamilton et al. 2005) in the Klamath River watershed. As a result of these and other factors, spring-run populations are less than 10 percent of their historic levels, and at least seven spring-run populations that once existed in the Klamath-Trinity Basin are now considered extinct (Myers et al. 1997).

Passage for spring-run Chinook into the Project Reach will restore access to cool water refugial areas such as the 220 cfs of spring water in the J.C. Boyle bypassed reach. During summer months, this area will provide key holding areas, cool water, and refugial habitat necessary for this run of fish (McCullough 1999). Juvenile spring-run salmon will rear in the cool water habitat adjacent to the springs in the J.C. Boyle bypass reach. Water temperatures in this spring-influenced area do not vary substantially from 50 to 55°F throughout the year (USDI Bureau Land Management 2003). During winter months, the reach will also provide relatively warmer water, benefiting rearing spring-run Chinook by providing optimal temperatures for juvenile growth (McCullough 1999). Spring-run Chinook will also use the main channel as an upstream migration corridor necessary to reach historical spawning areas in the Upper Klamath Basin (California Department of Fish and Game 1990).

G. Steelhead

The Project excludes steelhead trout from historical spawning, incubation, and rearing habitats in the Project area (Hamilton et al. 2005). In the Project reach, there are approximately 58.9 miles of steelhead habitat (Table 3).

2. Fishway Benefits by Species - Above Project Reach

The Above Project Reach, upstream from Link River Dam, contains approximately 49 significant tributaries comprising 360 miles of suitable, existing habitat and an additional 60 miles of recoverable[7] habitat for Chinook salmon and steelhead (Huntington 2006). While habitat has been degraded in some sections of the watershed above Link River Dam, substantial quantity and quality of habitat remains and effective habitat restoration programs could increase anadromous fish habitat to 420 miles (Huntington 2006). Ongoing habitat restoration work will continue (USDI Fish and Wildlife Service 2006). The work will expand to fully develop the capacity of the Upper Basin for anadromous fish. Efforts will include a broad range of restoration projects to restore and protect instream and riparian habitats. Chinook salmon and other anadromous fish returning to stream habitats above Upper Klamath Lake will improve the quality of spawning gravels as they construct redds. The Services expect that over a period of time, the condition of spawning sites will be improved in terms of embeddedness, particle size distribution, and compaction.

A. Resident trout

For resident redband/rainbow trout, which are present in the mainstem Klamath River, Upper Klamath Lake, and the lake's tributaries, fishways will allow reconnection of historical migration patterns. In the Upper Klamath Basin, resident redband/rainbow trout support a world class recreational fishery (Bill Tinniswood, ODFW, pers. comm.). These fish, particularly in the Williamson River, are renowned for their large size. Klamath Basin redband trout exhibit a pattern of downstream migration as fry or juveniles (Beyer 1984; Hemmingsen 1997) and return upstream as adults (Fortune et al. 1966). Historically, these populations were connected. Rainbow trout from Spring Creek and Trout Creek (above Upper Klamath Lake) are remarkably similar genetically to trout from Spencer Creek and the Klamath River (below Upper Klamath Lake) and to steelhead from Bogus Creek (below Iron Gate Dam) (Buchanan et al. 1994). This study concluded that some of these Upper Basin populations were likely once associated with runs of anadromous rainbow trout. Fishways will reconnect these now disparate populations and allow redband/rainbow trout and steelhead to be a source of adaptive variability in Klamath Basin salmonid populations.

B. Federally-listed Suckers

Benefits to suckers above the Project are provided by the ability of the fish to pass upstream at Link River Dam. A new ladder designed and constructed to current sucker criteria at Link River

[7] Huntington (2006) used this term to describe habitat that could be rehabilitated to become functional for Chinook salmon and/or steelhead trout within the next 30-50 years.

was completed in 2005. Federally-listed suckers are currently using this fishway to move from Lake Ewauna to as far upstream as the Williamson River (Bennetts 2006).

C. Fall-run Chinook salmon

The Project excludes fall-run Chinook salmon from historical spawning, incubation, and rearing habitats above the Link River Dam (Hamilton et al. 2005). Passage will provide access to approximately 49 significant tributaries comprising 360 miles of suitable, existing habitat and an additional 60 miles of recoverable habitat for Chinook salmon and steelhead (Huntington 2006).

D. Pacific Lamprey

Historically, Pacific lamprey occurred at least to Spencer Creek (Hamilton et al 2005). Lampreys occur long distances inland in the Columbia and Yakima river systems (Wydoski and Whitney 2003) and, with passage, would likely do so in the Klamath River system as well. Passage will provide access to substantial areas of habitat.

E. Spring-run Chinook salmon

The Project excludes spring-run Chinook salmon from historical habitat above the Link River Dam (Hamilton et al. 2005). Restoring spring Chinook runs will contribute to the diversity of runs in the Klamath River and eventually restore fishing opportunities for tribal and recreational users in the Upper Klamath Basin. Historically, the Klamath River spring-run Chinook salmon predominated over the fall-run (Gatschet 1890; Spier 1930), (Hume in (Snyder 1931). Large populations of these fish were found in several of the Klamath's tributaries, including both the Williamson and Sprague rivers upstream of Upper Klamath Lake (California Department of Fish and Game 1990). Historical run sizes were estimated to be at least 5,000 spring–run Chinook in both the Sprague and Williamson Rivers (California Department of Fish and Game 1990). Adequate passage is necessary at dams below Link River Dam to facilitate fish movement to these rivers.

F. Steelhead

The Project excludes steelhead from historical spawning, incubation, and rearing habitats above the Link River Dam (Hamilton et al. 2005). Adequate upstream fish passage at dams below Link River Dam would restore these runs to 360 miles of currently productive anadromous fish habitat (if anadromous fish had access to this habitat) and an additional 60 miles of recoverable habitat (Huntington 2006).

3. Additional Fishway Benefits

Restoration of populations of anadromous fish above Iron Gate Dam will provide a drought resistant genetic source (see discussion on SONCC coho above), helping to protect coastal coho and Chinook salmon stocks during extreme drought or flood events (Weitkamp et al. 1995).

Increases in the abundance of natural Klamath River Chinook stocks will not just be limited to the Klamath River and associated fisheries. There are multiplier benefits to Chinook salmon fisheries coastwide from increases in the abundance of these natural Klamath River Chinook. In many years, the abundance of Klamath River Chinook salmon can directly affect the coastal

mixed stock fisheries. When Klamath abundance is low, overall fishing effort is restricted to protect those fish. For example, in 2000, the ratio of Klamath Chinook to Chinook harvest in other fisheries was projected to be approximately 1:25 fish (Allen Grover, CDFG, pers. comm.). An increase in the abundance of Klamath River fall-run Chinook in that year would have resulted in substantial multiplier benefits to overall Chinook harvest, if other harvest restrictions (e.g. to protect federally listed coho and CA Coastal Chinook) had not been in place. In years 2003-2005, the low abundance of Klamath stocks was again a factor in the restriction of coastal Chinook fisheries south of the Columbia River and in 2005 there was also a request for disaster relief associated with the restricted fisheries due to the low abundance of Klamath stocks (Pacific Fishery Management Council 2006b). In 2006, a forecast for low abundance of Klamath stocks could require closure of most salmon fisheries from Cape Falcon, Oregon to Point Sur, California (Pacific Fishery Management Council 2006a).

There are significant ecosystem benefits associated with anadromous fish reintroduction. Restoration of anadromous runs will provide benefits to native fishes such as bull trout (*Salvelinus confluentus*) - a threatened species present in the Wood, Sycan, and Sprague rivers. This species is known to seek anadromous fry and juveniles as food sources (Wydoski and Whitney 2003). Anadromous fish runs provide nutrient input from the marine environment. They are an important source of energy and nutrients for subsequent generations of salmon; and they help to maintain proper ecological function (Stockner 2003). Over the past century, the natural contribution of marine-based nutrients to Pacific Northwest rivers declined in proportion to the decrease in salmon spawning (Gresh et al. 2000). When salmon return from the ocean to spawn, they bring vital nutrients with them to the watershed. Their decomposing carcasses provide a vital source of food and nutrients, not just for other fish species and wildlife, but for a whole host of organisms in the watershed. In addition to elemental nutrients, salmon carcasses contain minerals, amino acids, proteins, fats, carbohydrates, and other essential biochemicals for living organisms (Wipfli et al. 2003). The significance of these biochemicals and their availability to the food web may be more important than nitrogen, phosphorous, or other nutrients (Wipfli et al. 2003). Reintroduction of marine-derived nutrients from salmon carcasses will have a positive effect on the recovery of riparian ecosystems in the Klamath River Basin and provide associated benefits to other species, including federally listed suckers and terrestrial wildlife.

As a strategic approach to restoring Pacific Northwest watersheds, efforts should first focus on reconnecting isolated, high quality fish habitats made inaccessible by artificial obstructions (Roni et al. 2002). The safe, effective, and timely passage of fish around dams on the Klamath River is consistent with this strategy. The portion of the Klamath River watershed below the current upstream limit of anadromy continues to support viable (albeit diminished) runs of Pacific lamprey, steelhead, coho salmon, as well as spring-run and fall-run Chinook salmon. A run of over 30,000 hatchery and natural spring-run Chinook salmon still exists in the Trinity River and a remnant run of wild spring-run Chinook persists in the Salmon River. In the area of the Basin upstream from Iron Gate Dam, existing habitat continues to support fluvial and ad-fluvial populations of redband trout, and in some places, cold water species such as brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and bull trout. Many of the necessary components of

the ecosystem above Iron Gate Dam appear to be present and functional, or are restorable to functional form (California Department of Fish and Game 2005; Klamath Basin Ecosystem Foundation 2005; USDI Bureau of Land Management 2005; USDI Bureau of Land Management et al. 1995; USDI Fish and Wildlife Service 2004c).

The safe, effective, and timely passage of fish around dams on the Klamath River has significant potential to assist in the recovery of depressed stocks of anadromous fish. While the entire Upper Klamath and Trinity Rivers Chinook ESU is not listed under the ESA (Myers et al. 1997), the Klamath River spring-run Chinook population is considered to be at high risk of extinction (Nehlsen et al. 1991). The Klamath Mountains Province steelhead ESU is not listed under the ESA (Busby et al. 1996), but summer steelhead in the lower Basin are in decline and are identified as being at high risk of extinction (Nehlsen et al. 1991). Access to hundreds of miles of historical anadromous habitat above dams on the Klamath River (Huntington 2006) would greatly benefit these stocks and may reduce the potential for future ESU listings under Federal and State Endangered Species Acts.

C. Summary of Benefits and Need for Fishway Prescriptions

The Upper Klamath River, above Iron Gate Dam, historically supported the spawning and rearing of large populations of both anadromous and resident fish. Due to several factors, including impacts from the Project, Klamath River anadromous fish populations are substantially diminished and, in some cases, struggling to survive. Safe, timely, and effective fishways at all hydropower and water diversion developments on the river are essential precursors to the eventual re-establishment of more robust and resilient fish populations.

Fish passage at Project developments at and above Iron Gate Dam will provide multiple benefits to society and the environment:

- Access to hundreds of miles of habitat for returning anadromous species
- Restoration of native and resident fish populations
- Restoration of historical migration patterns and access to refugial areas
- Improved species diversity and ecosystem integrity
- Resilience of commercially important Chinook stocks
- Significant contributions to coastwide and Klamath River fisheries
- Fulfillment of numerous government and stakeholder goals and objectives
- Restoration of important public trust resources
- Minimizing the loss of federally listed suckers due to entrainment by the Project

V. PRELIMINARY SECTION 18 PRESCRIPTIONS FOR FISHWAYS

Section 18 of the Federal Power Act (16 U.S.C. 811) states in part that: "the Commission shall require the construction, maintenance, and operation by a Licensee of... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior." Section 1701(b) of the National Energy Policy Act of 1992, P.L. 102-486, provides guidance as to what constitutes a fishway. Section 1701(b) states: "The items which may constitute a 'fishway' under section 18 for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish, and Project operations and measures related to such structures, facilities, or devices which are necessary to ensure the effectiveness of such structures, facilities, or devices, for such fish."

These preliminary fishway prescriptions are based on the best biological and engineering information available, as described more fully in the explanatory statements that accompany each preliminary prescription. Although the maximum benefits to the fisheries are accrued with the combination of all the prescription elements in Section V, each prescription also stands on its own, and provides its own benefits. These prescriptions have been developed over a period of several years by the biological and engineering staff of the Services, in consultation with the Applicant, the U.S. Bureau of Land Management (BLM), the California Department of Fish and Game (CDFG), ODFW, affected Tribes, the Klamath Intertribal Commission, and other entities that are participating in this relicensing proceeding. Each preliminary prescription is based on substantial evidence contained in the record of this licensing proceeding before the Commission, and filed herein with the Commission. The explanatory statements below are intended only to summarize the supporting information and analysis upon which these preliminary prescriptions are based. Several documents previously submitted to the record in this proceeding contain detailed and specific information describing the Project's impacts on fish and wildlife (National Marine Fisheries Service 2003 DLA; National Marine Fisheries Service 2004 FLA; U. S. Department of the Interior 2004). These documents, including the relevant descriptions of baseline reference conditions and ongoing Project effects relative to applicable resource planning goals, provide relevant supporting information pertaining to Project impacts on anadromous fish and their habitat. All documents previously filed with the Commission by the Services are hereby incorporated by this reference.

For the Service, the preliminary prescriptions for fishways herein are issued under the authority of the Secretary of the Interior pursuant to section 18 of the Federal Power Act (see 64 Stat.1262). The Service's preliminary prescriptions are also consistent with the requirements of the Guidance for the Prescription of Fishways Pursuant to Section 18 of the FPA (USDI Fish and Wildlife Service 2002).

NMFS hereby prescribes, on a preliminary basis, the following license conditions for the construction, operation and maintenance of upstream and downstream fishways for the Klamath Hydroelectric Project pursuant to its authority under section 18 of the Federal Power Act, 16 U.S.C. § 811 as delegated to NMFS by the Secretary of Commerce.

A. RESERVATION OF AUTHORITY TO PRESCRIBE FISHWAYS

NMFS reserves the right to modify these preliminary fishway prescriptions and recommended terms and conditions in any comments filed responding to any subsequent Notice of Offer of Settlement issued by the Commission. In addition, NMFS reserves the right to modify its preliminary fishway prescriptions and its recommended terms and conditions, based on the results of new information and conclusions developed during the Commission's NEPA analysis, comments received as a result of public or agency review, or in connection with the fulfillment of other statutory consultation and review requirements, including review pursuant to regulations at 50 CFR Part 221 for implementing requirements under the Energy Policy act of 2005, or pursuant to section 7 of the ESA 16 U.S.C 1536 (implementing regulations at 50 C.F.R Part 402), or section 305(b) of the Magnuson-Stevens Act, 16 U.S.C. 1855(b), regarding essential fish habitat (implementing regulations at 50 C.F.R. Part 600, Subpart K). NMFS anticipates submitting any modified prescriptions and terms and conditions by no later than 60 days after the Commission's issuance of a Draft Environmental Impact Statement (DEIS). Finally, NMFS expressly reserves the right to revise its fishway prescriptions and recommended terms and conditions prior to a final licensing decision based upon significant new information or modifications to the Commission's proposed licensing alternative following the Commission's completion of an EIS or upon rehearing of the Commission's licensing order.

NMFS exercises its authority under section 18 and requests that the Commission include the following condition in any license it may issue for the Project:

> NMFS expressly reserves its authority under section 18 of the FPA to prescribe such additional or modified fishways at those locations and at such times as it may subsequently determine are necessary to provide for effective upstream and downstream passage of anadromous fish through the Project developments, including without limitation its authority to amend the following fishway prescriptions upon approval by NMFS of such plans, designs and implementation schedules pertaining to fishway construction, operation, maintenance and monitoring as may be submitted by the applicant (licensee) in accordance with the terms of the license articles containing such fishway prescriptions. NMFS is prescribing the design and construction standards for fishways herein. As an alternative, if necessary, authority is reserved to prescribe performance standards to ensure safe, timely, and effective movement of fish.

The Service reserves the right to modify its preliminary fishway prescriptions based on the results of new information and conclusions developed during the Commission's NEPA analysis, comments received as a result of public or agency review, or in connection with the fulfillment of other statutory consultation and review requirements, including review pursuant to 43 C.F.R Part 45 and consultation under section 7 of the ESA (16 U.S.C 1536 (implementing regulations at 50 C.F.R Part 402)). The Service anticipates submitting any modified prescriptions by no later than 60 days after the Commission's issuance of a Draft Environmental Impact Statement (DEIS). Finally, the Service expressly reserves the right to revise its fishway prescriptions prior

to a final licensing decision based upon significant new information or modifications to the Commission's proposed licensing alternative following the Commission's completion of an EIS or upon rehearing of the Commission's licensing order.

This reservation of authority allows the Service to consider additional data as it becomes available, to respond to changed circumstances, and modify the existing section 18 prescriptions as may be necessary. The reservation of mandatory authorities under the FPA has been accepted by the Commission and judicially affirmed. *Wisconsin Public Services Corp.*, 62 FERC ¶ 61,905 (1993), *aff'd, Wisconsin Public Serv. Corp. v. FERC*, 32 F.3d 1165 (7th Cir. 1994).

The Klamath Tribes of Oregon hold treaty-protected property rights, including fishing and water rights, in the upper Klamath Basin. The United States and the Klamath Tribes have jointly filed claims in the State of Oregon's water rights adjudication for the surface waters of the Klamath Basin in Oregon, including instream flow claims within the Project area (from Link River Dam to the Oregon-California border), to protect the Tribes' fishing and water rights reserved to them pursuant to their 1864 Treaty with the United States. In addition, the Hoopa Valley and Yurok Tribes have confirmed reserved fishing rights in the lower Klamath Basin, and the water necessary to protect those rights may likewise be determined in a subsequent proceeding.

Any license articles required for this Project's license, including those to protect federal interests, must be consistent with these reserved rights. Additional data or other information, including a binding decree resulting from the State of Oregon's water rights adjudication, may require modification to the license conditions. Thus, the Service is submitting this reservation of authority. The Service's other recommendations do not ask Commission to take any action or otherwise engage in the issues being addressed in the water rights adjudication.

The Service has prepared its preliminary prescriptions for fishways in response to the proposals being considered by the Commission in this proceeding. If any proposal is modified prior to licensing, as a result of licensing, or after licensing, then the Service will require adequate opportunity to reconsider each prescription and make modifications it deems appropriate and necessary for submittal to the Commission. Therefore, the Service exercises its authority under section 18 and requests that the Commission include the following condition in any license it may issue for the Project:

> Authority is reserved for the Service to prescribe the construction, operation, and maintenance of fishways at the Klamath River Hydroelectric Project, Project No. 2082, as appropriate, including measures to determine, ensure, or improve the effectiveness of such fishways, pursuant to section 18 of the FPA, as amended. This reservation includes, but is not limited to, authority to prescribe fishways for spring and fall-run Chinook salmon, coho salmon, steelhead trout, Pacific lamprey, Lost River and shortnose suckers, and any other fish to be managed, enhanced, protected, or restored to the Klamath River Basin during the term of the license. Authority is reserved to the Service to prescribe an upstream fishway to sucker criteria at Keno Dam pending the evaluation of the need for such a

fishway. The Service is prescribing the design and construction standards for fishways herein. As an alternative, if necessary, authority is reserved to prescribe performance standards to ensure safe, timely, and effective movement of fish.

The Services reserve the authority to modify these prescriptions for fishways at any time before license issuance, as well as any time during the term of the license, after review of new information.

B. PRELIMINARY PRESCRIPTIONS FOR FISHWAYS

These prescriptions for the Klamath Project include design specifications and implementation schedules, operating requirements and procedures, and specifications for post-installation implementation, evaluation, and maintenance. The Services have carefully reviewed these preliminary prescriptions, and consider them to fall fully within the scope of their section 18 authority. In general, the Licensee shall develop all elements of the prescriptions in consultation with appropriate technical specialists of the Services, along with CDFG, ODFW, and affected Tribes where appropriate.

Design, construction, evaluation, monitoring and modifications of developments shall be conducted according to NMFS guidelines (National Marine Fisheries Service 2003). The Services expect that the Licensee shall employ all measures necessary and appropriate to maximize upstream and downstream fish passage effectiveness for resident and anadromous species over the full range of river flows for which the Project maintains operational control. The Licensee shall manage Project reservoirs and forebays to ensure that all upstream and downstream fish passage facilities are fully operational at all times and at all reservoir elevations and inflows. Other general prescriptions for fishways are specified to provide for the modification, inspection, and maintenance of upstream and downstream fishways during the term of the license.

Rationale for General Preliminary Prescriptions*:*

Agency Review and Approval: Because the Services, along with other Federal, State, and Tribal partners, have considerable expertise, experience, and responsibilities in fishway system design and operations, it is standard procedure for this type of design review procedure to be instituted for any plans proposed by the Licensee or its agent(s). This is particularly true where Federal and State oversight is implied by law, either explicitly or implicitly, as is the case here. The Services possess multi-disciplinary technical review capabilities to assist the Licensee in developing effective functional fishway system designs. A Fisheries Technical Subcommittee (FTS), to be established by the Services and comprised of engineers, biologists, and other fish passage specialists, will help ensure quality and performance of complex hydraulic and biological systems.

Sequencing of Construction and Operations Rationale: As explained in greater detail below in the rationale for specific preliminary prescriptions, adult and juvenile fish may migrate into

Project facilities that may cause injury or mortality if measures are not in place to ensure their protection. For example, if adult fish are allowed to migrate upstream via a fish ladder, they may become susceptible to entrainment in hydro-turbines unless the downstream screening facilities are also in place. Large numbers of juvenile fish (downstream migrants) will be particularly susceptible to entrainment into hydro-turbines if screen and bypass systems are not in place and functioning for their protection. The Services intend to work with the Licensee to design the best sequence for the construction and operation of fishway facilities when more specific design information is known.

Design and Construction: Fish passage facilities shall be completed on a phased schedule to allow appropriate time for design and contracting construction. The Licensee shall complete downstream fishways (screens, bypasses, and spillway modifications) at each development, at or before the completion of the upstream fishway at that development, to prevent injury or mortality to fallback fish.

Access to Developments and Records Rationale: The Licensee shall grant reasonable access to developments and Project records so that Agency personnel will be able to evaluate fishway performance, inspect fishway facilities, and help to optimize facility performance based upon those evaluations and inspections.

Post-Construction Evaluation: The Licensee must complete a Post-construction Evaluation Plan for review and approval by the Services because it will be necessary to determine fishway system effectiveness and to identify and correct any fish delay, loss, injury, or hydraulic problems that may be present. Adjustments are often required to achieve optimal fish passage conditions within the fishway, in front of screens, and within bypass systems, or to achieve effective attraction flows in front of fishway entrances. After the initial adjustments have been made, wear and tear, accumulation of sediment and other debris, and various other factors can, over a period of time, alter hydraulic conditions and decrease the effectiveness of fishways (National Marine Fisheries Service 2003). Therefore, periodic evaluations of fishway effectiveness are necessary to assure continuing compliance and the safe, timely, and effective passage of fish.

Maintenance Requirement: It is essential that the Licensee observe proper maintenance practices for the correct, long term operation of each facility. Large scale fishways and fish protection systems are subject to continuous operations and harsh riverine and climatic conditions. Because vital fish migrations occur at each site on a regular basis, the Services must be notified whenever system maintenance is required that may cause excessive delay, injury, or mortality to migrating fish, or other species. An explicit element of fishway maintenance is the design of facilities that can withstand the elements and perform in continuous duty. Proper maintenance is necessary to ensure the temporal movement of fish in completing their biological requirements, including spawning, smolting, and outmigration (National Marine Fisheries Service 2003).

Maintenance, Inspection, and Operation Plan Rationale: Effective operation and performance of the fishways, including fish screens, conveyance, and bypass facilities, are also dependent on

regular inspection and maintenance to assure proper operating conditions within the fishway. Wear and tear, corrosion, accumulation of sediment and debris, and various other factors decrease the effectiveness of the fishway's physical features such as screens and seals. If left untreated, this would increase fish losses. Annual inspections of the physical features prior to each migratory period are necessary to assure that all elements of the fishways are in good condition and will operate effectively (National Marine Fisheries Service 2003). Maintenance procedures during shutdown periods need to include provisions for timing fishway maintenance to avoid peak migration periods and safely removing fish from the fishways and returning them to the river. All fishway elements need to be made available to fishery agencies (the Services, CDFG, ODFW, and the Tribes) for immediate inspection to ensure proper implementation of and compliance with fishway operation and maintenance conditions.

Fishway Evaluation and Modification Plan Rationale: It is important that the Licensee complete Fishway Evaluation and Modification (FEMPs) for the optimal operation of each fishway for the safe, effective, and timely passage of each species. These plans need to include measures to remedy problems with fish passage observed through operations and maintenance and fishway evaluations. FEMPs are necessary to achieve program goals, objectives, and strategies. To assess progress towards these goals and objectives, and minimize fish losses, the Service and NMFS-Engineering must approve these plans.

Annual Work Plan Rationale: The FEMPs will include an Annual Work Plan describing prospective actions the Licensee will take to implement and monitor fish passage. The Work Plan will ensure adequate and timely coordination between the Licensee and the Services, allowing the Services to determine whether program goals are being achieved and whether the Licensee is utilizing appropriate methodologies.

Attraction Flow Rationale: The higher percentage of total river flow used for attraction into the fishway, the more effective the facility will be in providing upstream passage. Experience with other fish facilities often shows that lack of adequate attraction flow, poor auxiliary water system design and operation, or unsatisfactory water quality can be major limiting factors in successful fish passage (National Marine Fisheries Service 2003)[8]. However, water allocated for attraction flow cannot be used for electricity generation. Therefore, the Services will allow the Licensee to scientifically test whether fish passage efficiency can be satisfactorily maintained with attraction flow rates between 5 and 10 percent. Testing will be based upon experimental testing protocols recommended by the Services to optimize the balance between attraction flow and fish passage efficiency. If statistically valid testing proves that flows less than ten percent, but not less than 5 per cent (National Marine Fisheries Service 2003), can provide equivalent passage efficiency, then the Services may authorize the Licensee to adopt a different attraction flow regime. It is recognized that attraction flows may vary depending on a variety of factors and over time. This prescription recognizes that variability and offers the Licensee the opportunity to demonstrate the viability of different attraction flow regimes and to adaptively manage Project operations during the new license term.

[8] Some large hydropower installations use pump-back systems to recover auxiliary water so that it can be used for electricity generation.

High and Low Passage Design Flow Rationale: The design streamflow range for fish passage, bracketed by the designated fish passage design high and low flows, constitutes the bounds of the fish passage facility design where fish passage facilities must operate within the specified design criteria. Within this range of streamflow, migrants must be able to pass safely and quickly. The low passage design flow is the lowest stream discharge for which migrants are expected to be present, migrating, and dependent on the proposed facility for safe passage. The high fish passage design flow rationale is the highest stream discharge for which migrants are expected to be present, migrating, and dependent on the proposed facility for safe passage. Within this range of streamflow, migrants should be able to pass in a safe and timely fashion. Outside of this flow range, fish are expected to be either not present or not be actively migrating, or shall be able to pass safely without need of a fish passage facility. Site-specific information is critical to determine the design time period and river flows for the passage facility. Local hydrology may require that these design streamflows be modified for a particular site (National Marine Fisheries Service 2003).

General Preliminary Prescriptions:

The following general prescriptions for fishways apply to each of the specific prescriptions below for the construction, operation, and maintenance of upstream and downstream fishways at the Project. These preliminary prescriptions are included to ensure the effectiveness of the fishways pursuant to section 1701(b) of the 1992 National Energy Policy Act (P.L. 102-486, Title XVII, 106 Stat. 3008).

1.1.1. *Design and Construction Plans*: For each facility, the Licensee shall develop detailed design, construction, evaluation, and monitoring plans for review and approval by the Services prior to construction. All original plans, and subsequent modifications of facilities, shall be conducted according to NMFS guidelines for the design of fish screens, fishways, and other fish passage structures (National Marine Fisheries Service 1997, 2003). The Licensee, or their authorized and qualified agent(s),[9] shall have all designs reviewed by the FTS. The Licensee and its agents must establish close consultation with Agency fisheries engineering and fish passage specialists at the outset of design and throughout the entire process. The initial design meetings shall commence at the pre-design, or conceptual-level design phase. Prior to advancing to feasibility-level of design, the Services must concur with all preferred alternatives for each independent facility, or any major feature of a facility. The Licensee will then proceed with the feasibility and final design phases providing detailed design, specification, and construction plans at the 50, 90, and 100 percent stage of completion. The Licensee shall schedule and provide a minimum of 90 days for the Services' engineering and technical specialists to review and approve

[9] "Authorized agents" will typically be qualified engineering and/or biological consulting firms who specialize in this area of work.

comprehensive plans. Shorter review periods may be possible, depending on the nature of the subject, as approved by the Services. The Licensee shall implement any design modifications as required by the Services as necessary to fulfill the objective of safe, timely, and effective passage for all species considered. The Licensee shall include in plans and obtain any critical spare parts or equipment, as needed to effect timely repairs of critical system components. The Licensee shall complete and begin operation of fish passage facilities in a phased schedule. The phased schedule will allow appropriate time and sequencing for design, contracting, and construction. Unless otherwise approved, downstream fishways (screens, bypasses, and spillway modifications) at each development must be complete prior to the completion of the upstream fishway at any given development. After approval by the Services, the Licensee shall file final designs with the Commission. The Services may specify the acquisition of any critical spare parts or equipment, as needed to effect timely repairs of critical system components. Fish passage facilities shall be completed, and brought on line, in a phased schedule. This will allow appropriate time and sequencing for design, contracting, construction, and in some cases, studies of the optimal design for tailrace barriers, or other facility enhancements not immediately apparent. Unless otherwise approved, downstream fishways (screens, bypasses, and spillway modifications) at each development must be complete prior to the completion of the upstream fishway at any given development. The designs approved by the Services shall be filed with the Commission.

1.1.2. *Access to Developments and Records*: The Licensee shall provide timely site access to Agency personnel at all Klamath River Hydroelectric Project developments, as well as pertinent Project records for the purpose of inspecting fishways to determine compliance with this fishway prescription.

1.1.3. *Maintenance Requirement:* The Licensee shall keep all fishways in proper order, and shall keep all fishway areas clear of trash, sediment, logs, debris, and other material that would hinder passage, or create a personnel safety hazard. The Licensee shall perform anticipated maintenance well in advance of any critical migratory periods so that fishways can be tested, inspected, and be operating effectively during fish migration. If any fishway system becomes seriously damaged or inoperable, the Licensee shall notify NMFS Engineering and the Service within 48 hours. The Licensee shall take remedial in a timely manner and in a manner satisfactory to NMFS-Engineering and the Service.

1.1.4. *Fishway Operation, Inspection, and Maintenance Plans*: The Licensee shall, in consultation with the Services, affected Tribes, CDFG and ODFW, develop a fishway operation, inspection, and maintenance plan describing anticipated operation, inspections, maintenance, schedules, inspections, and contingencies for each fish passage facility. The operation, inspection, and maintenance plans shall be submitted to the Service and NMFS Engineering

for final review and approval with final designs for fishway construction. To minimize fish losses, the Licensee must complete these plans and ensure adequate time for review and approval by the Service and NMFS Engineering prior to the completion of construction and operation of each upstream and downstream fish passage facility. After approval by the Services, the Licensee shall file these plans with the Commission.

1.1.5. *Post Construction Fishway Evaluation Plans:* Prior to the completion of construction of the new fishways, the Licensee shall, in consultation with the Services, ODFW, CDFG, and affected Tribes, develop post-construction monitoring and evaluation plans to assess the effectiveness of each fishway, spillway, and the tailrace barrier prescribed below. The plans shall include hydraulic, water quality, and biological evaluations using Passive Integrated Transponder (PIT) or similar technology to detect and record fish passage and assess the performance of the fishway, including measures for follow-up evaluations of effectiveness and fish survival through fishways. The Licensee shall provide a report on the monitoring and evaluation of the developments annually for the term of the new license. Specifically, the plans must include measures to estimate numbers of fish passed by species on a daily basis (including but not limited to spring-run and fall-run Chinook salmon, coho salmon, steelhead, Pacific lamprey, Lost River and shortnose suckers, and redband/rainbow trout), sampling of fish size, and the sampling of age class of fish passed at each development on a daily basis; a record of the daily observations by a qualified fisheries biologist on the physical condition of the fish using the fishways; and a continuous record of DO (dissolved oxygen) and water temperature at locations in the fishway as determined by the Services, and in front of and adjacent to the entrance(s) and exit(s) of the fishways. The evaluation plans shall be submitted to the Services for final review and approval within six months of the date when final designs for fishway construction are approved by the Services. At least 60 days shall be provided for Services to review the evaluation plans. The Licensee shall fund and implement the approved plans and any plan modifications, operational or physical changes necessary for the safe, effective, and timely passage of fish as may be required by the Services. The Agency approved designs shall be filed with the Commission.

1.1.6 *Fishway Evaluation and Modification Plans:* The Licensee shall, in consultation with the FTS, prepare a Fishway Evaluation and Modification Plan (FEMP) for each fishway, spillway, and tailrace barrier prescribed to achieve the Services' fish passage goals and objectives. The Licensee shall provide an outline of the FEMPs to the Services no later than one year after license issuance. Consultation with the agencies listed above shall begin as early as possible following license issuance. The Licensee shall document all consultation, including the agencies' responses to requests for consultation, and include this documentation in the FEMPs. The complete FEMPs shall be submitted to the Services for review and approval no later

than eighteen months from the date of license issuance. At least 60 days shall be provided for review. After receiving the Services' approval, the Licensee shall file the FEMPs with the Commission.

A. Each FEMP shall include:

1. A specifically quantified program to meet the Services' fish passage goals, objectives, and strategies;
2. The Services criteria by which to measure progress towards fisheries management goals;
3. Procedures for redirecting effort, including funding, as necessary under adaptive fishway management to achieve the Services' goals and objectives;
4. Schedule for implementation of activities to achieve the Services' goals and objectives;
5. A monitoring plan to evaluate progress towards, and achievement of the Services' goals and objectives; and
6. A format for the Annual Report and Annual Work Plan, which are described below.

B. The Services, in consultation with the States of Oregon and California as well as affected Tribes, will review the FEMPs and reserve the right to accept, reject, or modify the FEMPs, in whole or in part, to ensure the safe, timely, and effective passage of resident and anadromous fish. Any reviews or amendments to the FEMPs, over the term of the license, shall be subject to the same level of Services' review and approval as the original FEMPs. After receiving the Services' approval, the Licensee shall file with the Commission FEMPs and any amendments therein.

C. By February 1 of every year, for the term of the License and all annual licenses, the Licensee shall submit to the Services for approval an Annual Report detailing the work accomplished under the FEMPs during the previous calendar year, progress made toward program goals and objectives, plans or suggestions to redirect effort per adaptive fishway management with a detailed justification of why this is warranted, and documentation of consultation with the Services and their responses. After receiving Services' approval, the Licensee will submit each Annual Report to the Commission.

D. By December 1 of every year, for the term of the License and all annual licenses, the Licensee shall submit to the Services for approval an Annual Work Plan detailing the Licensee's proposed activities for the next calendar year as necessary to implement the FEMPs. The work plan must provide sufficient detail for the Services to determine whether the Plan

continues to provide for the safe, effective, and timely passage of resident and anadromous fish. The Annual Work Plan shall include, but not be limited to, detailed information on methods to be employed; schedule of activities; and explanations of how planned activities will help attain program goals.

1.1.7. *Upstream Fishway Attraction Flows and Range of Design Flow*: The following general prescriptions for design flow ranges and attraction flows for fishways apply to each of the specific prescriptions below for the construction, operation, and maintenance of upstream fishways at the Project. These prescriptions are included to ensure the effectiveness of the fishways consistent with NMFS guidelines and criteria (National Marine Fisheries Service 2003).

A. The Licensee shall design each upstream fish passage facility to pass migrants throughout a design streamflow range, bracketed by a designated High and Low Fish Passage Design Flow.

1. Low Fish Passage Design Flow - For each upstream fish passage facility the Low Fish Passage Design Flow shall be the mean daily average stream discharge that is exceeded 95 percent of the time during periods when migrating fish are normally (historically) present at the site, as determined by a flow-duration curve summarizing at least the previous 25 years of daily discharges or, if discharge records are not available, by an artificial streamflow duration methodology approved by the Services. This could also be an applicable minimum instream flow, as determined by state regulatory agencies, by ESA consultations with NMFS, or by an article in Project license.

2. High Fish Passage Design Flow - For each upstream fish passage facility, the High Fish Passage Design Flow shall be the mean daily average stream discharge that is exceeded 5 percent of the time during periods when migrating fish are normally (historically) present at the site, as determined by a flow-duration curve summarizing at least the previous 25 years of daily discharges or, if discharge records are not available, by an artificial streamflow duration methodology.

B. Each upstream fish passage facility shall provide physical facilities capable of producing at least 10 percent attraction flow as a percent of High Fish Passage Design Flow. Attraction flow is the total amount of flow discharged from the fishway entrance pool at any given time. For fishways in streams with mean annual streamflows exceeding 1000 cubic

feet per second (cfs), the Licensee shall determine the optimum attraction flow in consultation with the Services (National Marine Fisheries Service 2003). During facility evaluations, attraction flows may be throttled for testing purposes between the range of 5 percent and 10 percent, in order to determine whether fish passage efficiency can be maintained at a lower attraction flow.

C. The Licensee shall ensure that any reduction in attraction flow shall not result in reduction in fish passage efficiency below performance standards (established by the Services) during seasons of important fish migrations. The Licensee shall test fishway performance in accordance with experimental testing protocols recommended by the FTS. The Licensee shall report testing results to the Services, and implement adaptive management measures to alter attraction flows (to no less that 5 percent), if approved by the Services. The Licensee shall report any changes in attraction flows to the Commission. In the absence of valid experimental results, the default attraction flow is 10 percent.

Specific Fishway Prescriptions for Klamath Hydroelectric Project Fishways

All general prescriptions above shall apply to the specific prescriptions below. The preliminary prescriptions for developments in the Project are summarized in Table 4.

Table 4. Summary of Preliminary Fishway Prescriptions and Timetable for the Klamath Hydroelectric Project (Commission Project #2082)

Development	Target Species	Fish Ladder and Passage Impediment Modification (in Chronological Order)	Tailrace Barrier	Screens and Bypass	Spillway Modifica-tions	Interim, Seasonal Trap and Haul
Copco 2 Bedrock Sill	Salmonids, lamprey	2 yrs (Bypass Barrier/Impediment Modification)	Not Applicable (NA)	NA	NA	NA
JC Boyle	Salmonids, lamprey	2 yrs (Bypass Barrier/Impediment Modification)	NA	NA	NA	NA
Eastside	Salmonids, lamprey, suckers	BOR current facility	3 yrs[1]	3 yrs[2] (to sucker criteria)	NA	Seasonal downstream trapping and hauling for Chinook
Westside	Salmonids, lamprey, suckers	BOR current facility	3 yrs[1]	3 yrs[2] (to sucker criteria)	NA	Seasonal downstream trapping and hauling for Chinook
Fall Creek	Resident trout	3 yrs (0.5 ft/drop and ≤ 10%)	5 yrs[3]	3 yrs	NA	NA
Spring Creek	Resident trout	3 yrs (0.5 ft/drop and ≤ 10%)	NA	3 yrs	NA	NA
Keno	Salmonids, lamprey,	3 yrs (0.5 ft/drop and ≤ 10%)	NA	NA	3 yrs	Seasonal upstream trapping and hauling for Chinook
Iron Gate	Salmonids, lamprey	5 yrs (0.5 ft/drop and ≤ 10%)	NA	5 yrs	5 yrs	Modify existing trapping facility
Copco 2	Salmonids, lamprey	6 yrs (0.5 ft/drop and ≤ 10%)	8 yrs[3]	6 yrs	6 yrs	NA
Copco 1	Salmonids, lamprey	6 yrs (0.5 ft/drop and ≤ 10%)	8 yrs[3] (if adults in C2 pool)	6 yrs (bypass below C2)	6 yrs	NA

[1]Study of impacts to and the potential design and construction of tailrace barrier is given priority due to the presence of federally listed suckers
[2] Screen and bypass system given priority due to the presence of federally listed suckers
[3] Tailrace Barrier design and construction deferred for study to determine optimal design

1. Iron Gate Dam

Upstream Prescription Rationale: Historically coho salmon, Pacific lamprey, steelhead, and spring-run and fall-run Chinook salmon (Hamilton et al. 2005) and resident trout migrated above the site of Iron Gate Dam to reach holding, spawning, incubation, and rearing habitat. Iron Gate Dam is a barrier to this passage and thus to critical holding, spawning, incubation, and rearing habitat in tributaries (Slide, Scotch, Camp, Jenny, Salt, and Fall creeks) and the Copco 2 bypass reach. The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore anadromous salmonids to their historical range and habitat. A goal of the Service is to successfully restore resident fish to their historical range and habitat as well. The means of reaching these goals is restoration of safe, timely, and effective fish movement. Volitional fish passage at Iron Gate Dam would be consistent with the goals and objectives of the Services and the Klamath River Basin Fisheries Task Force for resource management. The Licensee shall provide effective facilities to meet these goals and mitigate for the impacts of the dam. A holding, sorting, and counting facility is necessary to segregate and mark fish for management purposes, including returning fish resulting from upstream restoration for transport efforts. The 5 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Benefits: Specific benefits of fishways at Iron Gate Dam include:

Resident Trout: For the resident redband trout currently present both above and below Iron Gate Dam, fishways would restore historical seasonal movement for immature fish, restore population connectivity and genetic diversity, and allow greater utilization of existing habitat and refugial areas. Fish passage at Iron Gate Dam alone would restore the connectivity of resident redband populations in the mainstem Klamath River with those in the Copco 2 bypassed channel and Slide, Scotch, Camp, Jenny, Salt, and Fall creeks. These tributaries also provide important habitat elements, such as spawning and temperature related refugial areas. In particular, Fall Creek provides a steady volume of high quality water and historically provided good habitat for resident fish, including rainbow/redband trout, Klamath small-scaled suckers (*Catastomus rimiculus*), and Klamath sculpin (*Cottus klamathensis*) (Coots 1957). With fish passage, seasonal migration of trout and access to refugial areas would be restored.

- Coho: Coho salmon are present in the Klamath River below the dam and were present historically above the dam. Iron Gate Dam blocks these fish species from reaching elements of their historical habitat. Between Iron Gate Dam and the next barrier upstream (Copco 2 Dam), coho salmon would regain access to 11.1 miles of habitat, including tributaries and the Copco 2 bypass reach (Table 3). National Research Council (2003) considered the amount of this tributary habitat between Iron Gate Dam and the next barrier upstream to be substantial. Coho are known to have spawned in Fall Creek (California Department of Water Resources 1964; Coots 1954; Coots 1957; Coots 1962). In both 1951 and 1952, at least 10 adult coho spawned in Fall Creek and greater than 29,600 young of the year and juvenile coho salmon outmigrated in 1954 (Coots 1954). No information is available for Scotch, Slide, Camp, and Jenny creeks, but the lower

reaches of these streams are relatively low gradient and appear to be suitable coho habitat. With fish passage, coho will have access to this habitat and access to refugial areas would be restored.

- Fall-run Chinook: With fish passage at Iron Gate Dam, fall-run Chinook salmon access would be restored to 11.1 miles of habitat, including Scotch, Camp, Jenny, and Fall Creeks (Table 3) between Iron Gate Dam and the next barrier upstream (Copco 2 Dam). Prior to the construction of Iron Gate Dam, escapement of Chinook salmon to Jenny and Fall Creeks averaged 215 and 1,384 adults respectively from 1950 to 1960 (Coots 1957; Coots 1962; Coots and Wales 1952; Wales and Coots 1954). With fish passage, fall-run Chinook will have access to this habitat again. Seasonal migration of fall-run Chinook and access to refugial areas would be restored.
- Spring-run Chinook: With fish passage at Iron Gate Dam, spring-run Chinook salmon would regain access to cool water refugial areas necessary for this run of fish (McCullough 1999) such as Fall Creek. Spring-run Chinook would also regain access to upstream migration corridors necessary to reach historical spawning areas in the Upper Klamath Basin (California Department of Fish and Game 1990).
- Pacific Lamprey With fish passage at Iron Gate Dam, Pacific lamprey would regain access to 13.7 miles of habitat, including tributaries and the Copco 2 bypass reach (Table 3) between Iron Gate Dam and the next barrier upstream (Copco 2 Dam). Pacific lamprey are known to have been present and spawning in Fall Creek (Coots 1954, 1957). With fish passage, lamprey will have access to this habitat again.
- Steelhead With fish passage at Iron Gate Dam, steelhead would regain access to 13.7 miles of habitat, including tributaries and the Copco 2 bypass reach (Table 3), between Iron Gate Dam and the next barrier upstream (Copco 2 Dam). Adult steelhead have been documented in Fall Creek (Coots 1957, 1962). During 1951-1952, 471 steelhead spawners were counted in Fall Creek and between January and April 1954, more than 6,500 fry and 1,200 yearling steelhead emigrated from Fall Creek (Coots 1954). Steelhead are generally tributary spawners and able to access reaches of tributaries upstream from areas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would have access to habitat in its entirety in tributaries above Iron Gate Dam. Steelhead would have access to 13.7 miles of habitat in Slide, Scotch, Camp, Jenny, and Fall creeks. Seasonal migration of steelhead and access to refugial areas would be restored.

Downstream Prescription Rationale: Downstream fishways and fishway modifications are prescribed for Iron Gate Dam. Redband/rainbow trout and other resident fish (including federally listed suckers) are currently present in Iron Gate Reservoir. The Services conclude that trout (in particular fry and juveniles) move downstream (Hemmingsen 1997), a significant portion move through the powerhouse, and turbine entrainment at Iron Gate Dam causes significant mortality to downstream migrating redband trout (see discussion of turbine-caused mortality later in this paragraph). In addition, with the construction of a functional adult fish ladder at Iron Gate Dam, Pacific lamprey, salmon, and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005). However, the progeny of these fish must negotiate not only the reservoir but the dam, powerhouse, and

spillway during their outmigration. To ensure that the fish can outmigrate, downstream passage through the dam, powerhouse and spillway is necessary. Unless protected by fish screening and bypass systems, fish migrating downstream can suffer injury or death by passing through turbines at hydroelectric plants (Electric Power Research Institute 1987). Turbine caused mortality can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001), turbine mortality being caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (Electric Power Research Institute 1987) reported that Francis turbines, which are used at Iron Gate Dam, had average mortality to downstream moving fish of about 24 percent (see section IV.A.2 of this document for additional discussion of turbine entrainment). In light of the foregoing evidence, the Services conclude that turbine entrainment at Iron Gate Dam presently causes a degree of mortality to downstream migrating resident fish comparable to that cited in the studies above and would cause comparable losses of reintroduced anadromous fish populations in the future, absent effective fish screening systems. The Applicant has acknowledged, based on their initial review of other studies, that tens of thousands of resident fish are likely entrained annually at each of the unscreened mainstem Klamath River developments and estimated that between 7 to 21 percent of those fish are killed passing through the Iron Gate Powerhouse (PacifiCorp 2004a, Exhibit E 4-113). The Applicant has estimated that approximately 85,848 fish are entrained annually at each mainstem development and that many of these fish are nongame or warmwater fish species. Volitional fish passage would be consistent with fish movement through Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat, as well as ensuring that the goals and objectives of the Klamath River Basin Fishery Task Force and the Services for resource management are met. The Licensee must provide effective facilities to meet these goals and objectives and mitigate for impacts of the dam. The 5 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Spillway Prescription Rationale: Spill survival estimates for juvenile salmonids are numerous and range from 70 percent to 100 percent, depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (Bell and DeLacy 1981 in National Marine Fisheries 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Turbulent mixing of spilled water with receiving waters may result in gas supersaturation and resultant gas bubble disease in fish. Dissolved nitrogen concentrations of more than 130 percent of normal equilibrium levels have been measured in tailwaters (Ebel and Raymond 1976). The threshold value for significant mortality among juvenile Chinook salmon and steelhead trout occurs when nitrogen gas levels are about 115 percent of normal. Along the Columbia River, where many spillways discharge from a given dam and there are many consecutive dams along the stream course, supersaturation increases cumulatively from one dam to the next. Losses of salmon and steelhead trout in this river due to supersaturation have been severe in years of high spillage (Ebel and Raymond 1976). Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g. baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water.

Given the steepness and configuration of the Iron Gate Dam spillway, the Services conclude that spillway mortality will likely occur at levels near the high end of the range found in the studies above. Therefore, the following spillway modifications and 5 year timeline are necessary to meet resource goals and objectives as quickly as possible.

1.1 Iron Gate Dam Upstream Fishway

1.1.1 Fishway Design Features and Performance Standards: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at Iron Gate Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria for anadromous fish (National Marine Fisheries Service 2003) or alternative acceptable criteria for other species as determined by the Services. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools. An auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The AWS shall be screened and bypassed in accordance with NMFS juvenile fish screen and bypass criteria (National Marine Fisheries Service 1997) or such alternative criteria as may be determined acceptable to the Services. The AWS shall be designed to provide the correct water quality and quantity to effectively attract fish. The fish ladder and AWS together must supply at least 5-10 percent of high fish passage design flow (National Marine Fisheries Service 2003) for adequate attraction to the ladder. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The ladder shall include features to detect and record data for PIT-tagged (or fish identified using similar technology) upstream migrating fish. The construction shall include features to modify the existing development to hold, count, and mark fish and to sort fish by age, species, and origin for the purposes of fish population restoration and management. The upstream fishway must be constructed to current criteria for passage of Pacific lamprey. The Licensee shall complete construction and begin operation of the fishway within 5 years of the issuance of the new license.

1.1.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged (or fish identified using similar technology) upstream migrating anadromous fish. The Licensee shall develop design and construction plans according to the terms of 1.1.1 above within 2 years of the issuance of a new license for review and approval by the Services prior to construction. The design shall include features to modify the existing development to hold, count, and mark fish;

and to sort fish by age, species, and origin for the purposes of fish population restoration and management.

1.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

1.2 Iron Gate Dam Downstream Fishway

1.2.1 Intake Fish Screens and Bypass Facilities: The Licensee shall, to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout, construct, operate, maintain, and evaluate a fish screen and bypass facility for volitional fish passage at Iron Gate Dam. The screens and bypass shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service and NMFS Engineering. The screens and bypass shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The bypass facility shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall complete construction and begin operation of the fishway within 5 years of the issuance of the new license.

1.2.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

1.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

1.3 Iron Gate Spillway

1.3.1 Spillway Modification: The Licensee shall modify, maintain, and evaluate hydraulically-engineered spillway modifications to improve volitional downstream fish passage at Iron Gate Dam for Chinook and coho salmon, steelhead trout, and redband trout. The purpose of all spillway modifications is to improve hydraulic conditions and overall fish passage conditions on the downstream side of the dam, to prevent false attraction to non-passable areas, and to make the entrance of the fishway more accessible. The spillway modifications shall be constructed and operational within 5 years of the issuance of the new license.

1.3.2 Spillway Design Consultation: Within 2 years of the issuance of the new license, the Licensee shall develop design and construction plans according to the terms of 1.1.1 above for review and approval by the Service and NMFS Engineering.

1.3.3 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

2. Fall Creek Diversion Dam

The prescriptions for fishways at the Fall Creek Diversion Dam are made solely by the Service. The prescription for the Fall Creek Powerhouse Tailrace Barrier is made jointly by NMFS and the Service.

Upstream Prescription Rationale: There are currently no upstream fish passage facilities at the Fall Creek Diversion Dam for any species (PacifiCorp 2004b Fish Resources FTR). This dam is a seasonal or low flow barrier to the upstream movement of fish (Scott Snedaker, BLM pers. comm.). The Applicant has proposed an upstream fishway at this development. The Service's prescription is consistent with this proposal. Redband/rainbow trout are present in Fall Creek below the dam and above the dam. The fish need to be able to move between the two areas to make seasonal use of habitat. Volitional upstream passage would be consistent with the Service goal to successfully restore resident fish to their historical range. One objective of reaching this goal is the restoration of safe, timely, and effective fish movement, and to ensure the Project does not impair future restoration of fish populations in the upper Fall Creek and Klamath River systems. The Licensee must provide effective facilities to meet the volitional passage goal and mitigate for impacts of the diversion dam. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Downstream Prescription Rationale: There are currently no downstream fish passage facilities at the Fall Creek Diversion Dam for any species (PacifiCorp 2004b Fish Resources FTR, Exhibit E). The Applicant has proposed a downstream fish screen at this development. We agree with the Applicant's proposal to screen downstream migrating fish. In addition, a bypass system is needed to guide the movement of redband/rainbow trout and restore historical fish populations in Fall Creek. Redband trout are present above the diversion. The Service concludes that trout (in particular fry and juveniles) move downstream here as they do in the Klamath River system elsewhere (Hemmingsen 1997), a significant portion move through the diversion canal, and that turbine entrainment at the Fall Creek Powerhouse causes significant mortality to downstream migrating redband trout (see the discussion for the Downstream Prescription Rationale for the Iron Gate Dam development). The Licensee must provide effective facilities to protect rainbow/redband trout and mitigate for impacts of the dam. With the 5 cfs proposed for instream flows by the Licensee and the construction of a functional fish ladder at the Fall Creek Diversion Dam, biological connectivity for rainbow trout would be restored to some degree in upper Fall Creek. However, the progeny of these fish must be excluded from the power canal and turbines. Adequate passage conditions would be consistent with the Service's goal of restored fish

populations in the Fall Creek system. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Fall Creek Powerhouse Tailrace Prescription Rationale: With an upstream fishway at Iron Gate Dam, anadromous fish would migrate to Fall Creek. Water discharging from the Fall Creek Powerhouse can represent a significant portion of the total flow of Fall Creek in the vicinity of the powerhouse. Coots (1954; 1957; 1962) reported steelhead, Pacific lamprey, and both coho and Chinook salmon in Fall Creek downstream from the powerhouse. The natural tendency for fish attracted to such an area is to hold and wait for upstream passage opportunities or to attempt to move past the obstacle either by swimming or leaping. Depending on powerhouse operations, water velocities in hydropower facilities range from roughly 5 to 10 fps; these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985). To prevent injury or mortality to salmonids caused by attempts to swim upstream into the tailrace, a barrier is required to prevent fish from entering this area (National Marine Fisheries Service 2003). The 5 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

2.1 Fall Creek Diversion Dam Upstream Fishway

2.1.1 Fall Creek Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional upstream fishway at the Fall Creek Diversion Dam to provide for the safe, timely, and effective upstream passage of rainbow/redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NOAA's National Marine Fisheries Service (NMFS) criteria (National Marine Fisheries Service 2003) or alternative criteria as determined by the Service. The ladder shall provide for the uninterrupted passage of fish over the full range of Fall Creek flows for which the Project maintains operational control. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The fishway shall be constructed and operational within 3 years of the issuance of the new license.

2.1.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of 1.1.1 above within 1 year of license issuance for review and approval by the Service prior to construction.

2.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

2.2 Fall Creek Diversion Dam Downstream Fishway

2.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility at the Fall Creek Diversion Dam to provide for the safe, timely, and effective downstream passage of rainbow/redband trout. The screens and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service. The screens and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The downstream fishway shall be constructed and operational within 3 years of the issuance of the new license.

2.2.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above, within 1 year of the issuance of the new license, for review and approval by the Service prior to construction.

2.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

2.3 Fall Creek Powerhouse Tailrace Barrier

2.3.1 Tailrace Barrier Construction: The Licensee shall construct a tailrace barrier and guidance system at Fall Creek Powerhouse. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 5 years of the issuance of the new license.

2.3.2 Tailrace Barrier Design: The Licensee shall, within three years of the issuance of the new license develop detailed design and construction plans for Service and NMFS Engineering approval for a tailrace barrier and guidance system to protect adult fish according to the terms of 1.1.1 above.

2.3.3 Tailrace Barrier Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

3. Spring Creek Diversion Dam

The prescriptions for fishways at the Spring Creek Diversion Dam are made solely by the Service.

Upstream Prescription Rationale: There are currently no upstream fish passage facilities at the Spring Creek Diversion Dam for any species (PacifiCorp 2004b Fish Resources FTR). The

Applicant has proposed an upstream fishway at this development. We agree with this action and our prescription is consistent with the Applicant's proposal. Redband/rainbow trout are present in Spring Creek below the dam and above the dam. The fish need to be able to move between the two areas to make seasonal use of habitat. Volitional upstream passage would be consistent with the Service goal to successfully restore resident fish to their historical range. The objective in reaching these goals is the restoration of safe, timely, and effective fish movement, and to ensure the Project does not impair future restoration of fish populations in the upper Spring Creek, Jenny Creek, and Klamath River systems. The Licensee must provide effective facilities to meet the volitional passage goal and mitigate for impacts of the diversion dam. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Downstream Prescription Rationale: There are currently no downstream fish passage facilities at the Spring Creek Diversion Dam for any species (PacifiCorp 2004b Fish Resources FTR). The Applicant has proposed a downstream fish screen at this development. We agree with the Applicant's proposal to screen downstream migrating fish. In addition, a bypass system is needed to guide the movement of redband/rainbow trout and restore historical fish populations in Spring Creek. The Service concludes that trout (in particular fry and juveniles) move downstream here as they do in the Klamath River elsewhere (Hemmingsen 1997), a significant portion move through the Spring Creek diversion canal to Fall Creek, and turbine entrainment at the Fall Creek Powerhouse causes significant mortality to redband/rainbow trout that have originated in Spring Creek (see the discussion for the Downstream Prescription Rationale for the Iron Gate Dam development). Volitional fish passage to a bypass around the Spring Creek Diversion Dam is consistent with the Service goals and objectives for resource management. The Licensee must provide effective facilities to meet these goals and mitigate for impacts of the dam. With minimum flows and the construction of a functional fish ladder at the Spring Creek Diversion Dam, biological connectivity for rainbow trout would be restored to some degree in Spring Creek. However, these fish must be excluded from the power canal and turbines. Adequate passage conditions would be consistent with the Service's goal of restored fish populations in the Spring Creek system. The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

3.1 Spring Creek Diversion Dam Upstream Fishway

3.1.1 Spring Creek Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at Spring Creek Diversion Dam to provide for the safe, timely, and effective upstream passage of rainbow/redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria (National Marine Fisheries Service 2003) or alternative criteria as determined by the Service. The ladder shall provide for the uninterrupted passage of fish over the full range of Spring Creek flows for which the Project maintains operational control. The ladder shall have a maximum drop between pools of 0.5 ft (Table 1) and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The fishway shall be

constructed and operational within 3 years of the issuance of the new license.

3.1.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service prior to construction.

3.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

3.2 Spring Creek Diversion Dam Downstream Fishway

3.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility at the Spring Creek Diversion Dam to provide for the safe, timely, and effective downstream passage of rainbow/redband trout. The screen and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service. The screens and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The downstream fishway shall be constructed and operational within 3 years of the issuance of the new license.

3.2.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service prior to construction.

3.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

4. Copco 2 and Copco 1 Dams

Copco 2 and Copco 1 Upstream Prescription Rationale: Historically coho salmon, Pacific lamprey, steelhead, and spring-run and fall-run Chinook salmon (Hamilton et al. 2005) and resident trout migrated above the site of Copco 2 and Copco 1 dams to reach holding, spawning, incubation, and rearing habitat. Copco 2 and Copco 1 dams are a barrier to this passage and thus to holding, spawning, incubation, and rearing habitat in tributaries (Shovel, Long Prairie, Deer, Edge, Frain, Negro, Tom Hayden, Topsy, and Beaver creeks) and the Boyle peaking and bypass reaches (Table 3). The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore corresponding life history phases of anadromous salmonids to their historical range and to this habitat. The Service goal is to successfully restore resident fish to their historical range and habitat as well. The objective in reaching these goals is restoration of

safe, timely, and effective fish movement through volitional fish passage. Providing volitional fish passage at Copco 2 and Copco 1 dams is consistent with goals and objectives for resource management of the Services and the Klamath River Basin Fisheries Task Force. The Licensee shall provide effective facilities to meet these goals and mitigate for the impacts of the dam. The 6-8 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Benefits – The Copco Dams are less than one half mile apart. Specific benefits of fishways at Copco 2 and Copco 1 dams include:

- Resident Trout: For the resident redband/rainbow trout currently present both above and below Copco 2 and 1 dams, fishways would restore historical seasonal migration patterns for immature fish, restore population connectivity and genetic diversity, and allow greater utilization of existing habitat and refugial areas. For resident rainbow/redband populations, fish passage at the Copco dams alone would result in restoring the connectivity of fish populations in the mainstem Klamath River below the Copco dams with those in tributaries above the dams and the Klamath River reach designated as Wild Trout water by the CDFG (California Department of Fish and Game 2005). The lower 2.7 miles of Shovel Creek are accessible and provide important habitat elements for rainbow/redband trout, including spawning and temperature related refugial areas. With fish passage, Shovel Creek would again become accessible to resident trout from below the Copco dams and seasonal migration and habitat use would be restored.
- Coho: Coho salmon are present in the Klamath River below Iron Gate Dam and were present historically below and above Copco 2 and Copco 1 dams. Copco 2 and Copco 1 dams block these fish from reaching elements of their historical habitat. Between Copco 1 and Copco 2 dams and the next barrier upstream (J.C. Boyle Dam), coho salmon would have access to 25.8 miles of habitat, including the J.C Boyle peaking and bypass reaches of the Klamath River mainstem (Table 3). With fish passage, coho would have access to this habitat again and connectivity to refugial areas would be restored.
- Spring-run Chinook: With passage, spring-run Chinook salmon access to cool water refugial areas such as the 220 cfs of spring water in the J.C. Boyle bypassed reach would be restored. During summer months, this would provide key holding, coolwater refugial habitat necessary for this run of fish (McCullough 1999). Juvenile spring-run Chinook would be able to rear in the cool water habitat adjacent to the springs in the J.C. Boyle bypass reach. These springs also provide warmer, ice-free habitat during winter months (Hanel and Gerlach 1964). The temperature of incoming spring water does not vary substantially from 50 to 55°F throughout the year (USDI Bureau Land Management 2003) and would be optimal for juvenile Chinook growth (McCullough 1999). Spring-run Chinook adults would also have access to the main channel as an upstream migration corridor necessary to reach historical spawning areas in the Upper Klamath Basin (California Department of Fish and Game 1990).
- Fall-run Chinook: Between Copco 2 and Copco 1 dams and the next barrier upstream (J.C. Boyle Dam), passage for fall-run Chinook salmon would restore access to 25.8 miles of habitat, including the J.C Boyle peaking and bypass reaches of the Klamath

River mainstem (Table 3). Snyder (1931) reported large numbers of salmon annually passed the point where the Copco dams are now located. The lower 2.7 miles of Shovel Creek continue to provide good salmonid habitat. The reach of the Klamath River between Copco 1 Reservoir and the Oregon/California State line is designated Wild Trout water and is currently managed under the Wild Trout Program by the CDFG (California Department of Fish and Game 2005). With fish passage, this area would again become accessible to fall-run Chinook salmon.

- Pacific Lamprey Between Copco 2 and Copco 1 dams and the next barrier upstream (J.C. Boyle Dam), passage for Pacific lamprey would restore access to 27.1 miles of habitat, including the J.C Boyle peaking and bypass reaches of the Klamath River mainstem (Table 3). Pacific Lamprey were present historically above Copco 2 and Copco 1 dams (Hamilton et al. 2005). Pacific Lamprey are able to access higher gradient stream reaches and would fully use the 27.1 miles of habitat in Shovel, Long Prairie, Deer, Edge, Frain, Negro, Tom Hayden, Topsy, and Beaver creeks (Table 3). With fish passage, this habitat would again be utilized by Pacific lamprey.
- Steelhead Between Copco 2 and Copco 1 dams and the next barrier upstream (J.C. Boyle Dam), passage would allow steelhead to regain access to 27.1 miles of habitat, including the J.C Boyle peaking and bypass reaches of the Klamath River mainstem (Table 3). Steelhead occurred historically above the Copco 2 and Copco 1 dams (Hamilton et al. 2005). Steelhead are generally tributary spawners and able to access reaches of tributaries upstream from areas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would utilize habitat in its entirety in tributaries above the Copco dams. This means that steelhead would fully have access to the 27.1 miles of habitat in Shovel, Long Prairie, Deer, Edge, Frain, Negro, Tom Hayden, Topsy, and Beaver creeks (Table 3). Seasonal migration of steelhead and access to refugial areas would be restored.

Copco 2 and Copco 1 Downstream Prescription Rationale: Downstream fishways and fishway modifications are prescribed for Copco 2 and Copco 1 dams. Redband/rainbow trout and other resident fish are currently present in Copco reservoirs. The Services conclude that trout (in particular fry and juveniles) move downstream here as they do in the Klamath River elsewhere (Hemmingsen 1997), a significant portion move through the powerhouses, and turbine entrainment at Copco 2 and Copco 1 dams causes significant mortality to downstream migrating redband trout (see discussion of turbine-caused mortality later in this paragraph). In addition, with the construction of a functional adult fish ladder at Iron Gate Dam and the Copco dams, Pacific lamprey, salmon, and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005). The progeny of these fish must negotiate not only the reservoirs but the dams, powerhouses, and spillways during their outmigration. To ensure these fish can safely outmigrate, downstream passage around the dams, powerhouses, and spillways is necessary. Fish migrating downstream can suffer injury or death by passing through turbines at hydroelectric plants (Electric Power Research Institute 1987). Turbine caused mortality can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001), turbine

mortality being caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (Electric Power Research Institute 1987) reported that Francis turbines, which are used at both Copco dams, had average mortality to downstream moving fish of about 24 percent. In light of the foregoing evidence, the Services conclude that turbine entrainment at each Copco dam presently causes levels of mortality to downstream migrating resident fish comparable to those cited in the studies above and would cause comparable losses of reintroduced anadromous fish populations in the future, absent effective fish screening systems. The Applicant has estimated that approximately 85,848 fish are entrained annually at each mainstem development and has estimated that between 7 to 20 percent of fish passing through the Copco 2 Powerhouse are killed and that between 6 to 18 percent of the fish passing through the Copco 1 Powerhouse are killed (PacifiCorp 2004a, Exhibit E 4-113). Volitional fish passage would be consistent with fish movement through the Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat. Volitional fish passage is consistent with the goals and objectives for resource management of the Klamath River Basin Fishery Task Force and the Services. The Licensee must provide effective facilities to meet this goal and mitigate for impacts of the dam. The 6 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Tailrace Prescription Rationale: Water discharging from the Copco 2 and Copco 1 powerhouses can represent the major portion of the total river flow of the Klamath. Under the current license, the powerhouses each can discharge up to ~3000 cubic feet per second (cfs) and the Copco 2 bypass reach contains as little as 5-10 cfs. Even with the Applicant's proposed minimum instream flow, the disparity in flow levels can contribute to false attraction of upstream migrating fish to an area which provides no upstream passage, and delay these fish in their migration. The natural tendency for fish attracted to such an area is to hold and wait for passage conditions to improve, or to attempt to move past the obstacle either by swimming or leaping. Depending on powerhouse operations, water velocities in hydropower facilities range from roughly 5 to 10 feet per second (fps); these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985).

Adult anadromous fish are attracted into oncoming flows (National Marine Fisheries Service 2003). Migration upstream may be delayed when tailrace flows from the powerhouse exceed river bypass reach flows. A migration delay, or combined delays at several facilities, may prevent fish from reaching suitable spawning habitat when they are ready to spawn or conditions are optimal for survival. Migration delays caused by tailrace effects may have a greater impact on fish populations than injury and mortality from turbine impacts (Federal Energy Regulatory Commission 1994). Migration delays may occur to a greater percentage of migrating adults than the percentage of adults impacted by turbine mortality. Migration delays are well documented for anadromous salmonids in the Pacific Northwest (Haynes and Gray 1980; Rondorf et al. 1983; Schadt et al. 1985; Vogel et al. 1990). For migratory adults, false attraction occurs when

upstream migrants are attracted to turbine discharge or spillway flows rather than to fishway flows. False attraction also occurs when upstream migrants detect the scent of their natal stream downstream of its natural outlet (Fretwell 1989). This happens when water from a natal stream is diverted through a canal or pipe to a hydroelectric project. In either instance, without proper project design or operation modifications, there may be migratory delays.

To prevent injury, delay, or mortality to salmonids, caused by attempts to swim upstream into the tailrace, a barrier is required to guide migrating fish away from this area and encourage them to continue their upstream migration (National Marine Fisheries 2003). The 8 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Spillway Prescription Rationale: Spill survival estimates for juvenile salmonids are numerous and range from 70 percent to 100 percent, depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (Bell and DeLacy 1981 in National Marine Fisheries Service 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Turbulent mixing of spilled water with receiving waters may result in gas supersaturation and resultant gas bubble disease in fish. Dissolved nitrogen concentrations of more than 130 percent of normal equilibrium levels have been measured in tailwaters (Ebel and Raymond 1976). The threshold value for significant mortality among juvenile Chinook salmon and steelhead trout occurs when nitrogen gas levels are about 115 percent of normal. Along the Columbia River, where many spillways discharge from a given dam and there are many consecutive dams along the stream course, supersaturation increases cumulatively from one dam to the next. Losses of salmon and steelhead trout in the Columbia River due to supersaturation have been severe in years of high spillage (Ebel and Raymond 1976). Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g. baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water. After examining the height of Copco 1 Dam, the angle of the spillway, and the stair-stepped design of this spillway, the Services conclude that spill entrainment mortality at the Copco 1 development will likely occur at levels near the high end of the range found in the studies above. While Copco 2 Dam is not as high, mortality may occur here as well (National Marine Fisheries Service 2000). Therefore, spillway modifications and a 6 year timeline are necessary to meet resource goals and objectives as quickly as possible.

Transverse Bedrock Sill Fish Barrier Evaluation/Modification Rationale: A transverse bedrock sill is located about RM 197.3 or 0.5 miles above the Copco 2 Powerhouse (1 mile below Copco 2 Dam). Historical fish distribution upstream from this point (Hamilton et al. 2005) indicates this sill was not a fish barrier prior to the Project, but the sill is a depth barrier to salmonids under the current 5-10 cfs release during normal operation, except during periods of spill, and may continue to be a depth barrier under the flows specified in the new license. This impediment to fish was observed during the summer of 2005 (David K. White, NMFS, pers. comm.). The 2 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

4.1 Copco 2 Upstream Fishway

4.1.1 Copco 2 Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at Copco 2 Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria (National Marine Fisheries Service 2003) or alternative criteria as determined by the Service and NMFS Engineering. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools and the auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or such alternative criteria as may be determined acceptable NMFS Engineering and the Service. The AWS shall be designed to provide the correct water temperature and water quality to attract fish. The fish ladder and AWS together must supply at least 5-10 percent of fish passage design high flow for adequate attraction to the ladder. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway must be constructed to current criteria for passage of Pacific lamprey (Table 1). The fishway shall be constructed and operational within 6 years of the issuance of the new license.

4.1.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

4.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

4.2 Copco 2 Downstream Fishway

4.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility for volitional fishway at Copco 2 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead

trout, Pacific lamprey, and redband trout. The screens and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service and NMFS Engineering. The screens and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The bypass facility shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The downstream fishway shall be constructed and operational within 6 years of the issuance of the new license.

4.2.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction.

4.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

4.3 Copco 2 Spillway

4.3.1 Spillway Modification Design Consultation: The Licensee shall modify, maintain, and evaluate a spillway for the volitional passage at Copco 2 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The spillway modifications shall be constructed and operational within 6 years of the issuance of the new license.

4.3.2 Spillway Design: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction.

4.3.3 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

4.4 Copco 2 Tailrace Barrier

4.4.1 Tailrace Barrier Construction: The Licensee shall construct a tailrace barrier and guidance system at Copco 2 Dam. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 8 years of the issuance of the new license.

4.4.2 Tailrace Barrier Design: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 5 years of the issuance of the new license, for review and approval by the Service and NMFS Engineering prior to construction.

4.4.3 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

4.5 Copco 2 Bypass Channel Barrier/Impediment Modification

4.5.1 Barrier Modification: The Licensee shall modify the sill (as provided in 4.5.2 below), unless the Licensee demonstrates through an evaluation (conducted in consultation with the Services and CDFG and in a manner approved by the Services) using accepted fish barrier evaluation methodology (Powers and Orsborn 1985) that the transverse bedrock sill approximately 0.5 miles above the Copco 2 Powerhouse in the Copco 2 bypassed reach is not a barrier to fish passage under normal operating flows specified for the Copco 2 bypassed reach in the new license. The evaluation shall be completed within six months of the issuance of the new license and its conclusions must be approved by the Services.

4.5.2 Design and Construction: The Licensee shall develop design and construction plans for the barrier modification according to the terms of general article 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction. The barrier shall be modified in accordance with specified guidelines and criteria for fish passage (National Marine Fisheries Service 2003), including providing at least 1.0 foot of swimming depth across the sill and with adequate attraction, velocity, capacity and vertical jump characteristics.

4.5.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

5. Copco 1 Dam

5.1 Copco 1 Dam Upstream Fishway

5.1.1 Copco 1 Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional upstream fishway at Copco 1 Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS criteria (National Marine Fisheries Service 2003) or alternative criteria as determined by the Service and

NMFS Engineering. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools and the auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or such alternative criteria as may be determined acceptable to NMFS Engineering and the Service. The AWS shall be designed to provide the correct water temperature and water quality as to attract fish. The fish ladder and AWS together must supply at least 5-10 percent of fish passage design high flow for adequate attraction to the ladder. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall construct the upstream fishway according to current criteria for passage of Pacific lamprey (Table 1). The fishway shall be constructed and operational within 6 years of the issuance of the new license.

5.1.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of general article1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction.

5.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

5.2 Copco 1 Downstream Fishway

5.2.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a fish screen and bypass facility for volitional fish passage at Copco 1 Dam to below Copco 2 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The screens and bypass facility shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria as determined by the Service and NMFS Engineering. The screens and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The bypass facility shall include features to detect and record

data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The downstream fishway shall be constructed and operational within 6 years of the issuance of the new license.

5.2.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

5.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

5.3 Copco 1 Spillway

5.3.1 Spillway Modification: The Licensee shall modify, maintain, and evaluate a spillway for volitional passage at Copco 1 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The spillway modifications shall be constructed and operational within 6 years of the issuance of the new license.

5.3.2 Spillway Design: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 3 years of the issuance of the new license for review and approval by the Service and NMFS prior to construction.

5.3.3 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

5.4 Copco 1 Tailrace Barrier

5.4.1 Tailrace Barrier Construction: The Licensee shall construct a tailrace barrier and guidance system at Copco 1 Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 8 years of the issuance of the new license.

5.4.2 Tailrace Barrier Design: The Licensee shall, within 5 years of the issuance of the new license, develop design and construction plans according to the terms of general article 1.1.1 for review and approval by the Service and NMFS Engineering prior to construction.

5.4.3 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

6. J.C. Boyle Dam

Upstream Prescription Rationale: Historically coho salmon, Pacific lamprey, steelhead, and spring-run and fall-run Chinook salmon (Hamilton et al. 2005) and resident trout (Hanel and Gerlach 1964) migrated above the current site of J.C. Boyle Dam to reach holding, spawning, incubation, and rearing habitat. The upstream fishway at J.C. Boyle Dam is obsolete and does not meet current design criteria. It is a partial barrier to trout passage and thus to critical holding, spawning, incubation, and rearing habitat in tributaries (Spencer, Hunters Park, and Miners creeks) and the Boyle Reservoir to Keno Dam reach (Table 3). The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore corresponding life history phases of anadromous salmonids to their historical range and this habitat. The Service goal is to successfully restore resident fish to their historical range and habitat as well. The objective in reaching these goals is the restoration of safe, timely, and effective fish movement. Providing fishways that meet current criteria at J.C. Boyle Dam is consistent with the goals and objectives for resource management of the Services and the Klamath River Basin Fisheries Task Force. The Licensee shall provide effective facilities to meet these goals and mitigate for the impacts of the dam. The 4 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Benefits: Specific benefits of fishways at J.C. Boyle Dam include:

- Resident Trout: Fish passage at J.C. Boyle Dam alone would restore the unimpaired connectivity of resident redband trout populations in the mainstem Klamath River with those in Spencer Creek. This tributary, in particular, provides important habitat elements, such as spawning and temperature related refugial areas for redband trout. A number of reports document the importance of Spencer Creek habitat to redband trout (Buchanan et al. 1990; Buchanan et al. 1991; Hemmingsen 1997; Hemmingsen et al. 1992; USDI Bureau of Land Management et al. 1995). The Spencer Creek population of Klamath River redband trout is migratory and has connectivity to the population in the mainstem Klamath River and nearby tributary watersheds. This Basin connectivity coupled with homing behavior (and straying of individuals) allows Spencer Creek redband/rainbow trout to be a source of adaptive variability in Klamath Basin trout populations (USDI Bureau of Land Management 1995). This connectivity has been greatly impaired by inadequate passage at J.C. Boyle Dam. The number of redband trout using the J.C. Boyle fish ladder have declined 90 percent or more since shortly after the dam was constructed (Hanel and Gerlach 1964; Hemmingsen et al. 1992; Oregon Department of Fish and Wildlife 2006a). An upstream ladder, built to current criteria and with the entrance located to avoid false attraction flows, would provide for the safe, timely and effective passage around J.C. Boyle Dam for redband trout migrating to Spencer Creek and upstream. With fish passage, habitat in Spencer Creek and habitat between J.C. Boyle Dam and Keno Dam would be fully utilized. Seasonal migration of steelhead and access to refugial areas would be restored.
- Coho: Coho salmon are present in the Klamath River below Iron Gate Dam and were present historically below and above the J.C. Boyle Dam to at least Spencer Creek. With

passage at J.C. Boyle Dam, coho salmon would regain access to 9.6 miles of habitat (Table 3). With fish passage, access to this habitat would no longer be unutilized. Seasonal migration of coho and access to refugial areas would be restored.

- Spring-run Chinook: With fish passage at J.C. Boyle Dam, spring-run Chinook salmon would regain access to seasonal cool water refugial areas necessary for this run of fish (McCullough 1999) between J.C. Boyle Dam and the next dam upstream (Keno Dam). Spring-run Chinook would also have access to the main channel as an upstream migration corridor necessary to reach historical spawning areas in the Upper Klamath Basin (California Department of Fish and Game 1990).
- Fall Chinook: With fish passage, fall-run Chinook salmon would regain access to 14.3 miles of habitat, including tributaries and the mainstem Klamath River (Table 3) between J.C. Boyle Dam and the next dam upstream (Keno Dam). With fish passage seasonal migration of fall-run Chinook and access to refugial areas would be restored.
- Pacific Lamprey: With fish passage, Pacific lamprey would regain access to at least 17.1 miles of habitat, including tributaries and the mainstem Klamath River (Table 3) between J.C. Boyle Dam and the next dam upstream (Keno Dam).
- Steelhead: With fish passage, steelhead would regain access to 17.1 miles of habitat between J.C. Boyle Dam and the next dam upstream (Keno Dam). Steelhead are generally tributary spawners and able to access reaches of tributaries upstream from areas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would utilize habitat in its entirety in tributaries above J.C. Boyle Dam. This means that steelhead would fully have access to the 17.1 miles of habitat in Spencer, Hunters Park, and Miners creeks as well as the mainstem Klamath River below Keno Dam (Table 3). Seasonal migration of steelhead and access to refugial areas would be restored.

Downstream Prescription Rationale: Redband/rainbow trout, federally listed suckers, and other resident fish are currently present in J.C. Boyle Reservoir (Desjardins and Markle 2000; PacifiCorp 2004b). The Services conclude that trout (in particular fry and juveniles) move downstream as they do in the Klamath River elsewhere (Hemmingsen 1997) and that the vast majority of these move through the J.C. Boyle Powerhouse because the screens are ineffective and the facility seldom spills. Dam operators at the J.C. Boyle development generally do not spill until Klamath River discharge exceeds 3,000 cfs. Over the past 25 years the Klamath River exceeded this threshold a median of 4.5 days per year and in 12 years it did not exceed 3,000 cfs (Oregon Department of Fish and Wildlife 2006a). The Services conclude that turbine entrainment at J.C. Boyle Dam causes significant mortality to downstream migrating redband trout (see discussion of turbine-caused mortality later in this paragraph). With the construction of a functional adult fish ladder at J.C. Boyle Dam, Pacific lamprey, salmon, and steelhead would return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005). However, the progeny of these fish would also move downstream and must negotiate not only the reservoir but the dam, powerhouse, and spillway during their outmigration. Turbine caused mortality at dams can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001), turbine mortality being caused by pressure changes, cavitation, shear stress, turbulence,

strike, and grinding (Cada 2001). The Electric Power Research Institute (EPRI) (Electric Power Research Institute 1987) reported that the Francis turbines which are used at the J.C. Boyle development have an average mortality of about 24 percent for all subject species. EPRI's studies, and those of Milo Bell (Bell 1986; Bell et al. 1967) measured entrainment for some of the same species and under similar conditions as exist at J.C. Boyle Dam, and thus support the conclusion that entrainment mortality is presently occurring at significant levels for resident fish. The J.C. Boyle development, at 440 feet of head, may have even greater mortality due to turbine entrainment, as pressure gradients will be even greater. For projects with Francis turbines, the EPRI study found a high correlation (r = 0.77) between head and fish mortality. Four hydroelectric developments with Francis turbines that had greater than 335 feet of head had mortality ranging from 33 to 48 percent (Electric Power Research Institute 1987). The facilities in these studies have comparable or less hydraulic head than the J.C. Boyle development and comparable turbine types. Using the above evidence, the Services conclude that entrainment mortality at J.C. Boyle Powerhouse likely falls in this range rather than the 12 to 36 percent range estimated by the Applicant (PacifiCorp 2004a, Exhibit E 4-113). When anadromous fish are restored above J.C. Boyle Dam, out-migrating salmonid smolts, including federally listed coho, would be entrained and a significant portion killed during turbine passage absent downstream fish screens and bypass systems. Volitional fish passage would be consistent with fish movement through Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat. It is also consistent with the goals and resource management objectives of the Klamath River Basin Fishery Task Force and the Services.

The development of detailed design and construction plans for review and approval by the Service and NMFS Engineering is critical to ensure that effective passage measures are incorporated into the design. The 4 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Sidecast Rock Barrier Removal Prescription Rational: Sidecast rock extends from the J.C. Boyle canal access road into and across the J.C. Boyle bypass channel, blocking or inhibiting fish passage. Presently, all flows in the bypass reach filter through the sidecast rock and there is no unimpeded route for anadromous fish passage at the typical bypass flows observed. The rock has been deposited in this channel recently and is sidecast from Project construction and operation of the J.C. Boyle canal and access road. This impediment to fish was observed during the summer of 2005 (David K. White, NMFS, pers. comm.). Historically, higher flows in the bypassed channel might have been able to disperse this material and restore fish movement. Removal is necessary to achieve the safe, timely, and effective passage through the channel past this obstruction and would be consistent the goals and objectives for resource management of the Services and the Klamath River Basin Fishery Task Force. The 2 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Tailrace Prescription Rationale: Water discharging from the J.C. Boyle Powerhouse represents a significant portion of the total river flow of the Klamath River. Under the current license the powerhouse can discharge up to 3000 cubic feet per second (cfs) and the bypass reach contains as little as 320 cfs. Even with the instream flow in the bypassed channel proposed by the

Applicant, this disparity in flows contributes to false attraction for upstream migrating fish to an area which provides no upstream passage. The natural tendency for fish attracted to such an area is to hold and wait for passage conditions to improve or to attempt to move past the obstacle either by swimming or leaping. Depending on powerhouse operations, water velocities in hydropower facilities range from roughly 5 to 10 fps; these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985).

Adult anadromous fish are attracted into oncoming flows (National Marine Fisheries Services 2003). Migration upstream may be delayed when tailrace flows from the powerhouse exceed river bypass reach flows. A migration delay, or combined delays at several facilities, may prevent fish from reaching suitable spawning habitat when they are ready to spawn or conditions are optimal for survival. Migration delays caused by tailrace effects may have a greater impact on fish populations than injury and mortality from turbine impacts (Federal Energy Regulatory Commission 1994). Migration delays may occur to a greater percentage of migrating fish than the percentage of fish impacted by turbine mortality. Migration delays are well documented for anadromous salmonids in the Pacific Northwest (Haynes and Gray 1980; Rondorf et al. 1983; Schadt et al. 1985; Vogel et al 1990). For migratory fish, false attraction occurs when upstream migrants are attracted to turbine discharge or spillway flows rather than to fishway flows. False attraction also occurs when upstream migrants detect the scent of their natal stream downstream of its natural outlet (Fretwell 1989). This happens when water from a natal stream is diverted through a canal or pipe to a hydroelectric project. In either instance, without proper project design or operation modifications, there may be migratory delays.

In order to prevent injury, delay, or mortality to salmonids, caused by attempts to swim upstream into the tailrace, a barrier is required to guide migrating fish away from this area and encourage them to continue their upstream migration. The 4 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Spillway Prescription Rationale: Spill survival estimates for juvenile salmonids are numerous and range from 70 percent to 100 percent, depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (Bell and DeLacy 1981 in National Marine Fisheries Service 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Turbulent mixing of spilled water with receiving waters may result in gas supersaturation and resultant gas bubble disease in fish. Dissolved nitrogen concentrations of more than 130 percent of normal equilibrium levels have been measured in tailwaters (Ebel and Raymond 1976). The threshold value for significant mortality among juvenile Chinook salmon and steelhead trout occurs when nitrogen gas levels are about 115 percent of normal. Along the Columbia River, where many spillways discharge from a given dam and there are many consecutive dams along the stream course, supersaturation increases cumulatively from one dam to the next. Losses of

salmon and steelhead trout in the Columbia River due to supersaturation have been severe in years of high spillage (Ebel and Raymond 1976). Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g. baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water. The configuration of the J.C. Boyle Dam spillway includes numerous rocks and many such solid objects and it is reasonable to conclude that significant mortality will occur while passing fish through the spillway. Therefore, the following spillway modifications and 4 year timeline are necessary to meet resource goals and objectives as quickly as possible.

6.1 J.C. Boyle Bypass Channel

6.1.1 Barrier Removal: The Licensee shall remove the sidecast rock barrier approximately 2.5 mile above the J.C. Boyle Powerhouse in the J.C. Boyle Bypass reach within 2 years of the issuance of the new license to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout.

6.1.2 Design and Construction: The Licensee shall develop design, construction, and maintenance plans according to the terms of general article 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction.

6.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

6.2 J.C. Boyle Upstream Fishway

6.2.1 J.C. Boyle Upstream Fishway: The Licensee shall construct, operate, maintain, and evaluate a volitional fishway at J.C. Boyle Dam to provide for the safe, timely, and effective upstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The fishway shall be operated year-round and shall consist of a fish ladder designed in accordance with NMFS' criteria (National Marine Fisheries Service 2003) or alternative criteria acceptable to the Service and NMFS Engineering. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The ladder shall have a minimum of two entrances and associated entrance pools and the auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The ladder entrance shall be located downstream of the fish screen bypass outfall and existing velocity barrier below the existing ladder. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997), or such alternative criteria as may be determined acceptable by NMFS Engineering and the Service. The AWS shall be designed to provide the correct water temperature and water quality as to attract fish.

The fish ladder and AWS together must supply at least 5-10 percent of fish passage design high flow for adequate attraction to the ladder. The ladder shall have a maximum drop between pools of 0.5 ft and the maximum slope of the fish ladder shall not exceed 10 percent (Table 1). The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway must be constructed to current criteria for passage of Pacific lamprey. The fishway shall be constructed and operational within 4 years of the issuance of the new license.

6.2.2 Design Consultation: The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction.

6.2.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

6.3 J.C. Boyle Downstream Fishway

6.3.1 Intake Fish Screens and Bypass Facility: The Licensee shall construct, operate, maintain, and evaluate a new fish screen and a bypass facility at J.C. Boyle Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, Pacific lamprey, and redband trout. The screen and bypass shall be operated year-round and shall be designed in accordance with NMFS juvenile fish screen and bypass facility criteria (National Marine Fisheries Service 1997) or alternative criteria acceptable to the Service and NMFS Engineering. The screen and bypass facility shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The screen shall divert all fish to a bypass facility. The bypass facility shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall complete construction and begin operation within 4 years of the issuance of the new license.

6.3.2 Design Consultation: The bypass facility design shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology). The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction.

6.3.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

6.4 J.C. Boyle Spillway

6.4.1 Spillway Modification: The Licensee shall modify, maintain, and evaluate a spillway for the volitional passage at J.C. Boyle Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, steelhead trout, and redband trout. The spillway modifications shall be constructed and operational within 4 years of the issuance of the new license.

6.4.2 Spillway Design: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 2 years of the issuance of the new license for review and approval by the Service and NMFS engineering prior to construction.

6.4.3 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

6.5 J.C. Boyle Tailrace Barrier

6.5.1 Tailrace Barrier Construction: The Licensee shall construct a tailrace barrier and guidance system at J.C. Boyle Dam. The tailrace barrier and guidance system shall be constructed according to approved design plans and within 4 years of the issuance of the new license.

6.5.2 Tailrace Barrier Design –The Licensee shall, within 2 years of the issuance of the new license, develop design and construction plans according to the terms of general article 1.1.1 for review and approval by the Service and NMFS Engineering prior to construction.

6.5.3 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

7. Keno Dam

Upstream Prescription Rationale: Historically steelhead, spring-run and fall-run Chinook salmon (Hamilton et al. 2005), and resident fish migrated through the current site of Keno Dam to reach holding, spawning, incubation, and rearing habitat. Keno Dam is a partial barrier to this passage and thus to holding, spawning, incubation, and rearing habitat in the Link River reach. The goal of the Services and the Klamath River Basin Fisheries Task Force is to successfully restore corresponding life history phases of anadromous salmonids to their historical range and habitat. The goal of the Service is to successfully restore resident fish to their historical range and habitat as well. The objective in reaching these goals is restoration of safe, timely, and

effective fish movement. Providing fish passage that meets current standards at Keno Dam is consistent with goals and objectives for resource management of the Services and the Klamath River Basin Fisheries Task Force. The Licensee shall provide effective facilities to meet these goals and mitigate for the impacts of the dam.

Keno Reservoir in its current state would be primarily a migration corridor for anadromous salmonids because the depth and velocity of the impoundment provide little suitable habitat. Link River is the only free flowing reach of the Klamath River between Keno Dam and Link River Dam. Link River provides habitat for Klamath largescale suckers (Catastomus snyderi) during all months of the year, and for Lost River and shortnose suckers in summer when water quality is poor in downstream Lake Ewauna (Rich Piaskowski, BOR, pers. comm.) For salmonids, Link River provides habitat most of the year other than summer months. During most years, the Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) has dissolved oxygen concentrations greater than 6 mg/L and temperatures less than 20C from mid-November through mid-June (Jason Cameron, BOR, pers. comm.). These conditions are within the criteria for migrating adult anadromous salmonids for these months (U. S. Environmental Protection Agency 2003). However, interim, seasonal, upstream trap and haul for adult Chinook salmon around Keno Reservoir and Lake Ewauna would be necessary during summer months when DO and temperature are out of criteria for this life stage of this species (USEPA 2003) and water quality conditions may not be suitable for migration. The Services expect that the major runs of these fish would occur from March to June for spring- run adult Chinook and October through December for fall-run adults. The Services expect trap and haul to be an effective interim, seasonal fish passage method for adult Chinook salmon under these summer conditions because only this species would be transported and only for a short distance. Other species need volitional fishways to access habitat in Keno Reservoir and Link River year round. Conditions in this reach are expected to improve over time to a point when volitional passage will be effective year-round for all target species. Water quality is expected to improve over the term of a new Project license through the implementation of the Total Maximum Daily Load (TMDL) process, imposition of state water quality certification conditions, and provisions of a new license including terms and conditions added by the Commission as well as the inclusion of recommendations pursuant to FPA section 10(j). Upper Klamath Lake above Link River Dam currently provides habitat for salmonids. Water quality problems in the lake during the summer months are relatively short lived and springs in the lake provide thermal refugial areas for redband trout and other species. Redband trout are also well known for migrating upstream into the Wood and Williamson rivers when Upper Klamath Lake water quality deteriorates. Once fish pass Keno Dam, Keno Reservoir, and Lake Ewauna, the current upstream fishway at Link River Dam would pass anadromous fish species (including Pacific lamprey) on their way to currently available, good quality upstream habitat upstream (Oregon Department of Fish and Wildlife 1997; Huntington 2006). The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

Keno Dam may impede native suckers occupying habitat below the dam from reaching elements of their historical habitat including Lake Ewauna, Link River, and Upper Klamath Lake, the core recovery area for this species (USDI Fish and Wildlife Service 1993). The existing fishway at

Keno Dam does not meet Service and ODFW criteria for sucker passage (Table 1) because the slope is too steep (USDI Fish and Wildlife 2005). However, the potential contribution of the J.C. Boyle Reservoir population for conservation of the species may be limited. Monitoring of fish passage at Keno Dam has demonstrated small numbers of fish moving upstream through the existing ladder at Keno Dam (PacifiCorp 1997). Until additional information becomes available regarding the populations of federally listed suckers in J.C. Boyle Reservoir and the need for passage of federally listed suckers upstream, the Service will reserve the authority to prescribe an upstream fishway to sucker criteria at Keno Dam.

Benefits of fishways at Keno Dam include:

- Resident Trout: Significant recreational fisheries for redband trout currently exist in the Project area, as well as in and upstream of Upper Klamath Lake. Upstream fish passage at Keno Dam would result in restoring the connectivity of resident redband populations in the mainstem Klamath River with those in Keno Reservoir/Lake Ewauna, Link River, and Upper Klamath Lake. In 2005, Reclamation completed a new fishway at Link River Dam designed to pass endangered suckers, trout, lamprey, and other native species. Adequate upstream fish passage at Link River Dam has resulted in restoring the connectivity of resident redband populations in the Link River reach with those in Upper Klamath Lake and its tributaries. These tributaries, including the Wood, Williamson, and Sprague rivers in particular, provide important habitat elements, such as spawning and temperature related refugial areas for redband trout (Oregon Department of Fish and Wildlife 1997). With fish passage, habitat between Keno and Link River Dam would be fully utilized. Seasonal migration of trout and access to refugial areas would be improved.
- Spring-run Chinook salmon, fall-run Chinook, and steelhead: All these species occurred historically above the current site of Keno Dam and Upper Klamath Lake (Hamilton et al. 2005). With upstream fishways at downstream dams and the new ladder at Link River Dam, adequate anadromous fish passage facilities at Keno Dam would mean these runs would regain access to 49 significant tributaries in the Upper Klamath Basin, comprising 360 miles of currently productive anadromous fish habitat (if anadromous fish had access to this habitat) and an additional 60 miles of recoverable habitat (Huntington 2006). Large populations of spring-run Chinook were found in several of the tributaries to Upper Klamath Lake, including both the Williamson and Sprague rivers (California Department of Fish and Game 1990). Historical run sizes in each these two rivers were estimated to be at least 5,000 spring-run Chinook salmon (California Department of Fish and Game 1990). Substantial numbers of what were apparently fall-run Chinook were still being harvested in the Sprague River up until about 1910 (Lane and Lane Associates 1981). Steelhead are generally tributary spawners and able to access reaches upstream from areas where salmon spawn (Platts and Partridge 1978). Therefore, with fish passage, steelhead would have access to tributaries above Keno Dam. Seasonal migration of anadromous salmonids and access to refugial areas would be restored.
- Pacific lamprey: At Keno Dam the existing fishway does not meet current criteria to accomplish lamprey passage because corners and ladder steps are not rounded (USDI

Fish and Wildlife 2005). Lampreys occur long distances inland in the Columbia and Yakima river systems (Wydoski and Whitney 2003) and would likely do so in the Klamath River system as well, as habitat conditions are similar.

Spillway Prescription Rationale: Spill survival estimates for juvenile salmonids are numerous and range from 70 percent to 100 percent depending on species, life stage, amount or proportion of water spilled, spillway configuration, tailwater hydraulics, the methodology of estimating survival, and predator conditions (Bell and DeLacy 1981 in National Marine Fisheries Service 2000). Fish passing down a spillway may experience physical, chemical, and biological effects. Fish passing over spillways can be injured by strikes or impacts with solid objects (e.g. baffles, rocks, or walls in the plunge zone), rapid pressure changes, abrasion with the rough side of the spillway, and the shearing effects of turbulent water. Water exits Keno spillways via undershot gates with small openings and plunges into a wide, shallow bedrock sill that is an area known for predatory fish (Oregon Department of Fish and Wildlife 1997). It is likely that fish will be injured as water is passed through the gates under pressure and that predation will occur in the receiving waters. Therefore, the spillway modifications and 3 year timeline are necessary to meet resource goals and objectives as quickly as possible.

7.1 Upstream Fishway at Keno Dam

7.1.1 Keno Upstream Fishway: To provide for the safe, timely, and effective upstream passage of Chinook salmon, steelhead trout, Pacific lamprey, and redband trout, the Licensee shall modify, operate, and maintain the existing volitional fishway. The Licensee shall also construct, operate, and maintain a holding and sorting facility to accommodate upstream interim, seasonal trap and haul for anadromous salmonids at Keno Dam. In addition, the modification shall include features to trap, hold, and sort anadromous salmonids by age and species, as well as accomplish the transfer of these fish upstream above Link River Dam between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. If agreed to by the Services, seasonal trap and haul shall not be employed during this time in periods when dissolved oxygen concentrations are greater than 6 mg/L and temperatures lower than 20°C, as measured at Miller Island using a method that is acceptable to the Services. The upstream fishway shall be operated year-round regardless of trap and haul operations to allow for the passage of lampreys, suckers and other species. The ladder shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The auxiliary water system (AWS) shall be designed to augment ladder flow from the forebay. The AWS shall be screened in accordance with NMFS juvenile fish screen criteria (National Marine Fisheries Service 1997) or such alternative criteria acceptable to NMFS Engineering and the Service. The AWS shall be designed to provide the correct water temperature and water quality as

to attract fish. The fish ladder and AWS together must supply at least 5-10 percent of fish passage design high flow for adequate attraction to the ladder. The ladder shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway shall be modified to current criteria (Table 1) for passage of Pacific lamprey. The fishway shall be modified and operational within 3 years of the issuance of the new license.

7.1.2 Design Consultation: The Licensee shall develop design and modification plans according to the terms of general article 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS Engineering prior to construction. The design shall include features to hold and sort anadromous salmonids by age and species, as well as accomplish the transfer of these fish upstream between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. Facilities shall be designed so that fish to be trapped and hauled above Keno are held a maximum of 8 hours before transport. The ladder design shall include features to detect and record data for PIT-tagged upstream migrating anadromous fish (or fish identified using similar technology). The upstream fishway must be modified to current criteria for passage of Pacific lamprey.

7.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

7.2 Keno Spillway

7.2.1 Spillway Modification: The Licensee shall modify, maintain, and evaluate the radial gate(s) to provide a spillway at Keno Dam to provide for the safe, timely, and effective downstream passage of Chinook and coho salmon, suckers, lamprey, steelhead trout, and redband trout. The spillway modifications shall be constructed and operational within 3 years of the issuance of the new license.

7.2.2 Spillway Design: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS engineering prior to construction.

7.2.3 Spillway Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

8. Eastside and Westside Developments

Eastside and Westside Downstream Prescription Rationale: PacifiCorp's Eastside and Westside developments divert water at Link River Dam to downstream powerhouses. Significant numbers of redband trout and other resident fish are presently moving downstream from Upper Klamath Lake and being entrained by PacifiCorp's Eastside and Westside developments, including tens of thousands of larvae and juveniles of federally listed suckers annually (Gutermuth et al. 2000). Unless protected by fish screens and bypasses, fish migrating downstream can suffer injury or death by passing through turbines at hydroelectric plants (Electric Power Research Institute 1987). Turbine-caused mortality can have serious consequences for fish populations, especially among anadromous species (Cada 2001). Survival of juvenile salmonids passing dams during their seaward migration is highest through spillways and lowest through turbines (Muir et al. 2001); turbine mortality being caused by pressure changes, cavitation, shear stress, turbulence, strike, and grinding (Cada 2001). The Electric Power Research Institute (Electric Power Research Institute 1987) reported that Francis turbines, which are used at PacifiCorp's Eastside and Westside developments, have an average mortality of about 24 percent. Based upon these studies, turbine similarities, and known entrainment, the Services conclude that turbine entrainment at PacifiCorp's Eastside and Westside developments causes comparable levels of mortality to downstream migrating fish as found in studies cited above. Volitional fish passage would be consistent with fish movement through the Klamath River system for purposes such as spawning, rearing, feeding, and seasonal use of habitat. Volitional fish passage would be consistent with the goals and objectives for resource management of the Klamath River Basin Fishery Task Force and the Services. Downstream fishways at PacifiCorp's Eastside and Westside developments would screen and divert both resident and anadromous fish from turbine intakes. This would guide downstream migrating fish, minimize mortality of federally listed suckers, and ensure that delay and entrainment mortality of redband trout, other resident species, and anadromous outmigrants would be minimized. With the adult fish ladder in place at BOR's Link River Dam and construction of functional adult fish ladders at dams downstream of Link River, Pacific lamprey, salmon, and steelhead will return to hold, spawn, and rear in habitat where they were present historically (Hamilton et al. 2005). However, the progeny of these fish must negotiate not only the reservoir but the dam, powerhouse, and spillway during their outmigration. To ensure that these fish can outmigrate, downstream passage facilities at the Eastside and Westside developments are necessary.

Temporary, seasonal trap and transport for downstream migrants would be necessary due to seasonal water quality problems in Lake Ewauna and Keno Reservoir. During most years, the Lake Ewauna reach of the Klamath River (Link River Dam to Keno Dam) has dissolved oxygen concentrations less than 6 mg/L and temperatures greater than 20°C from mid-June through mid-November (Jason Cameron, BOR, pers. comm.). These conditions are not within criteria (USEPA 2003) for outmigrating juvenile anadromous salmonids and may not be conducive to downstream migration during this period. Transporting outmigrant anadromous salmonids around Keno Reservoir during this period would avoid poor water quality during summer months until restoration efforts improve reservoir dissolved oxygen and water temperatures.

The Services expect that the major outmigrations of juvenile Chinook salmon would occur from March to June for spring-run Chinook and February to May for fall-run juveniles. The Services expect trap and haul to be an effective interim, seasonal fish passage method for Chinook salmon under these summer conditions because only this species would be transported and only for a short distance. Other species need volitional fishways to access habitat in Keno Reservoir\Lake Ewauna and Link River year round. Seasonal trap and haul would be performed on an interim basis. Water quality is expected to improve over the term of a new Project license through the implementation of the Total Maximum Daily Load (TMDL) process, imposition of state water quality certification conditions, and provisions of a new license (the inclusion of 10(j) recommendations).

Migrating suckers make use of habitat in Lake Ewauna as long as water quality is adequate (i.e. outside of July, August, September (Rich Piaskowski, BOR, pers. comm). Downstream migrating suckers captured during periods when water quality is inadequate in Keno Reservoir\Lake Ewauna would be returned to Upper Klamath Lake.

Eastside and Westside Tailrace Barrier Prescription Rationale: Water discharging from the Eastside and Westside powerhouses represents a significant portion of the total river flow of the Klamath River. These developments have no tailrace barriers and have never been tested for mortality to federally listed suckers, other resident fish, or anadromous salmonids. The natural tendency for fish attracted to such an area is to hold and wait for passage conditions to improve, or to attempt to move past the obstacle either by swimming or leaping. Depending on powerhouse operations, water velocities in hydropower facilities range from roughly 5 to 10 fps; these velocities easily fall within the swimming abilities of salmonids (Weaver 1963). The types of injury sustained by some fish entering draft tubes or contacting turbines vary from site to site, as do immediate and delayed mortality rates. Several studies, however, attribute injuries in migrating salmonids to powerhouse structures associated with tailrace structures (Department of Fisheries Canada 1958; International Pacific Salmon Fisheries Commission 1976; Schadt et al. 1985; Williams 1985).

Adult anadromous fish are attracted into oncoming flows (National Marine Fisheries Service 2003). Migration upstream may be delayed when tailrace flows from the powerhouse exceed river bypass reach flows. A migration delay, or combined delays at several facilities, may prevent fish from reaching suitable spawning habitat when they are ready to spawn or conditions are optimal for survival. Migration delays caused by tailrace effects may have a greater impact on fish populations than injury and mortality from turbine impacts (Federal Energy Regulatory Commission 1994). Migration delays may occur to a greater percentage of migrating fish than the percentage of fish impacted by turbine mortality.

Migration delays are well documented for anadromous salmonids in the Pacific Northwest (Haynes and Gray 1980; Rondorf et al. 1983; Schadt et al. 1985; Vogel et al 1990). For migratory fish, false attraction occurs when upstream migrants are attracted to turbine discharge or spillway flows rather than to fishway flows. False attraction also occurs when upstream

migrants detect the scent of their natal stream downstream of its natural outlet (Fretwell 1989). This happens when water from a natal stream is diverted through a canal or pipe to a hydroelectric project. In either instance, without proper Project design or operation modifications, there may be migratory delays. In order to prevent injury, delay or mortality to suckers and salmonids, caused by attempts to swim upstream into the tailraces, barriers are required to guide migrating fish away from the tailrace area to continue their upstream migration.

The 3 year construction timeline is necessary to meet resource goals and objectives as quickly as possible.

8.1 Eastside and Westside Downstream Fishways

8.1.1 Intake Fish Screens and Bypass Facilities: The Licensee shall construct, operate, maintain, and evaluate fish screens and bypass facilities for volitional fishways at both Eastside and Westside developments to provide for the safe, timely, and effective downstream passage of Chinook salmon, steelhead trout, Pacific lamprey, federally listed suckers, and redband trout,. The fish screens and bypass facilities shall be located as close as is practicable to the beginning of each diversion to minimize entrapment in the diversion canals. The fish screens and bypass facilities shall transport fish to holding, sorting, counting, and tagging facilities where fish would either be passed into a volitional fishway or into temporary, seasonal trap and haul facilities for transport downstream. The facilities shall be constructed to accomplish the transfer of these fish downstream between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. If agreed to by the Services, seasonal trap and haul shall be not be employed during this time in periods when dissolved oxygen concentrations are greater than 6 mg/L and temperatures lower than 15°C, as measured at Miller Island using a method that is acceptable to the Services. The bypass facilities shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology), including features to detect and record data from fish tagged above the facilities to evaluate survival and fishway effectiveness. The downstream fishway shall be operated year-round regardless of trap and haul operations to allow for the passage of lampreys, suckers and other species. The screens and bypass facilities shall be operated year-round and shall be designed in accordance with sucker criteria (Table 2), or alternative criteria as acceptable to the Services. The screens and bypass facilities shall provide for the uninterrupted passage of fish over the full range of river flows for which the Project maintains operational control. The construction shall include features to return suckers to Upper Klamath Lake. The downstream fishways shall be constructed and operational within 3 years of the issuance of the new license.

8.1.2 Design Consultation: The Licensee shall develop design and construction plans according to the terms of general article 1.1.1 above within 1 year of the issuance of the new license for review and approval by the Service and NMFS Engineering. The design of the bypass facilities shall include features to detect and record data for PIT-tagged downstream migrating fish (or fish identified using similar technology) and to hold, sort, count, and mark downstream migrating anadromous fish by age and species. The facilities shall include features to detect and record data from fish tagged above the facilities to evaluated survival and fishway effectiveness. The design shall include features to accomplish the transfer of these fish downstream between June 15 and November 15 for the purposes of restoration and the safe, effective, and timely passage of fish. The design shall include features to return suckers to Upper Klamath Lake. Facilities shall be designed so that fish to be trapped and hauled are held a maximum of 8 hours before transport.

8.1.3 Monitoring, Reporting, and Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

8.2 Tailrace Barriers at Eastside and Westside Developments

8.2.1 Tailrace Barrier Construction: The Licensee shall construct a tailrace barrier and guidance system at the Eastside and Westside powerhouses. The tailrace barriers and guidance system shall be constructed according to approved design plans and within 3 years of the issuance of the new license.

8.2.2 Tailrace Barrier Design: The Licensee shall, within 1 year of the issuance of the new license, develop design and construction plans according to the terms of general article 1.1.1 for review and approval by the Service and NMFS Engineering prior to construction.

8.2.3 Tailrace Barrier Evaluation: The Licensee shall complete reporting, monitoring, and evaluation of this facility as specified in General Prescriptions, above.

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