YUROK TRIBE
190 Klamath Boulevard • Post Office Box 1027 • Klamath, CA 95548

LATE COMMENT

February 11, 2009

State of California
Water Resources Control Board
PO Box 2000
Sacramento CA 95812-2000
Attn: Jennifer Watts

RE: Request for Extension of 401 Scoping Comment Deadline for the Klamath Hydroelectric Project from February 23, 2009 to July 15, 2009.

Dear Board Members:

Introduction

You are asked to grant an extension of the 401 scoping comment period for the Klamath Hydroelectric Project. The Yurok Tribe recommends and joins in the other parties' requests for an Extension of the comment period. The Tribe explains briefly here why the health of the Klamath River is essential to the Tribe, and why it believes that additional time to focus on negotiations will lead to improvements in water quality in the Klamath River.

In considering this request, the Yurok Tribe requests that the SWRCB consider and property weigh the overwhelming reliance of the Klamath Tribes, Karuk and Yurok Tribes on the health of the Klamath River and its fisheries and other natural resources.

STANDING

The Yurok People Have a Stake in the Outcome of the 401 Process Because of their Dependence on the Klamath Fishery for Survival

The Klamath River Basin is home to the largest population of Native Tribes in California. With 5,500 registered members the Yurok Tribe is the largest federally recognized Tribe in California.[1] The ancestral territory of the Yurok Tribe was centered on the Klamath

[1] 65 Federal Reg. 13298, March 13, 2000.

Phone: (707) 482-1350 • Fax: (707) 482-1377

and Trinity Rivers. Today, the Yurok Reservation extends for a mile on each side of the Klamath River from the Pacific Ocean to just upstream of the confluence of the Klamath and Trinity Rivers; approximately 45 miles. The Yurok people have depended on the Klamath River for its fisheries, and the River has been the focus of Yurok cultural rites and traditions since time immemorial.[2]

The federal courts have confirmed that for "generations, the Yurok Tribe has depended on the Klamath Chinook salmon for their food and economic livelihood."[3]

The Yurok people are totally reliant on the Klamath River salmon fishery for survival. Historically the Yurok Tribe is allocated approximately 80% of the harvest of fall Chinook in the Klamath River Indian Fishery. Out of this conservation-driven harvest the Yurok Tribe has traditionally harvested approximately 89% of the Salmon in the Klamath River Indian Fishery. In all years the Yurok Tribe has not been able to fulfill its entire need for fish

The Klamath River flows for 45 miles directly through the heart of the Yurok Reservation and is considered by the Tribe to be the lifeblood of the people. As stated in the Yurok Tribal Constitution: "The Yurok people have always lived on this land on the Klamath River. The Yurok bless the deep River and pray for the health of all the animals and prudently harvest and manage the great salmon runs. The Tribe never wastes and uses every bit of salmon, sturgeon, and eels that the River provides. The Klamath River was and remains the people's highway." Therefore, the Tribe must act accordingly and consistent with its goal of protecting tribal cultural and trust resources, which includes, but is not limited to the protection of a healthy salmon fishery.

Obviously, the Yurok Tribe's interest in the water quality certification proceedings is an exceeding significant one.

The Yurok Tribe Dependence on Klamath River Basin Fish

Klamath River fish are irreplaceable to the Yurok Tribe's culture, religion and economy. From time immemorial, Yurok people have depended on the Klamath River. The River is central to Yurok society by providing food, transportation, commercial trade, and numerous other activities essential to Yurok life. Throughout history and today, the identity of the Yurok people has been intricately woven into natural environment including the Klamath Basin watershed. Tribal religious and ceremonial practices focus on the health of the world; the Klamath River and its fisheries are a priority. The Yurok Tribe's obligation to protect the fishery has always been understood by Yurok people. The ancestral territory of the Yurok Tribe included coastal lagoons, marshes, ocean waters, tidal areas, redwood and other ancient forests, prairies and the Klamath River. The Preamble of the Constitution of the Yurok Tribe identifies:

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[2] *Kandra v. United States,* 145 F.Supp.2d 1192, 1200 (D.Ore.2001).
[3] *Parravano v. Masten,* 70 F.3d 539, 545-46 (9th Cir. 1995), *cert. denied,* 518 U.S. 1016 (1996), 116 S.Ct. 2546 (1996).

> Our people have always lived on this sacred and wondrous land along the Pacific Coast and inland on the Klamath River, since the Spirit People, *Wo'ge'* made things ready for us and the Creator, *Ko-won-no-ekc-on Ne ka-nup-ceo*, placed us here. From the beginning, we have followed all the laws of the Creator, which became the whole fabric of our tribal sovereignty. In times past and now Yurok people bless the deep river, the tall redwood trees, the rocks, the mounds, and the trails. We pray for the health of all the animals, and prudently harvest and manage the great salmon runs and herds of deer and elk. We never waste and use every bit of the salmon..., sturgeon, eels, seaweed, mussels, candlefish..., and other ocean and river animals...
>
> (Yurok Tribe Constitution 1993)

The Yurok Reservation extends for a mile on each side of the Klamath River from the Pacific Ocean to above the confluence of the Klamath and Trinity Rivers. The Reservation stretches for a distance of approximately 44 miles.

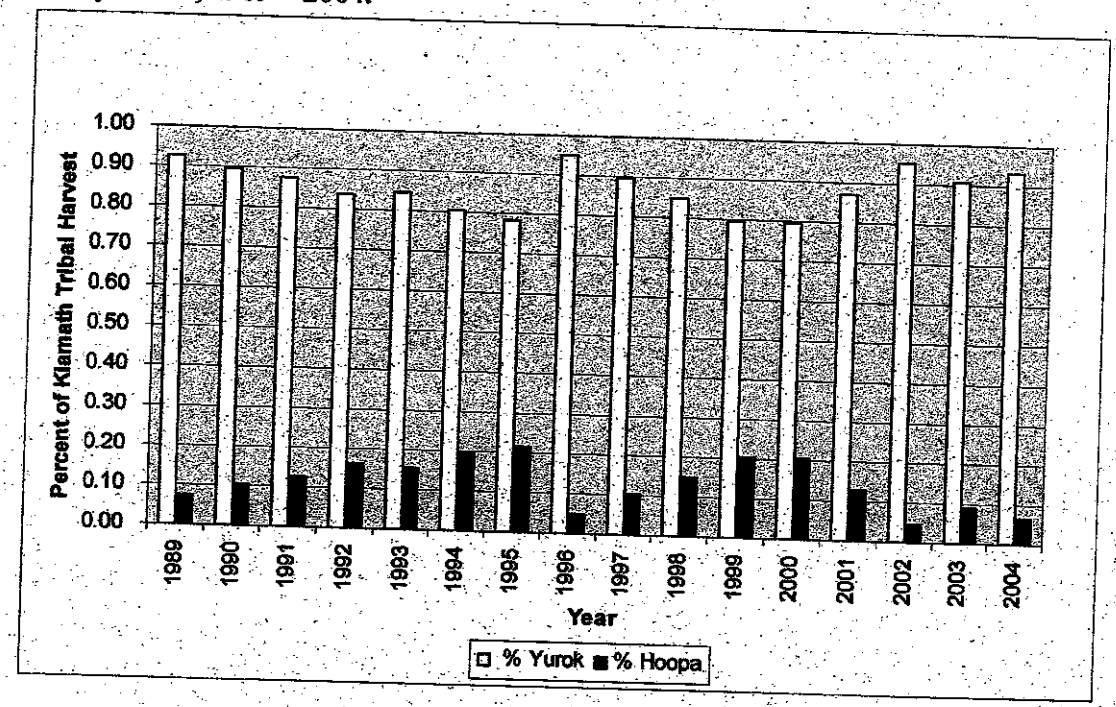
Because of the rivers' importance, one of the Tribe's highest priorities is to protect and preserve the resources of the rivers, and in particular, to restore the anadromous fish runs to levels that can sustain Yurok people. When the original Klamath Reservation was established in 1855, the rivers were filled with abundant stocks and races of salmon, steelhead, eulachon, lamprey, and green sturgeon. Today, the abundance of fish in the Klamath River and its tributaries are only a small fraction of their historic levels. Many species of fish have gone extinct, many other species, such as fall Chinook, are in serious trouble. Nonetheless, anadromous fish continue to form the core of the Yurok Tribal fishery. The Yurok Tribe is pursuing its fishery restoration goals through a fish management and regulatory program, participation in various forums to reach long term solutions to Basin problems and when necessary, litigation. The Tribe has devoted a large share of scarce funding resources to budgets for fishery management and regulation. The Tribe has enacted a fisheries ordinance to ensure that the fishery is managed responsibly and in a sustainable manner and has a longstanding record of resource protection. The Yurok Tribal Council and the Tribal members they represent are well known for taking and supporting responsible actions to protect fisheries resources.

The Yurok Tribe dependence upon Klamath River fish is supported by Tribal harvest information. Since the passage of the Hoopa Yurok Settlement Act in 1988, the Yurok Tribe harvest of Klamath River fall Chinook represents approximately 87% of the 50%[4] Tribal allocation (see Figure 1.) In terms of the overall allocation of Klamath River

[4] See Letter from Eddie F. Brown, Assistant Secretary of Indian Affairs, Department of the Interior to Barbara Hackman Franklin, Secretary of Commerce, 1-3 (May 19, 1992); See also 1993 Interior Solicitor's Opinion M-36979, at 27. Se also Magnuson Act 16 U.S.C. § 1851 (delegated to the Secretary of Commerce the authority set harvest levels in ocean fisheries between the states of Washington, Oregon and California and the Indian Tribes).

fall Chinook, comprised of Tribal and non-Tribal fishing groups, the allocation of fall Chinook for the Yurok Tribe is the largest single allocation of any group, Tribal or non-Tribal, harvesting Klamath River fall Chinook. The Tribe is allocated 80% of the Tribal allocation or 40% of the total allocation of harvestable Klamath fish.

Figure 1. Percent of Klamath Tribal allocation harvested by the Yurok and Hoopa Valley Tribes, 1989 – 2004.



The Tribe's dependence on Klamath River fish and the expectation that the Tribe would have significant economic opportunities from the fishery was identified by Congress during passage of the 1988 Hoopa Yurok Settlement Act. Unfortunately, the lack of Klamath River fish has prevented the Yurok Tribe from realizing the benefits of the Klamath fishery as intended by Congress. The legislative history confirms that Congress intended to vest in the Tribe property rights to the fishery on the Klamath River. The Committee noted that the Act "will also establish and confirm the property interests of the Yurok Tribe in the Extension, including its interest in the fishery." Senate Report No. 564, 100 Cong., 2d sess. (1988).

Legal Basis of Yurok Fishing Rights

The fishing rights of the Yurok Tribe are well-established as a matter of federal law. The Yurok Reservation, created pursuant to an 1855 act of Congress, was

established within the Yurok Tribe's aboriginal homeland primarily to provide a territory in which the Tribe's fishing-based culture and way of life could thrive and continue to exist. This fact has been recognized repeatedly since the Reservation was established – by the Departments of the Interior and Commerce, the United States Supreme Court, the lower federal courts, and the California courts. *See, e.g., Mattz v. Arnett*, 412 U.S. 481, 487 (1973); *Parravano v. Masten*, 70 F.3d 539, 545-46 (9th Cir. 1995), *cert. denied*, 116 S. Ct. 2546 (1996); *Blake v. Arnett*, 663 F.2d 906, 909 (9th Cir. 1981). As Justice Blackmun observed in *Mattz v. Arnett*, the original Klamath River Reservation, the precursor to the current Yurok Reservation, "abounded in salmon and other fish" and was in all ways "ideally suited for the Yuroks." 412 U.S. at 487.

The Yurok Tribe's right to take fish on the Klamath River is protected and guaranteed by federal law. The Ninth Circuit Court of Appeals confirmed that the executive orders that created the Yurok Reservation vested the Yurok Tribe with "federally reserved fishing rights." *Parravano v. Masten*, 70 F.3d 539, 541 (9th Cir. 1995), *cert, denied*, 518 U.S. 1016 (1996). The same court has aptly observed that the salmon fishery of the Yurok Tribe is "not much less necessary to the existence of the Indians than the atmosphere they breathed." *Blake v. Arnett, supra*, at 909. The Solicitor of the Department of the Interior has determined that the Yurok Tribe is entitled to a sufficient quantity of fish to support a moderate standard of living, or 50% of the Klamath fishery harvest in any given year, whichever is less. Memorandum from Solicitor to Secretary of the Interior, No. M-36979, October 4, 1993. The right includes fishing for subsistence, commercial and cultural purposes.
As the court in *Parravano* noted, the purpose of the Yurok Reservation was to enable the Yurok people to continue their fishing way of life. The River and its fish are undeniably the cultural heart of the Yurok people.

The Yurok Tribe has been a major protector of the Klamath River and the River would be in much worse condition if not for our presence.
Though the United States has a well-established legal obligation to protect the Yurok Tribe's fishery, the Tribe itself has been an active leader in efforts to protect the Klamath River; undoubtedly, the River would be in much worse condition if not for the Tribe's presence.

Cultural Beneficial Uses

The North Coast Regional Water Quality Control Board designated Native American fishing and subsistence fishing as a Beneficial Use of the Klamath River.[5] This Beneficial Use designation was approved unanimously by both the Regional and State Boards, was approved by the AOL and became effective with the approval of the U.S.

[5] *See* pgs. 2-3.00 North Coast Regional Water Quality Control Board's Water Quality Control Plan for the North Coast Region, January 2007, Klamath River. Native American Culture (CUL) "uses of water that support the cultural and/or traditional rights of the indigenous people such as subsistence fishing and shellfish gathering . . . navigation to traditional ceremonial locations, and ceremonial uses . . . Subsistence Fishing (FISH) uses of water that support subsistence fishing."

Environmental Protection Agency, (EPA) on March 4, 2005. This cultural use of the River 365 days of the year is symbolized by the Yurok Tribe's yearly world renewal and many other cultural ceremonies. The Tribe's cultural beneficial uses of the River have suffered greatly; the Yurok Tribe has established a link between the decline in the and a loss of almost 90% of pre-dam conditions, leading to a severe decline in the overall health of the tribal population.[6]

The Yurok Tribal Government Makes it a Priority to Protect the Klamath River Fishery

The Yurok Tribe devotes a substantial amount of its limited resources to fishery and water quality issues. The Tribal EPA Department has eight professionally trained employees and seven technicians working full time on natural resources issues. The Tribal EPA Department also employs two staff members, one, with a Masters Degree and one with a Ph D. The Fisheries Department has 16 Biologists and 20 to 50 technicians depending on the season and time of year, working on fishing and water quality matters. Their work includes preparing scientific testimony, gathering in-river water quality data, and conducting various fishery studies. The Tribal Fisheries Department also employs persons with Masters' degrees and one with a pending Ph.D. (*See* Exhibit A Flow Chart of Yurok Tribal Fisheries). The Watershed Restoration Department has four full time employees and 12 part time employees working on watershed restoration projects. In total the Tribe employs approximately 72 full-time-equivalent employees who devote 100% of their time to Fisheries, Water Quality, Watershed, and Natural Resources on the Klamath River.

The Office of Tribal Attorney legal department has two attorneys, a law clerk, a paralegal and a legal secretary who work on fishery and water quality issues. Cross deputized Tribal officers, who enforce tribal as well as state law, spend approximately 60% of their time (equivalent to five full time positions) patrolling the River and enforcing fishing regulations. The Yurok Tribal judge. (who is also a sitting California Superior Court Judge, for the County of San Francisco), and the Yurok Tribal Prosecutor, spend over 70% of their time on fishing and environmental cases. The Tribe further supports these efforts with a full time Natural Resources Policy Analyst. In addition, the Tribe also employs one Doctor of Philosophy; one additional Masters' of Laws in Water Quality; a former federal Magistrate Judge; and a former Coastal Commissioner. The Tribe has two outside law firms, Alexander, Berkey, Williams & Weathers LLP[7] and Hogan and Hartson[8] working on fisheries and natural resources issues for the Tribe. One of these lawyers is a former California Resources Agency Secretary. In addition, the Tribe has 706 registered commercial fisherman and approximately 5,500 subsistence fishing members each of whom participates in a regulated Tribal fishery.

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[6] The Effects of Altered Diet on the Health of the Karuk People: A Preliminary Report Kari Marie Norgaard, Ph.D. August 2004; Healthy River, Health Fish, Healthy People, Yurok Survey 2007.

[7] A Bay area firm specializing in Indian Law and Water Rights. Alexander Berkey, Williams & Weathers LLP, 2030 Addison Street, Suiote 410, Berkeley, CA 94704 (510) 548-7070

[8] Hogan & Hartson is an 1100 attorney law firm headquarted in Washington D.C. 555Thirteenth St., N.W. Washington DC. 2004 (202) 637-5600

The Yurok Tribe has conducted and participated in numerous scientific studies related to habitat, fish regulation and instream flow needs.

In summary, the Yurok Tribe devotes significant resources to restoration and protection of the fishery and has a sophisticated professional team that protects water quality within the 56,061 acres of tribal reservation land along the Klamath River, as well as the entire Klamath-Trinity Basin.

The State Water Resources Control Board Has Independent Regulatory Authority

The Yurok Tribe strongly supports the independent regulatory authority of both the State Water Resources Control Board (SWRCB) and the North Coast Regional Water Quality Control Boards (NCRWQCB). **As a general rule, the Yurok maintain that the legislated regulatory process should go forward without being affected by political considerations.** This rationale is supported by the administrative structure of placing the adjudicatory agencies within California E.P.A. as opposed to one combined Resources Agency. (*See* California State Government flow chart).[9]

The discharge of waste is a privilege, not a right, and authorization to discharge is conditional upon the discharge complying with provisions of the California Water Code and any more stringent effluent limitations necessary to implement water quality control plans, to protect beneficial uses, and to prevent nuisance.[10] This basic principle limits any agreements to insure regulatory certainty and strongly supports the ongoing independent adjudicatory role of the SWRCB.[11]

The Porter-Cologne Act and U.S. E.P.A. certifications under the State Water Quality laws, and the U.S. E.P.A. certifications under *PUD No. 1 of Jefferson County and City of Tacoma v. Washington Department of Ecology*,[12] as to the adequacy of state laws as meeting the Clean Water Act, are all premised on and reinforce this Board's independent regulatory authority.

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[9] The independent regulatory process is reflected at the state government administrative level by the current split structure between the Resources Agency and California E.P.A. The California E.P.A. was established by Governor Pete Wilson in 1991 for two basic reasons: 1.) to provide for a Cabinet level position for the Environment, and 2.) to insure the independent regulatory stature of the "umbrella" agencies. As Governor Wilson more specifically stated the purpose of the reorganization **was to insure that the scientific process of risk assessment would be kept separate from economic and political considerations and that a vigorous, predictable enforcement of environmental laws is necessary under guard of all other efforts. He noted and conditioned the reorganization to assure the regulatory decision making process must be opened as far as possible to the public as a whole. The benefits of separation, i.e. regulatory independence, were determined to outweigh the loss of management oversight. We concur.**

[10] *See* California Water Code, Division 7, § 13263(g).

[11] *See e.g. PUD No. 1 of Jefferson County v. Washington Department of Ecology* (1994) 511 U.S. 700; and *S.D. Warren Co. v. Maine Board of Environmental Protection*, 547 U.S. 370 (2006) (stating that the state does have authority to enforce state water laws for federally licensed hydroelectric projects).

[12] *PUD No. 1 of Jefferson County and City of Tacoma v. Washington Department of Ecology*, 511 U.S. 700, 114 S.Ct. 1900 (1994).

The Agreement In Principle Does Not Waive Water Quality Regulations

The Agreement in Principle (AIP) provides the right to withdraw, a (so called off "ramp") if there are significant regulatory costs for Clean Water Act certification, to PacifiCorp. These "significant regulatory costs" may take place during the time the AIP is being negotiated. This is a short period of time and is not a waiver of any Clean Water Act law.

Criteria for Extraordinary Extension of 401 Commenting Period

The Tribe suggests that the State Water Board should consider the following criteria when making a determination to grant an extension:

a) a clearly superior long range environmental solution is being considered;
b) timelines for progress are established and followed;
c) material progress is being made; and
d) there will be no prejudice to the Board or the interests of other parties to SWRCB 401 Certification process;
e) there will be no prejudice to the North Coast Regional Water Quality Control Board TMDL legislative rule making;
f) there will be no prejudice to the 401 certification process to other parties;
g) that Pacific Corps is obligated to report to the SWRCB the cessation negotiations;
h) environmental justice is furthered by the granting of the extension.
i) PacifiCorp has agreed to fund the Water Quality Conference and Monitoring
j) The SWRCB retains full authority to revoke the extension at any time.

The Tribe's position that an extension will not prejudice the interests of the Board or others in the 401 certification process could be reinforced if the State Board were to explore the following options:

a) PacifiCorp must file a binding Memorandum of Agreement to withdraw their application as well as a further agreement to immediately, (within twenty-four hours) resubmit an application to start the one year time for certification over again.
b) The State Board considers independently temporarily funding an EIR to avoid unnecessary delay. Our concern with this option is to make sure PacifiCorp will not be absolved of their responsibilities to fund the 401 certification EIR in the event negotiations fail.
c) The SWRCB determine the 401 certification application is not complete and require additional submittals, so that the one year certification federal law limit will start from the date of a complete application.

Spectacular Water Quality Treatment Plan

The Tribe has proposed, and the parties to the negotiations are developing, a Basin-wide water quality treatment plan in which PacifiCorp, the tribes, the United States, both states, agricultural interests, and all other stakeholders play their essential parts. This Basin-wide plan has significant advantages, and is based upon specific principles:

- A Watershed Approach is superior to "piece meal" solutions for the Klamath River.

- A Watershed approach must include water quality, fisheries restoration, habitat preservation and enhancement, increased water supply, and dam removal, (AIP).

- Permanent Solutions are better than temporary solutions.

- Whenever possible the best water quality treatment solution should be adopted.

- Quicker well funded treatment solutions are better than long term unfunded solutions.

- The AIP interim operations need to be coordinated with the Klamath Basin Restoration Agreement (KBRA) watershed approaches. In particular, the monitoring, water quality conference, and nutrient treatment measures must support water quality implementation provisions need to be considered crossovers to the KBRA.

- Endangered Species Act, (ESA) single species mandates need to be supplemented by a holistic multi-species-and-races approach.

- Producing large numbers of each water dependent species throughout the watershed provides greater survival within a watershed than the ESA approach of small numbers strictly protected within limited portions of the watershed[13]

- A consolidated treatment plan with marsh discharges is the best long term approach for nutrient removal.

- Existing Water Quality regulatory structures are ideal for implementing the watershed wide water quality approach.

- Klamath Basin water quality measures need to be science based.[14]

- The KBRA funds nutrient treatment.[15] The AIP should be considered as defining

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[13] A few cold water refugia can provide the protection for minimal fish populations but most if not all refugia need to be preserved to produce large quantities of salmon.

[14] The vast majority of scientists are supportive of the KBRA provisions to restore fish. See Attached Exhibit B. Klamath Science Meeting Summary May 6, 2008, Compilation of Information to Indorm USFWS Principals on Technical Aspects of the Klamath Basin Agreement Relating to Fish and Fish Habitat Conditions, Kamman Hyrdrology & Engineering inc. April 27, 2007, Support for the Klamath Settlement Agreement, Dr. Thomas B. Hardy, April 23, 2008_

PacifiCorp's fair share, (approximately $20.6.6 Million), contribution to this watershed wide system.[16] Such a program needs to encompass three separate nutrient events; nutrient levels while the four dams are in place, nutrients, if any, embedded in sediment behind the dams during dam removal, and nutrient reduction after the dams are removed. There are different parties and jurisdictions for each. (500K monitoring times 11 years =$5,500,000; $100,000 for Technical Water Quality Conference, and Nutrient Removal @ $10,000,000 =20.6 million.

Dam Removal

It is hard to imagine that the Salmon and other fish can make a comeback unless the habitat of the upper reaches of the Klamath is opened to fish passage and the water quality impacts from the reservoirs of the Hydro-project are addressed. A negotiated settlement for dam removal should receive encouragement.

In conclusion, the Tribe has concluded that its cultural, economic and social interests in a healthy Klamath fishery are best protected by an extension of these proceddings. That extension will permit the negotiations to conclude development of a water quality improvement plan, of which dam removal is one among many critical parts. If the state Board should deny the extension, the Yurok Tribe will be making extensive comments on the scope of the EIR.

The Tribe hopes to work closely with the State Water Board, the State Board 401 Certification negotiation staff and strongly recommends allowing for an Extension of the 401 commenting period from February 23, 2009 to June 23, 2009. If you have any questions please contact Mr. Troy Fletcher, Policy Analyst for the Yurok Tribe (707) 498-8486.

Sincerely,

Maria Tripp

Maria Tripp, Chairperson

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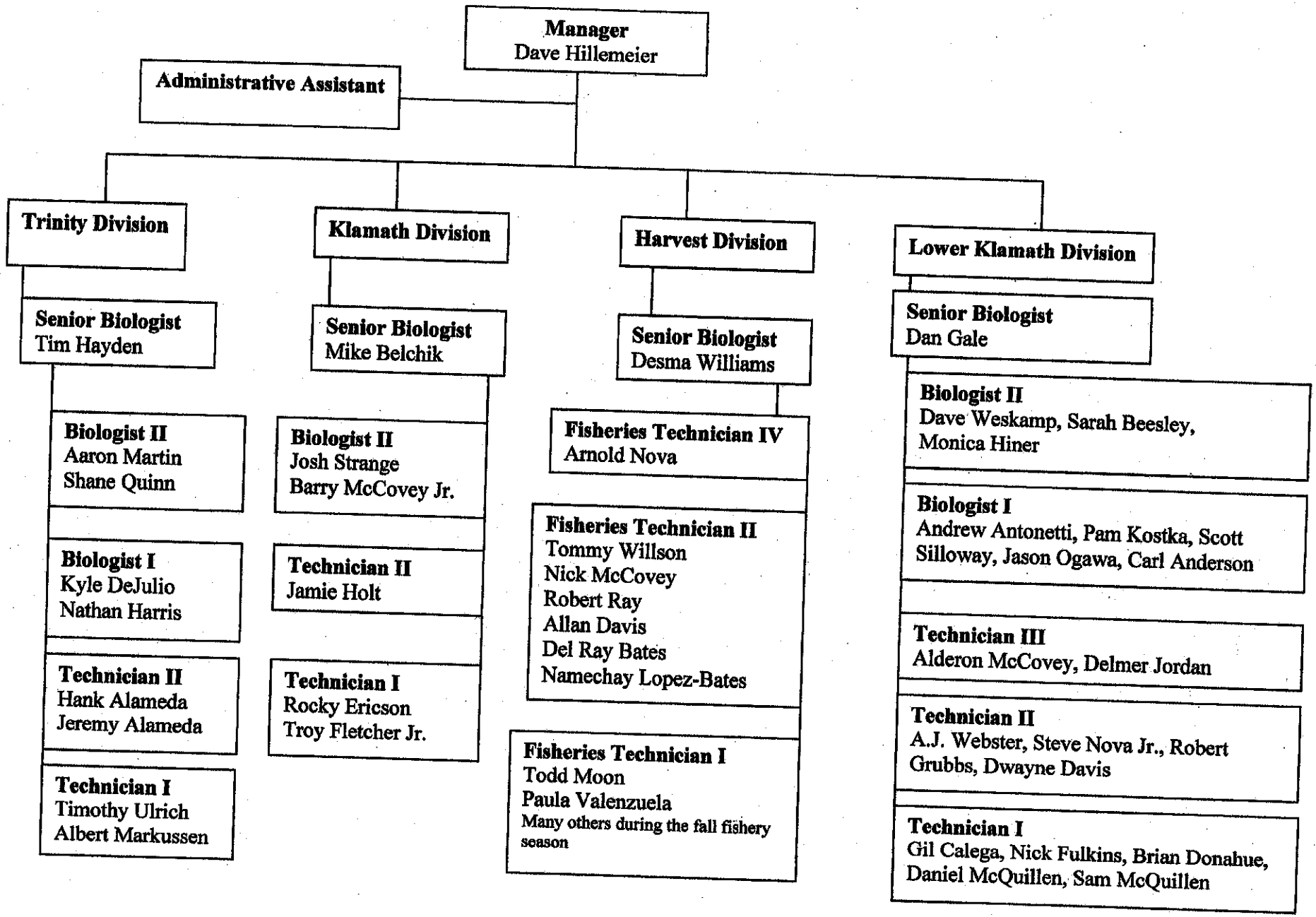
[15] *See* Appendix B-2 Table of the KBRA directly provides additional water quality funding; $50 million Keno Reservoir, Keno wetlands restoration $5 million, Keno Water Quality/algae/nutrient monitoring 7.5 million, Science and Analysis Real time Management; Calibration and improvements to RIMs modeling and predictions, $3.25 million, Monitoring and Evaluation $22.1 million = $87.85 million. (There are many other related fisheries and other habitat restoration programs that will also improve water quality. *See* attachments).

[16] *See* Agreement In Principle, Exhibit 1A, and 1B Item Nos. 11, 12, and 22, allocating $500,000 for ambient water quality monitoring from 2009 to 2020 in the amount of $5.5 Million; $100,000 for a water quality implementation conference; and $5,000,000 for Nutrient Removal. This makes the total $11.6 million in funding for water quality treatment plan as cross-overs from the AIP to the KBRA.

Fisheries Program Structure, December 2008



Klamath Science Meeting Summary

May 6, 2008

Summary

Federal, state, tribal and other scientists that work in the Klamath Basin met on April 10th and 11th in Mount Shasta, California to review the potential fishery benefits and risks associated with the Proposed Klamath Basin Restoration Agreement. This is a summary of the meeting.

The Fish and Wildlife Service is revising the paper *Compilation of Information to Inform USFWS Principals on Technical Aspects of the Klamath Basin Restoration Agreement Relating to Fish and Fish Habitat Conditions* based on oral comments received at the meeting and written comments from meeting participants. A revised paper is expected in mid-May. Comments from Thom Hardy, Greg Kamman, and Robert Franklin are attached to this summary. Comments from Bill Trush will be added as soon as they are available.

Purpose Statement for Meeting: "To achieve a common understanding and knowledge of existing data and analyses related to potential fishery benefits and risks associated with implementation of the proposed Klamath Basin Restoration Agreement. We will achieve this purpose by engaging in a facilitated discussion of the draft agreement's projected Klamath River flows and biological benefits for fish and wildlife."

Technical Review of Klamath Basin Restoration Agreement

The participants reviewed the flow and restoration measures in the Proposed Klamath Basin Restoration Agreement. The review included:

- Fishery Program
  - Fisheries habitat restoration measures.
  - Fisheries reintroduction measures.
  - Fisheries Monitoring Plan.
- Dam removal.
- Water Program
  - Agricultural allocation and water rights retirement programs
  - In season management
    - Technical Advisory Team
  - Environmental Water.
  - Projected Instream Flows
    - Headwaters to Keno
    - Keno to Iron Gate
    - Iron Gate to estuary
  - Upper Klamath Lake levels
  - Discuss water availability assumptions and level of uncertainty

- Protection measures—Groundwater
- Drought Plan.

- Governance and Implementation of the Basin Agreement.

Klamath Basin Restoration Agreement Issues

Participants discussed and clarified a number of elements in the proposed Agreement. Issues included:

- **Operation of Keno Dam:** Once the four PacifiCorp dams are removed, Keno Dam will be operated with no peaking for electricity generation. Reclamation and Fish and Wildlife Service staffs will develop a plan to address ramping.

- **Groundwater pumping:** The USGS model will be used to evaluate the impact of groundwater pumping on springs. If the impact exceeds 6 percent of 2000 levels at any of the index streams the Agreement includes requirements to remedy the impacts. State agencies clarified that it is very difficult to get new permits for groundwater pumping. Oregon Department of Water Resources indicated that under existing Oregon water law, groundwater pumping may not impact surface flows in streams.

- **Uncertainties:** Participants discussed the assumptions used in the WRIMS modeling and whether the actions assumed in the modeling are likely to occur. Issues included:

  - **Retirement of Upper Basin water rights**: Participants felt these actions had the least certainty; the Agreement has a voluntary program to reduce water diversions by 30 KAF. The modeling of this action is conservative in one respect because it assumes average gains in dry years when gains are likely to be greater.
  - **Additional storage**: Participants believed that the measures to increase storage in Upper Klamath Lake by 100 KAF were likely to occur given the proposed wetland restoration activities that have been implemented or are being planned.
  - **Project water use**: the model assumes full use of the sliding scale allocation of 330,000 to 385,000 acre feet and that the full 385,000 acre feet allocation will be used in all wet years; this was viewed as a conservative assumption because historically irrigators did not use this much in wet years.
  - **Evaporation losses in Upper Klamath Lake**: the model assumes 4 feet per year per acre; this was viewed as a conservative estimate and actual evaporation is expected to be lower.
  - **Evaporation losses at PacifiCorp dams**: the modeling did not assume any gains when there are no longer evaporation losses from the reservoirs behind the four dams. The estimated gain is 8 KAF per year.
  - **Drought Plan**: the model did not assume any increases in in-river flows during drought years. However, it is anticipated under the Settlement Agreement that the Drought Plan will entail some reductions in diversions.
  - Uncertainty is also a factor in the status quo.

Science Review

Participants discussed the biological benefits provided by the Basin Agreement.

U.S. Fish and Wildlife Service Paper: Nick Hetrick and Tom Shaw provided a presentation on their draft paper: *Compilation of Information to Inform USFWS Principals on Technical Aspects of the Klamath Basin Restoration Agreement Relating to Fish and Fish Habitat Conditions.* The Executive Summary is attached to this summary. Key conclusions include:

- Implementing the water allocation proposed in the Agreement prior to dam removal using Real Time Management (RTM) would significantly improve production potential of fall Chinook salmon below IGD in years resembling historic low and average production years.

- The removal of the Iron Gate, J. C. Boyle, and Copco 1 and Copco 2 complex of dams will provide the single greatest contribution to the recovery of native anadromous fish populations, as needed to support full participation in ocean and in-river harvest opportunities.

- The benefits to the Klamath River and its dependent fisheries will begin to be realized in the interim period leading up to dam removal, with a higher probability of significant improvements occurring once the dams are removed.

- The timing and magnitude of improvements, however, will largely depend on the timing and degree to which the suite of restoration and management actions identified in the Agreement are fulfilled

Discussion Issues:

- **Benefits for Scott and Shasta fish**: There are not many specific actions in the Agreement for these rivers. In the discussion, participants noted that there is funding assumed in the Agreement for these areas. They also discussed the benefits from lowered main stem Klamath River temperatures when dams are removed. These factors should improve survival both upstream adult migrants and out-migrant juveniles for all anadromous species.

- **Low river flows**: Robert Franklin provided analysis showing that it was not possible to meet low flow criteria including ESA requirements, fish-kill avoidance, and the 1,000 cfs minimum flow in Hardy Phase II flows during some months in a number of years. Most participants assumed that the water bank, in-season management, and Drought Plan will help address some dry years. Thom Hardy indicated that the real concern in flows below 1,000 cfs was an increased risk from disease and thermal effects; removal of the dams would help address this concern and the threshold flows at which significant concerns over thermal and disease factors will more likely be on the order of 700 to 800 cfs.

- **Coarse sediment management**: There appeared to be a consensus that additional actions may be needed to ensure more natural spawning habitat. Larry Dunsmoor, in consultation with other science staff drafted the following language as a potential insert for Sections 10.1.2 or 10.2.2:

  > Within the context of the availability of funding and the outcome of a comprehensive assessment of fisheries restoration needs, coarse sediment management in the mainstem Klamath River between Keno Dam and the Shasta River confluence will be pursued with the goal of filling and sustaining existing in-river coarse sediment. Once the existing in-river storage capacity has been replenished, the biological benefits of increasing and sustaining storage capacity will be evaluated and implemented as appropriate.

- **Natural hydrograph**: there was concern that the Agreement does not achieve the full characteristics of the historic hydrograph. Other participants felt it was a significant improvement over the status quo.

- **Fish targets**: Several participants believed that the Agreement should include specific targets for fish production, harvest and escapement. Other participants felt that the qualitative goals in the Agreement were appropriate. Several basin tribes oppose setting numerical fish goals, while the Hoopa Valley Tribe is a proponent.

- **Limiting factors**: There was discussion on whether the Agreement should contain specifics on limiting factors. Other participants stated that the key limiting factors are known: the dams and water availability.

Next Steps: FWS will incorporate comments into a revised paper that is expected in mid-May.

Other Recommendations

- There appeared to be a consensus that the final Fish and Wildlife Service Report should be referenced in the Klamath Basin Restoration Agreement.

- There appeared to be a consensus that a laypersons summary of the Hetrick et al. paper would be helpful.

- The group also discussed the benefits of an executive summary, including the biological benefits, at the beginning of the Agreement to provide a fuller context for the actions in the document.

Science Meeting Participants

Larry Dunsmoor, Thom Hardy, Bill Trush, Greg Kamman, Mike Belchik, Dave Hillemeier, Tom Shaw, Nick Hetrick, Robert Franklin, Mike Orcutt, Daniel Jordan,

George Robison, Curtis Knight, Keith Shultz, Jon Hicks, Jim Simondet, Toz Soto, Sue Corum, Glen Spain, Jim Dupree, John Hamilton, Laurie Simons, Roger Smith, Cindy Smith, USGS, Julie Perrochet, Dave Hogen, Mark Smelser, Mark Hampton, Mark Rockwell, Jim DePree, and Ed Sheets.

Participants in Policy Briefing (2:30 pm on April 11, 2008)

Brian Barr, Lyle Marshall, Phil Detrich, Irma Lagomarsino, Pablo Arroyave, Tom Schlosser, John Corbett, Troy Fletcher, Craig Tucker, Steve Kandra, Dave Solem, Gary Stacey, Steve Turek, Mary Grainey, Sue Knapp, Scott Williams, Annie Manji, Jeff Mitchell, Greg King.

Compilation of Information to Inform USFWS Principals on Technical Aspects of the Klamath Basin Restoration Agreement Relating to Fish and Fish Habitat Conditions

N. J. Hetrick, T. A. Shaw, P. Zedonis, and J. P. Polos

Arcata Fisheries Program
U. F. Fish and Wildlife Service, Arcata Fish and Wildlife Office
1655 Heindon Road; Arcata, California

Executive Summary

This document is a compilation and summarization of various modeling exercises, analyses, and relevant information relating to the potential effects of implementing the proposed Klamath Basin Restoration Agreement (Agreement) on fish and fish habitat conditions in the Klamath Basin. The Agreement includes a water management regime, programs for fish habitat restoration, fish reintroduction, and an assumption that a separate agreement will be reached with PacifiCorp regarding dam removal. The full text of the proposed Agreement is available for review at:

http://www.edsheets.com/Klamathdocs.html.

This report also provides the U.S. Fish and Wildlife Service (Service) Principals involved in finalizing the Agreement with supporting information and documentation of the technical staff analyses, data interpretations, and professional opinions relating to anticipated changes in fish production and fish habitat conditions that would occur as a result of implementing the Agreement. Information included in this document is not comprehensive due to the short time frame that accompanied this assignment, but may prove useful to initiate development of the Fisheries Restoration Plan to guide implementation of the Agreement. The summary below describes key points contained in this report with regard to the technical effects of the Agreement on fish and fish habitat conditions.

Water Quality

Potential changes in water quality conditions in the pre dam removal period are anticipated to be minor as the continued operation of the PacifiCorp dam complex has the greatest single influence on water quality dynamics in the Klamath River below IGD. Removal of project reservoirs and the restoration of the river channel in current hydropower reaches, in combination with attendant stream flows, are expected to contribute positively to restoring the physical, chemical, and biological interactions that are critical to a functioning river ecosystem, primarily through nutrient assimilation, re-aeration and shifts in the thermal regime. Following removal of the PacifiCorp dam complex, restoration efforts to improve water quality within and upstream of the Keno reach would be fully realized in the former hydropower reaches and below IGD.

- In the interim period leading up to dam removal, water quality conditions in the Klamath River may improve slightly in response to on-going regulatory and restoration actions, including the Total Maximum Daily Load (TMDL) assessment, FERC relicensing of PacifiCorp's hydroelectric project, Clean Water Act Section 401 Certification, and wetland restoration projects (e.g. dike removal on Upper Klamath Lake). Benefits would be achieved primarily through reductions in nutrient loading.

- With removal of the Klamath River dams, water would not be retained in reservoirs for power generation. In the absence of project dams, hydraulic residence time through reaches occupied by the PacifiCorp dam complex would decrease from several weeks to less than a day, with the added benefit of nutrient assimilation (river versus reservoirs) - thereby improving water quality.

- Benefits of restoration efforts to improve water quality upstream of the PacifiCorp dam complex prior to and following dam removal would, after dam removal, be fully realized in the former hydropower reaches and below IGD. With the reservoirs in place, water quality improvements within and upstream of the Keno reach provided by the Agreement will be altered in the existing reservoirs and therefore, may not be fully realized below IGD.

- Evaporation from the large surface area of existing reservoirs would be greatly reduced to that occurring on the new river channel and this volume of water would flow down the river.

- Water temperatures will change dramatically with removal of the dams, resulting in a thermal regime that exhibits natural diurnal and seasonal fluctuations rather than the phase shift in thermal regimes that exists today with the project reservoirs in place. Temperature reductions ranging between 2 and 10 ° C would occur from mid- to late August through mid-November, which will have a positive influence on adult salmon migration, holding, and spawning in reaches upstream of Seiad Valley.

- Removal of project reservoirs would allow important coldwater tributaries (e.g. Fall Creek, Shovel Creek Spencer Creek, Jenny Creek) and springs, such as the coldwater inflow to the JC Boyle bypassed reach, to directly enter and flow unobstructed down the mainstem Klamath River, thereby providing thermal diversity in the river in the form of intermittently-spaced patches of thermal refugia. Thermal diversity will benefit a variety of aquatic biota during warm summer months and warmer periods during adult fall and juvenile spring-summer fish migrations.

- The restored thermal regime will play a significant role in nutrient dynamics as will other natural riverine processes; most notably re-aeration of water provided by a turbulent well-mixed river. In spite of the continued release of eutrophic water from Keno Dam, natural riverine processes below Keno are expected to reduce nutrient concentrations and prevent low dissolved oxygen concentrations and high pH events from occurring.

- Water quality modeling performed by PacifiCorp and USGS for the without project dams alternative suggest that dissolved oxygen concentrations are likely to improve and be suitable for aquatic biota in restored river reaches previously inundated by project reservoirs, and below IGD. We do not expect pH to reach

levels that are detrimental to river biota because of the high degree of mixing that would occur and its associated positive influence on limiting algae production

- In the absence of project reservoirs, conditions under which blue green algae (BGA) thrive will be greatly diminished, resulting in fewer nutrients and a decrease in the alteration of water chemistry (pH and DO) associated with BGA blooms. Again, turbulent river conditions would prevent such blooms from occurring.
- Algae blooms in the reservoirs serve as an added source of nutrients (through nitrogen fixation with atmospheric nitrogen) to the already eutrophic water of the Klamath River.
- BGA can release toxins that have been found to be harmful to fish and invertebrates; dam removal will virtually eliminate this additional stressor to the biotic community.

Geomorphology and Channel Maintenance

- Lack of sediment input below IGD has created a sediment-starved system, which has caused negative changes in the quantity and quality of spawning gravels in the Klamath River, particularly in the reach below IGD.
- Information in the literature suggest that flows from IGD have been adequate for channel maintenance in most years and that fine sediments are regularly flushed from riffles and pools during average water years and under normal flow conditions.
- Low flows over extended period of drought have increased deposition of silt and fine organics, allowing rooted aquatic vegetation to become well established. These conditions provide habitats preferred by polychaete worms, the intermediate host of myxosporean parasites of salmonids in the Klamath River.
- Conflicting information exists regarding the extent of the effects that dam operations have had on the geomorphology of the river below IGD. However, geomorphic features important to aquatic organisms have been degraded due to fine sediment accumulations and establishment of dense beds of rooted aquatic macrophytes, which are the primary habitats for polychaete worms.
- While the coarse sediment deficit is anticipated to be alleviated with dam removal, flood flows to restore fluvial processes are necessary for the rehabilitation of the channel and associated riparian community. To address concerns relating to substrate conditions in the mainstem Klamath River, the Service has contracted with USGS to determine flow volumes and durations and bedload amounts and composition necessary to maintain dynamic alluvial processes, bank full and flood (timing, magnitude, frequency, and duration) events needed to improve and maintain quality spawning and rearing habitats for salmonids and to reduce abundance of preferred habitats of the polychaete worm. Results of this on-going study, when they become available, will be useful in guiding channel restoration actions in the interim period leading up to dam removal.

Water Quantity

The Water Resources Program in the Agreement consists of schedules, plans, and other provisions that will substantially change the management of delivered water supply for

irrigation and related uses in the Klamath Reclamation Project, upper Klamath Basin, and the National Wildlife Refuges:

Upper Klamath Lake Wetlands Reconnection - Measures to increase water supply in Upper Klamath Lake include completion of the breaching of levees in the Williamson River Delta to add approximately 28,800 acre feet of storage; reconnecting Barnes Ranch and Agency Lake Ranch to Agency Lake to add approximately 63,700 acre feet of storage; and reconnecting BLM's Wood River Wetlands to Agency Lake to provide approximately 16,000 acre feet of storage.

Federal Klamath Irrigation Project - The Agreement establishes limitations on the quantity of water diverted from Upper Klamath Lake and the Klamath River for use in the Klamath Reclamation Project. The limitation will result in the availability of water for irrigation being about 100,000 acre feet less than current demand in the driest years, with irrigation water availability increasing on a sliding scale with increasingly wet conditions. The pattern of agricultural deliveries being higher in dry years than in wet years would be reversed.

Off Project Program - The Agreement establishes a process to increase inflow to Upper Klamath Lake by 30,000 acre feet.

Real Time Water Management - The Agreement includes additional information sources and administrative structures to allow for real time scientific adaptive management by fish managers for the lake and river. The Agreement establishes a Technical Advisory Team that will develop an Annual Water Management Plan that will provide recommendations to the Secretary of the Interior. During each water year, the Technical Advisory Team will also recommend ongoing, real-time operations to adjust for changing environmental and biological conditions.

Refuges - The Agreement provides specific allocations and delivery obligations for water for the Lower Klamath and Tule Lake National Wildlife Refuges. It also increases water availability and reliability above historical levels.

Other (Drought, Emergency, Groundwater, Climate Change) - These programs will focus on investigations and development and implementation of specific management actions to that will give the Agreement the best chance of enduring through unforeseen circumstances and unintended consequences. The Agreement offers the structure and potential to implement a functional drought plan, which has been insufficient under recent management.

At the request of technical staff representing participants in the settlement negotiations, the Klamath Tribe performed iterative modeling simulations that incorporated differing flow and lake elevation targets, Klamath Irrigation Project delivery amounts, and model assumptions. Outputs of model runs were used to assess performance of model inputs and assumptions, determined by examination of deviations from model input targets. Comparisons between alternatives were conducted at a variety of exceedence year types (water year types) related to flow levels at the 10% (dryer), 30%, 50%, 70%, and 90% (wetter) exceedance levels. The model run that most closely reflects the water terms of the Agreement is labeled "WRIMS Run-32 Refuge." Model inputs and outputs of this run are compared to a number of alternatives, including recommendations from the Hardy Phase II habitat modeling study, which employed advanced field and modeling techniques to describe habitat-flow relationships for priority fish species and life stages in the Klamath River. Upper Klamath Lake elevation targets specified in the

WRIMS Run-32 Refuge model simulation are referred to as the ALT-Y lake elevation schedule.

- In general, WRIMS Run-32 Refuge output flows exceed historical IGD flows and were similar to the Hardy Phase II recommendations for the 30% and greater exceedences during the critical Chinook salmon fry rearing (March-April) and Chinook (May) and coho salmon (June) juvenile rearing months.
- At a 10% exceedence, WRIMS Run-32 Refuge model flow outputs and historic IGD flows were generally similar, but the difference varied between time steps within the March - June period. WRIMS Run-32 Refuge output flows for this period were considerably higher than the Hardy Phase II baseflow recommendations for a 10% exceedence, likely due to the Hardy baseflow recommendations not reflecting spill. We note that the Hardy Phase II flows were a baseflow regime target and that higher flows associated with pulse or overbank flows (i.e., spills) are also a component of the Hardy Phase II flow regime.
- Habitat values for WRIMS Run-32 Refuge model output flows were consistently higher than habitat values calculated for historic IGD flows for the March – June emergence and rearing life stages of Chinook and coho salmon for exceedences greater than 10%. At the 10% exceedence level, habitat values estimated for the WRIMS output were higher then historic IGD during the October, November spawning period and during March of the rearing period, but were similar to one another for April-June.
- WRIMS Run-32 Refuge model output flows were lower than the Hardy Phase II recommendations in the fall and winter for dryer water years to help insure that Upper Klamath Lake (UKL) would fill as needed to meet lake elevations and the specified allocation to the Klamath Irrigation Project.
- October-November Chinook salmon spawning habitat values for the WRIMS Run-32 Refuge model outputs were generally higher for the 10% exceedence level, similar for the 30, 50, and 70% exceedences, and less at the 90% exceedence level than values calculated for historic IGD flows and the Hardy Phase II recommendations. However, habitat values calculated for the Hardy Phase II flow recommendations would be lower in wetter water years as result of higher flows associated with pulse or overbank flows (i.e., spills) that exceeds flows corresponding to the maximum habitat value.
- WRIMS Run-32 Refuge model simulations predicted the lake to fill to the targeted lake elevation (4,143 feet) for the majority of exceedence year types.
- There was a clear trend in the lake elevation outputs of the WRIMS Run-32 Refuge model run being higher than the proposed ALT-Y lake elevation targets throughout the fall and winter and during the majority of exceedences. This indicates that there is an opportunity to adaptively manage the lake and river on a real time basis.
- Outputs of the WRIMS Run-32 Refuge simulations also predicted that lake elevations would not drop below 4,139 feet during late summer/early fall with the exception of September and October for a 90% exceedence year. This should greatly facilitate refill of the lake by the following spring and provide listed suckers with unrestricted access to tributaries and spring refugia areas during periods of adverse water quality.

Chinook Salmon Production

Prior to dam removal, production potential of fall Chinook salmon would significantly improve in years resembling historic low and average production years in response to implementing the water allocation proposed in the Agreement. In years where modeled historic production was high, potential for improvement under both Run-32 Refuge and Hardy Phase II flow schedules was consistently low as habitat availability modeled in SALMOD was at or near the maximum values. Conversely, years where modeled historic production of fall Chinook salmon was low provided the greatest opportunity for improvement under any of the alternative flow schedules.

While opportunity exists to improve Chinook salmon production prior to dam removal, removal of Klamath River dams has potential to greatly increase production over that experienced even in the historically highest production years. Expansion of accessible habitats resulting from removal of Klamath River dams will greatly increase production potential over that which exists with the dams in place and augmented flows provided by the Agreement. In general, gains in habitat availability and associated production potential that would result from removal of the Klamath River dams, including the reestablishment of spring Chinook salmon in the upper basin, far exceed gains that could be achieved below IGD through manipulation of flows alone.

Pre Dam Removal

- In general, years where modeled historic production of fall Chinook salmon was low provided the greatest opportunity for improvement under any of the alternative flow schedules. Conversely, in years were modeled historic production was high, there was little difference in the change in production for the alternatives.
- Percent change in production from the historic baseline for the Run-32 Refuge and Hardy Phase II simulations for the 10 highest historic production years (upper 25th percentile) averaged about +6 % and -7% and for the 10 lowest historic production years (lower 25th percentile) about +45 % and +51 %.
- In years when modeled fish production increased significantly over historic baseline predictions (> +10 % over baseline), improvements in production often occurred as a result of increased flows in the spring and/or reduction in intensity and/or frequency of fall spills. Early fall spills reduced estimates of adult spawning habitat availability, while increases in spring flows over historical baseline conditions resulted in increased fry and juvenile rearing habitat availability.
- Implementing either the WRIM Run-32 Refuge model outputs or Hardy Phase II flow recommendations was predicted to cut poor production years by about 2/3 in the future. Reducing the average occurrence of low production years from 1 out of every 4 years downward to 1 out of every 10 years is significant given the dominant 3 to 4 year life cycle of fall Chinook salmon in the Klamath Basin.
- SIAM simulations predicted Upper Klamath Lake water surface elevations to be substantially lower under the Hardy Phase II simulation than elevations predicted from the WRIMS Run-32 Refuge model outputs. This, however, should be expected as Hardy et al. (2006) characterize their flow recommendations as being "*made based on the ecological needs of the Lower Klamath River and anadromous fish in particular*" and that the Hardy Phase II study was "*not commissioned to undertake any 'optimization' or flow balancing to meet competing water demands*".

Post Dam Removal

- About 350 miles of stream and associated anadromous fish habitat, much of which has been lost since 1918 with the construction of Copco 1 Dam, would become available for spring and fall Chinook and coho salmon, steelhead, and lamprey in the Klamath Basin as a result of dam removal proposed under the Agreement. The return of these anadromous fishes to their historic range would provide a wider diversity of occupied fish habitats, such as intermittent streams and thermal refugia, than is currently present in the Klamath River system. This added diversity in fish habitats will be of benefit to various life stages and species of anadromous fishes and will contribute to the ability of these species to thrive in variable and challenging environments by providing opportunities to maintain greater genetic variation.
- Changes in water temperatures that more closely resemble the historic thermal regime are anticipated to increase the average size of juveniles at ocean entry, which has been widely shown in the literature to increase estuary/ocean survival. Adult salmon would also benefit from a colder thermal regime in the late summer and fall in the upper river, which may reduce disease incidence, increase swimming performance and increase gamete viability.
- Dam removal would provide access to additional spawning habitats that would disperse spawning. This would minimize the unnaturally high levels of redd superimposition that currently occurs below IGD, even in years of low escapement, thereby increasing adult to juvenile production ratios.
- Minimizing the high spawning and fry and juvenile densities that can occur below IGD may also benefit outmigrant fishes from the Shasta and Scott rivers, through reduced competition for food and space.
- Following removal of the Klamath dams, key historical spawning areas would become available in mainstem reaches such as Iron Gate and Copco and in numerous tributaries such as the Williamson and Sprague River, Jenny Creek, Fall Creek, Shovel Creek, etc.
- Dam removal provides a high potential for spring Chinook salmon to become established in the upper Klamath River and potentially become the dominant Chinook salmon run in the Basin once again. Under the Agreement, suitable stocks will be identified and a reintroduction plan will be implemented, with harvest of returning adults possible within several return cycles after supplementation begins.

Implementing the Water Allocation In Real Time

Under the Agreement, a Technical Advisory Team will develop an Annual Water Management Plan that will provide recommendations to the Secretary of the Interior. During each water year, the Technical Advisory Team will also recommend ongoing, real-time operations to adjust for changing environmental and biological conditions. Water management would become a transparent process, with flow release decisions made using an adaptive management process with stakeholder involvement. In this report, we provide an example of real time management (RTM) application that may serve as a viable approach for water management under the Agreement. The goals of the RTM application are 1) to provide a feasible method for implementing the water allocation proposed in the Agreement and 2) to reestablish important processes and function of the natural hydrograph, including the timing, frequency, magnitude, duration,

and rate of change in flows. The RTM process eliminates the need for water years and fixed flow schedules by using real-time daily discharge for an unregulated reference stream (Williamson River) to inform daily flows at IGD, as recommended by the NRC (2007). This concept was at the root of the Hardy Phase II flow regime and is strongly supported by instream flow practitioners and stream ecologists because it results in flow patterns that mimic the shape and function of the natural hydrograph under which the aquatic biota evolved.

- The RTM process would restore the natural flow paradigm under which aquatic biota evolved and that is inherent in unregulated, natural river systems.
- The RTM process proposed in this report has been demonstrated to be a viable tool for implementing the water allocation proposed in the Agreement.
- The division of water between the lake and the river could be modified using an adaptive management approach to provide flexibility in implementing river flows and maintaining lake elevations; a progressive approach new to Klamath water management.

Fish Health

Fish diseases are widespread in the mainstem Klamath River during certain periods and there is increasing evidence to suggest that disease levels, in some years, are adversely affecting the freshwater production of Chinook salmon. In recent years, the Service working collaboratively with its Tribal and Agency partners, has documented high infection rates in emigrating juvenile Chinook and coho salmon, primarily by one or both myxosporean parasites – *Ceratomxya shasta*, and *Parvicapsula minibicornis*. Fish health studies conducted from 1995 to present have consistently documented high infection incidence (up to 44% of natural origin juvenile fall Chinook salmon) in the Klamath River during the spring and summer. Abnormally high infection prevalence within the native salmon population indicates that a host-parasite imbalance exists below IGD.

- Polychaetes, the intermediate host for *C. shasta*, and *P. minibicornis,* are found throughout the mainstem Klamath River but are most prevalent in low velocity areas such as runs, pools, and riffle edge habitats In addition, inflow zones of Klamath River reservoirs have exceptionally high densities of polychaetes, which is consistent with published literature. Converting the existing reservoir complex to a riverine system will eliminate these densely colonized areas.
- Restoration of the hydrologic function of the river system is vital in creating habitat diversity and maintaining biophysical attributes of a river system. Flexibility to change flows to respond to real-time climatic and biological conditions, made possible by the Agreement, will create diversity in flows and resulting habitat conditions as well as instability and disturbance in microhabitat conditions that will diminish polychaete populations and presumably, reduce infection rates within polychaete populations.
- Stable, monotypic, nutrient- and diatom-rich flows that occur below IGD provide an optimal environment for production of filter-feeding benthic invertebrates like polychaete worms. Fluctuating flows that mimic, albeit to a lesser degree, conditions experienced under a natural flow regime, will eliminate the monotypic stable flow conditions in which polychaetes are known to proliferate.

- The greater thermal diversity that will be experienced following removal of the Klamath River dams and reservoirs is likely to result in greater invertebrate diversity and less favorable environmental conditions for production and survival of a single species such as the polychaete worms.
- Removal of the project dams is likely to alter the distribution of myxospores, an intermediate life stage of myxozoan parasites that are released from salmonids, by dispersing concentrations of adult salmon and resident trout found below IGD. The passage barrier created by IGD and the shared location of the Iron Gate Fish Hatchery has concentrated the density of spawning adult salmon in the IGD to Scott River reach, thereby exacerbating release of infectious myxospores within this reach. The greater abundance myxospores released by dense concentrations of spawning salmon within this reach results in higher infection rates in polychaetes, which proliferate in this relatively hydrologic stable reach.
- Removal of project dams would facilitate the occurrence of higher peak flows and restoration of mid-sized (gravel) sediment input below Iron Gate Dam that could scour polychaete colonies and their habitats and reduce actinospore loads in the following spring.

Conclusion

Successful implementation of the Fisheries Program of the Agreement will necessitate a change in scientific process within the Klamath Basin. Scientific efforts and funding would shift from competing science, which has functioned in the Klamath Basin to preserve status quo, to restoration, reintroduction, and adaptive management. A unified approach to science in the Basin that aligns funding and technical efforts to meet a common purpose identified in and supported by the Agreement, will contribute immensely to fish recovery in the Basin. This unified approach will be well defined in the Fisheries Restoration Plan required under the Agreement, a concept supported by the NRC (2007).

As described in section 9.1.1. of the proposed Klamath River Restoration Agreement, the purpose of the Agreement's Fisheries Program is to restore and sustain natural production of fish species throughout the Klamath River Basin. Specifically, this program

> *"...establishes conditions that, combined with effective implementation of the Water Resources Program in Part V, will contribute to the natural sustainability of fisheries and Full Participation in Harvest Opportunities, as well as the overall ecosystem health of the Klamath River Basin..."*

Based on information summarized in this report, in combination with various other technical documents provided to settlement participants by non-Service entities, the Technical Staff of the US Fish and Wildlife Service recommends that the Principals for the U. S. Fish and Wildlife Service support full implementation of the Klamath Basin Restoration Agreement. Implementing the water allocation proposed in the Agreement prior to dam removal would significantly improve production potential of fall Chinook salmon below IGD in years resembling historic low and average production years. However, the collective professional opinion of lead technical staff that contributed to this report concur that removal of the Iron Gate, J. C. Boyle, and Copco 1 and Copco 2 complex of dams will provide the single greatest contribution to the recovery of native

anadromous fish populations, as needed to support full participation in ocean and in-river harvest opportunities. When viewed in combination with the suite restoration and management actions proposed under the Agreement (Table I-1), we anticipate that benefits to the Klamath River and its dependent fisheries will begin to be realized in the interim period leading up to dam removal, with a high probability of significant improvements occurring once the dams are removed. The timing and magnitude of improvements, however, will largely depend on the timing and degree to which the suite of restoration and management actions identified in the Agreement are fulfilled (Table I-10).

Table I-1. Status of various activities that influence fish production in the Klamath River under current conditions, the FERC relicensing process, and under the Klamath Basin Restoration Agreement (no= will not occur, yes = will occur, ? = likelihood of occurrence unknown).

Activity	Status Quo	Dams Remain, Fish Passage Installed	Restoration Agreement
Basin-wide Restoration Plan	?	?	Yes
Increased Funding, Scope, and Pace of Restoration Actions	No	No	Yes
Reintroduction Plan above IGD	No	Yes	Yes
Reintroduction of Anadromy to 350 Miles of Habitat	No	Yes	Yes
HCP Above UKL	No	?	Yes
Acquisition of Water Rights above UKL	No	No	Yes
Increased Storage and Restoration in UKL Wetlands	Yes	Yes	Yes
Capped Allocation of Water to KIP & Increased Environmental Water	No	No	Yes
No Adverse Impact from KIP Groundwater use	No	No	Yes
Drought Management Plan	?	?	Yes
Real-time Management of Environmental Water	No	?	Yes
Funding Water Quality Work in Keno Reservoir	No	No	Yes
Dams out	No	No	Yes
Anadromous Fish Habitat at Present Reservoir Sites	No	No	Yes
Improved Water Quality in Lower Klamath River	Limited	Limited	Yes

Support for the Klamath Settlement Agreement
Dr. Thomas B. Hardy
April 23, 2008

I wish to express thanks to the Klamath Settlement Science Team for having made their time and expertise available to me to allow a detailed evaluation of the science and rationale behind the proposed Settlement Agreement. In particular, Mike Belchik, Nick Hetrick, Tom Shaw, and Larry Dunsmoor spent considerable time with me going over the technical details that underpin the Settlement Agreement and in particular, the expected flow regimes. My review of the technical work underpinning the Settlement Agreement was greatly facilitated by the USFWS 'White Paper' authored by N. J. Hetrick, T. A. Shaw, P. Zedonis, and J. P. Polos of the Arcata Fisheries Program of the USFWS. This document in conjunction with several full days of technical discussions by the principal authors in Arcata allowed a detailed and comprehensive review to be completed prior to the discussions held in Mt. Shasta on April 10th and 11th.The opportunity for open discussion provided during the science meetings on April 10th and 11th were also very helpful and served to reinforce my opinion to support the Settlement Agreement.

My initial concerns that precluded me from supporting the Settlement Agreement were broadly centered on the following main points:

1. Apparent lack of variation in winter and spring flows over a wide range of water year types.
2. Apparent sustained low flows below 1000 cfs during the later summer and early fall.
3. The potential affects of groundwater pumping on stream flows.
4. Uncertainty on the relationship between the Drought Management Plan and river flows during extreme drought conditions.
5. Other Factors

Prior to addressing each of these major issues, I want to commend the parties for their clear understanding of the technical basis behind the Hardy Phase II recommendations that served as the starting point for their evaluation of flow regimes. As noted in Hardy et al., (2006) the exceedence based flow recommendations (Base Flows) were target flows and did not incorporate any considerations of Upper Klamath Lake levels necessary for support of its endangered species nor the balancing necessary to consider beneficial out-of-stream uses of Klamath water for both agriculture and the wildlife refuge. It was also beyond the scope of that work to fully consider tributaries, dam removal, and restoration actions throughout the basin now being contemplated under the Settlement Agreement. The other components of the Hardy Phase II recommended flow regime associated with overbank and pulse flows and

Ecological Base Flows (i.e., 95 percent exceedence flows) were also recognized and considered in their evaluation of the Settlement flows as noted below. My detailed review of the technical information made it readily apparent that the flow regimes being considered under the Settlement Agreement are clearly an extension of the Hardy Phase II recommended flow regimes that reflect the necessary balance for agriculture, refuge deliveries, target lake elevations for the endangered Klamath Lake suckers, flood control curve, increased storage capacity of Upper Klamath Lake and factor in reasonable and achievable restoration actions both within Klamath Lake and upstream tributaries.

Apparent lack of variation in winter and spring flows over a wide range of water year types

My discussions with several individuals working on the Settlement Agreement made it clear to me that many people in the Klamath Basin do not necessarily understand the subtle difference between the various components of the flow recommendations provided in Hardy Phase II. One component, the 'Base Flow' recommendations, is represented by the exceedence flow based table (i.e., Table 27). These flow recommendations are target flows on a monthly basis by water year type that focus on providing variable habitat conditions for the anadromous species and other aquatic resources in the river. Flows associated with exceedence ranges lower than about the 10 percent level (i.e., high flows that are equaled or exceeded only 10 percent of the time) are superseded by the Hardy Phase II Overbank and Pulse Flow recommendations. In that context, it is not appropriate to be concerned with the prediction of available physical habitat values even if these higher flows would indicate reductions in available habitat as some individuals have expressed. As emphasized in the Hetrick et al. (2008) "whitepaper":

> "Even if the Hardy Phase II baseflow recommendations were implemented, flows during the wet years would surpass the Phase II schedule and habitat values would, in some cases, be lower during spill events than those calculated for the flow recommendations. We note that the Hardy Phase II flows are baseflow targets and that higher flows associated with pulse or overbank flows (i.e., spills) are also a component of the Hardy Phase II flow regime", and that "While flood flow events can diminish habitat availability, they are essential for geomorphic and channel maintenance processes that create and maintain quality and diversity in fish habitat conditions, a point well described by Hardy et al. (2006)."

Overbank and pulse flows that exceed the Hardy Phase II Base Flow recommendations are necessary for the physical, chemical, and biological processes of channel maintenance and riparian maintenance flows that create and maintain the habitats associated with the target Base Flow recommendations. As noted in the Hardy Phase II report, the existing infrastructure of the Klamath Basin does not unduly impact these higher flow

regimes. More importantly, the Real Time Management (RTM) analyses of the Settlement flows presented by Hetrick et al. (2008) as a potential method of implementing the water allocation proposed under Settlement show that these flow events will also be maintained given the management objectives of filling the lake early in the spring under both the flood control and target lake elevations for suckers. This will result in the high probability of lake spills over a wide range of water year types. My concern in the initial review of the Settlement Agreement was the apparent lack of variation in the winter and spring flows over a wide range of water year types as reflected in the WRIMS model flow duration summaries provided for my review. This was the only technical information that I had access to at the time of my initial review. During my detailed technical review, it became apparent that the WRIMS model outputs do not necessarily reflect anticipated daily flows within the river that would be achieved under the Settlement Agreement given the nature of that model (i.e., a planning tool) and how flows would be managed under the proposed RTM Operations tool. The detailed analysis conducted by Hetrick et al. (2008) clearly show for example, in many water years during the winter and spring periods, the WRIMS monthly time step would indicate a flow at Iron Gate on the order of 5,000 cfs while the RTM-based analysis shows Upper Klamath Lake in spill mode, with predicted flows at Iron Gate Dam more on the order 10,000 to 20,000 cfs. These differences in projected flow regimes are attributed to the nature of the WRIMS model structure, monthly time step, and conservative nature of the modeling assumptions. A careful comparison between the RTM-based analysis versus the WRIMS modeling show that on an annual basis, the total volume of water released within the Klamath River is similar for most years. However, the expected flow outcomes of the RTM model are expected to maintain both overbank and pulse flow characteristics as recommended in the Hardy Phase II work. Based on this review of the RTM-based flows, this approach should be explored further and refined as necessary to meet ecological objectives for river flows. In my opinion, the RTM-based flow management under the constraints of water deliveries, flood control, and target lake elevations for suckers will still result in adequate variation of winter and spring flow regimes and meet the required ecological flow regime characteristics of both overbank and pulse flows. The RTM analyses also demonstrated to me that over the intermediate ranges of water year types (i.e., 10 to 90 percent exceedence ranges) that expected daily flow regimes are within acceptable levels of the Hardy Phase II target flow recommendations given the required balancing with target lake elevations critical to the endangered sucker.

Apparent sustained low flows below 1000 cfs during the later summer and early fall

The other component of the flow regime highlighted in the Hardy Phase II recommendations relate to the Ecological Base Flow recommendations, and my concerns of allowing flows below 1000 cfs during the late summer and early fall due to the increased ecological risk from temperature and disease factors under

existing conditions. However, it should be noted that the Base Flow recommendations (Table 27 in Hardy Phase II), that the flow recommendations during July and August at exceedences greater than about 75 percent are in fact lower than 1000 cfs. What was critical to understand is that the Hardy Phase II concerns over the ecological risk from disease and thermal affects when flow fall below 1000 cfs were driven by the conditions with the dams in place. What became clear from the extended review of the technical work in the Settlement Agreement in conjunction with the work of Dumsmoor as part of the FERC relicensing of PacifiCorp facilities is that these conditions are anticipated to significantly improve with dam removal. My own assessment of anticipated channel conditions in the Copco to Iron Gate Dam reach in conjunction with the improved water quality and temperature regimes lessen these concerns under Settlement flow regimes. It is my opinion that the cold water refugia that will exist from tributaries and large springs in this reach as well as the anticipated shift in the thermal regime is anticipated to reverse the 2-3 week shift in run timing currently experienced in the main stem Klamath. Once the dams are removed, it may be that lower flow releases from Keno will result in improved thermal conditions in specific reaches due to lack of thermal dilution associated with existing reservoir conditions. These combined factors have led me to believe that the threshold flow at which significant concerns over thermal and disease factors will drop well below 1000 cfs to something on the order of 700 to 800 cfs.

Another significant factor in this regard is related to the Drought Management Plan that is a key element of the Settlement Agreement. My discussions with the technical team have clearly shown that this plan is critical in addressing flow regime changes when critical drought conditions are being experienced in the basin. Under the assumption that the Drought Management Plan will be required and completed as part of the Settlement Agreement and that the plan will result in compromises for both in river and out-of-stream diversions it is an equitable tradeoff within the context of the Settlement Agreement for addressing aquatic resource needs both within the main stem Klamath River and sucker needs within Upper Klamath Lake.

The potential affects of groundwater pumping on stream flows

In my initial review of the Settlement Agreement I raised concerns regarding the potential affects of groundwater pumping on stream flows. Discussions with the technical personnel and statements by the Oregon Department of Water Resources during the April 10th and 11th meetings in Mt. Shasta have clarified this issue. It is evident that setting the groundwater pumping to levels in existence in 2000, setting a 6 percent reduction in flow in any of several critical springs around Upper Klamath Lake important for the Klamath Lake suckers and enforcement of Oregon laws that govern curtailment of groundwater pumping if stream flows are affected will provide the necessary protections for over utilization of groundwater resources in the basin. It is recognized that both monitoring and enforcement will need to be adequately addressed.

Uncertainty on the relationship between the Drought Management Plan and river flows during extreme drought conditions

An initial concern in my review of the Settlement Agreement and limited technical material provided on the WRIMS modeling was related to projected flows at high exceedence levels (i.e., > 90 percent) where late summer and early fall flows were reported as low as 400 to 500 cfs. Based on my review of the RTM analysis and a better understanding of the assumptions made in these model runs, I am convinced that flows of these magnitudes are likely underestimating actual river flows. As was noted previously, the RTM-based analysis of flows clearly show higher flows than that projected by the WRIMS runs on a daily basis and that the estimated evaporation from the existing reservoirs (~ 8,000 ac-feet/year) were not added into the projected modeled WRIMS flows. This is not to suggest flows during critical drought years are expected to be low, but that these flows are not as low as being projected under the WRIMS runs and do not reflect flows that will be anticipated under the Drought Management Plan.

Other Factors

Several other factors that came to light as part of my opportunity to discuss the technical basis of the Settlement Agreement are worth noting. I believe that monitoring diversion of water for the Klamath Project to the point of diversion is an important element of the Settlement Agreement. This will ensure that the proposed flow volumes are being met with the implementation of that water use in the hands of the water users. I believe that this will result in more efficient use of the available water as evidenced by improved agricultural practices in other basin to which I am familiar. I also believe that the increased habitat availability to suitable stream habitats not only within the main stem Klamath River above Iron Gate Dam but also in upper basin tributaries will result in improved productive capacity for the entire system. This view is strongly supported by analyses conducted by Hetrick et al. (2008) which show increased outmigrant production from the system under Settlement Agreement flow regimes even prior to dam removal. I am also confident that the water quality and temperature modeling conducted for the 'no dam' conditions by Dunsmoor and Mike Deas show vastly improved conditions for the main stem Klamath River and is supported by both the bioenergetics modeling and salmon production modeling reported in Hardy Phase II.

Although a policy issue, I am now more comfortable that the proposed work anticipated under the Settlement Agreement on both the Implementation Plan and Drought Management Plan are in fact required to be completed in order for the Settlement Agreement to remain in place. This eliminates my initial concern that these elements were left uncompleted prior to being able to support the Settlement Agreement.

Kamman Hydrology & Engineering, Inc.
7 Mt. Lassen Drive, Suite B250, San Rafael, CA 94903
Telephone: (415) 491-9600
Facsimile: (415) 680-1538
E-mail: Greg@KHE-Inc.com

April 27, 2007

Mr. Greg King and Ms. Erica Terrence
Northcoast Environmental Center
1465 G Street
Arcata, California 95521

Subject: Impressions from Klamath Science Meeting
Klamath Independent Review Project (KIRP)

Dear Greg and Erica:

This letter was prepared in response to attending the Klamath Science meeting in Mt. Shasta, California, on April 10 and 11, 2008. At this meeting, I was able to gain more insight into the science behind the Settlement Agreement and discuss the comments, questions and recommendations I put forth in my November 9, 2007 letter to the Northcoast Environmental Center (NEC) with the subject heading, "Independent Model Review for Klamath Settlement Negotiations, Klamath Independent Review Project (KIRP)." This meeting also provided the opportunity to align my November 9 comments with the current version (Draft 11, January 15, 2008) of the Settlement Agreement (SA). I've learned that the final language contained in the Agreement addresses and negates some of my stated concerns, which were based on earlier draft versions of the Agreement. Presented below is a summary of my main concerns (bold italic text) taken from the November 9 letter and how these concerns have been addressed and alleviated (plain text) during the Science meeting or in review of the current SA.

1. ***The SA does not identify specific project areas that will provide the needed increase in UKL storage.*** Section 17.2 of Draft 11 of the SA provides the location and acreage for restoration projects that have or will cumulatively provide the added 100K AF of storage to UKL.

2. **How will the SA confirm that water supply gains are attained through water budget and evapotranspiration analyses?** Further development and expansion of the USGS hydrologic model is funded and thoroughly explained in Draft 11 of SA. As recommended, the SA indicates that this tool will be used as the means to verify targets and thresholds specified in the Water Resources Program.

3. ***How will the SA verify that additional 30K AF of inflow to UKL will be realized through land conversion?*** (see response 2. above)

4. ***I recommend that the Settlement Group endorse and support the development and maintenance of a watershed-scale integrated surface water-groundwater model used to: a) evaluate how changes in groundwater pumping impact the overall upper basin water budget; 2) evaluate how changes in groundwater pumping effect surface water***

flow and inflow to UKL; 3) evaluate how changes in land use and vegetation effect the overall upper basin water budget and inflows to UKL; and 4) provide quantitative estimates of the above mentioned water budget variables that can then be used to establish specific safe-yield groundwater use requirements. (see response 2. above)

5. ***Determine impacts to salmonids due to decreased river flow rates during the September-February period, especially under the R32_NewStorage alternative conditions.*** See Klamath Science meeting comments by Dr. Thomas Hardy, April 23, 2008.

6. ***Complete a hybrid model simulation that imposes a drought on the "Interim" Agreement period. This simulation would likely represent a worst-case dry-year scenario over the "Interim" Settlement Agreement period.*** We did not discuss this comment specifically, but from related discussions during the Science meeting and Appendix A of Draft 11 of the SA, I better understand prioritization of Drought Plan, Emergency Response Plan and Climate Change Assessment and where they fall within Agreement implementation schedule.

7. ***Determine how the shifted UKL annual storage hydrograph and significantly reduced (from historic) "Interim" lake levels impact the aquatic/wetland ecology and water quality of UKL.*** Larry Dunsmore provided a lot of insight to this concern as it relates to potential impacts to UKL. According to Larry, the shift in seasonal hydrograph will actually be better aligned with a more natural pattern than what has occurred historically. In addition, the ecological benefits associated with increased wetland habitat area due to UKL expansion will likely significantly out-weigh the adverse effects associated with lower lake levels.

8. ***Delete language in the Settlement Agreement that endorses the use of groundwater as a measure to augment surface water flow and irrigation until a complete and comprehensive analysis and understanding of associated impacts of the upper basin water budget are determined, likely from USGS groundwater modeling.*** Appears that this or acceptably similar language has been incorporated into Draft 11 of SA (see section entitled, "New Wells" on page 63).

9. ***The Settlement Agreement should contain specific language to ensure that water and water rights associated with land conversion or retirement are retained for instream beneficial use.*** These concerns/needs are addressed under current groundwater adjudications and Oregon Groundwater rights.

10. ***Clarify the definition of "adverse impact" in the Settlement Agreement in Section 15.2.4 to include a 6% reduction (relative to the 2000 baseline condition) in the cumulative inflow to UKL. This includes springs and stream inflows from areas outside of the KIP area.*** Section 15.2.4 of Draft 11 of the Settlement Agreement provides a better quantified and location-specific definition of adverse impact.

11. ***The Settlement Agreement should specify guidelines and protocols to verify that land retirement in the off-project areas is providing the desired annual increase in inflow (30K AF) to UKL. Two possible independent methods include: 1) flow monitoring and water budgeting of UKL and 2) water budget tracking using the USGS groundwater-based model.*** This item was discussed at length during the Science Meeting and I've come to feel that this issue is likely being addressed as best as practical at this time. Both physical monitoring and UGSG numerical modeling will be used to track changes and identify potential adverse impacts if they occur.

12. ***Develop more detailed, verifiable and enforceable drought emergency response and adaptive management plan language for the Settlement Agreement. Ensure that there are triggers in place that allow participants to revisit and modify operations if egregious allocations result during droughts or other situations.*** Section 18 of Draft 11 of the SA appears to have evolved along these lines, at least to the best as possible until the Drought and Emergency Response Plans and Climate Change Assessment are initiated.

I appreciate the opportunity to learn more about the specific scientific analyses behind development of the Settlement Agreement and to have obtained clarification to my stated concerns. It was also a unique opportunity to learn of and discuss some of the strategic decisions regarding the stated restoration goals contained (or not contained) in the Settlement Agreement. I strongly support the development and incorporation of the USFWS "White Paper" into the Agreement with the intent to summarize and publicize the opportunities and constraints to ecological restoration within the basin under a variety of Settlement Agreement alternatives.

Finally, I would like to take the opportunity to make a recommendation. It is my opinion that as it is currently written, there is an imbalance in stated goals in Draft 11 of the SA, such that a layperson reading it could perceive that there are more benefits and guarantees being provided to irrigators versus fish. Having attended the Klamath Science meeting, I've been fortunate to learn more about the history, study focus and commitment of resource managers to improve fish habitat. A lay person reading the Agreement for the first time, however, will not gain this perspective. Therefore, I believe that stating more definitive goals for fish habitat improvement will benefit the Agreement and address the perceived imbalance. If asked if I would support the Settlement Agreement as currently written, I would do so.

If you have any questions or would like to discuss the contents of this letter, please don't hesitate to contact me.

Sincerely,

Greg Kamman
Principal Hydrologist

Klamath River Basin

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