Water Quality Report

Upper Klamath and Lost River Subbasins TMDL and WQMP

Response to Public Comment

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State of Oregon
Department of
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Quality

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This report prepared by:

Oregon Department of Environmental Quality
811 SW 6th Avenue
Portland, OR 97204
1-800-452-4011
www.oregon.gov/deq

For more information contact:

Steve Kirk, Basin Coordinator
Oregon Department of Environmental Quality
475 NE Bellevue Drive, Suite 110
Bend, OR 97701-7415
(541) 633-2023
kirk.steve@deq.state.or.us

INTRODUCTION

This Response to Public Comments document addresses comments and questions received regarding the Draft Upper Klamath and Lost River Subbasins Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) dated February, 2010. The individuals and organizations shown in Table 1 provided comments on the Draft Upper Klamath and Lost River Subbasins TMDL/WQMP during the Public Comment Period which was held from February 10 through May 27, 2010. On March 16, 2010 a public hearing was held in Klamath Falls, OR. All comments received during the public comment period have been reviewed by DEQ and addressed in this document. Comments which required modifications to the TMDL or WQMP are noted.

Table 1. Comment Submission for Upper Klamath Lost River Subbasins TMDL

Commenter	Date Comments Received	Format of Submittal
Klamath Water Users Association	May 27, 2010	Email, mail
City of Klamath Falls	May 26, 2010	Fax, email, mail
Klamath County Commissioners	May 25, 2010	Fax, email, mail
Columbia Forest Products	May 27, 2010	Fax, email, mail
USBR	May 27, 2010	Fax, email, mail
PacifiCorp	May 27, 2010	Email, mail
Bureau of Land Management, Lakeview District	May 26, 2010	Email, mail
Bureau of Land Management, Medford District	May 26, 2010	Email, mail
US EPA Region 10	May 20, 2010	Email, mail
California Regional Water Quality Control Board	May 25, 2010	Email, mail
Yurok Tribe	May 26, 2010	Email, mail
Quartz Valley Indian Reservation	May 27, 2010	Email, mail
Karuk Tribe	May 27, 2010	Email, mail
Therese Cartwright	May 24, 2010	mail
Klamath River Keeper	May 26, 2010	Email, mail
201 Concerned Citizens	March 16 - 18, 2010	email
Betty Anderson	March 25, 2010	mail
Klamath Irrigation District	May 27, 2010	Mail, email
Curt Mullis	May 27, 2010	email
Jim Wrey	March 4, 2010	mail
William Kennedy	May 27, 2010	email
Brian and Sally Woodward	April 5, 2010	mail
Therese Cartwright	May 24, 2020	mail
Randy Shaw	May 13, 2010	oral
Luther Horsley	May 13, 2010	oral
Trish Seiler	May 13, 2010	oral
Gail Whitsett	May 13, 2010	oral
Betty Dickson	May 13, 2010	oral
Bob Flowers	May 13, 2010	oral
Therese Cartwright	May 13, 2010	oral
Claude Hagerty	May 13, 2010	oral

UPPER KLAMATH AND LOST RIVER SUBBASINS TMDL AND WQMP COMMENTS

Comments from: Klamath Water Users Association (KWUA)

KWUA General Comments

KWUA 1: The overall circumstances leading to the Draft TMDL are a significant concern. It is clear that the adopted water quality standards are unrealistic, but the exceedance of those underlying standards led to the listing of waters under Clean Water Act (CWA) section 303(d), frequently on a year-round basis. The Draft TMDL thus must simulate a separate "natural conditions" baseline for the purposes of establishing load allocations. We believe a more comprehensive planning process, that first looks to determine appropriate water quality standards, would be more appropriate. That is not to say that there would be no TMDL development; rather, it would help to identify where, and the time periods for which, TMDLs would actually be appropriate, and to focus resources in a cost-effective manner.

Response: The draft TMDLs were developed to address exceedances of water quality standards that are deemed protective and appropriate for the designated beneficial uses (OAR-340-041-180 Figure 180A) for the Upper Klamath and Lost River subbasins.

KWUA 2: The Draft TMDL is deficient in its consideration of feasibility and costs. With respect to feasibility, the Draft TMDL does recite the provisions of Oregon Administrative Rules (OAR) to the effect that WQMPs must explain how implementing management strategies will result in attainment of water quality standards. See Draft TMDL at 5-2, 5-5, 5-7, 5-10. But ultimately on this point, the Draft TMDL says little other than if specific assumptions used in modeling in fact occur, water quality standards will be met. See, e.g., id. at 3-31. We believe this falls short of the explanation required by the regulations. Any number of assumptions could be made. Without a linkage of an assumption to reality or feasibility, such conclusions are not valuable.

Response: The WQMP (Chapter 5) outlines the general approach and those responsible for TMDL implementation. Following TMDL issuance, DEQ will work with the DMAs and designated sources to develop TMDL implementation plans that contain site specific information and costs and timelines for how the DMA would implement the TMDL. It may be necessary for DMAs and designated sources to prioritize among the strategies if resources are limited. This may mean addressing some sources of pollution before others or focusing implementation efforts in a particular geographic area. To the extent possible, the selection of priorities should be driven by the greatest opportunities for achieving pollutant reductions. DMAs and designated sources may need to conduct a fiscal analysis to determine what additional resources are necessary to develop, implement, and maintain the management strategies, and how these resources will be obtained. The results of this analysis could be briefly described in the implementation plan. Section 5.3.1 was revised to emphasis this point.

KWUA 3: With respect to costs, the Draft TMDL unfortunately avoids even the bare "general discussion" required by OAR 340-042-0040(4)(l)(N), let alone the analysis of costs described in OAR 340-042-0040(6). The Draft TMDL provides no sense of what the costs and other consequences of implementation would be. We cannot stress enough that the TMDL should serve as a useful informational document for the public and policymakers and not merely a description of model assumptions and outputs. ODEQ actions related to water quality requirements must be reasonable and necessary. ORS § 46811.020(2)(b); In the Matter of Richard Eckerle, OAH Case No. 112032, Agency Case No. WQ/SW-WR-03-079 (2004) at 22, 25 (methods used to safeguard water quality must be reasonable). We emphasize that we do not believe ODEQ has authority to require specific compliance with load allocations. However, a more complete cost analysis is required.

Response: Section 5.3.13 Costs and Funding of the draft TMDL/WQMP discusses funding available to begin implementation of the WQMP and potential future funding sources for project implementation. The

designated management agencies are expected to provide a fiscal analysis of the resources needed to develop actions to address load allocations as part of individual source specific implementation plans,

KWUA 4: KWUA also believes that the Draft TMDL threatens to inhibit, not promote, meaningful water quality improvement. For example, while expressing general support for activities such as "trading" (see, e.g., Draft TMDL at 5-23 to 5-25), the Draft TMDL, and the other TMDLs adopted or being developed, would seem to make trading impossible. There are TMDLs that cover virtually all of Lost River within the Klamath Project area (and Klamath Straits Drain (KSD) and the Klamath River, resulting in a load allocation of one sort or another almost anywhere one looks. Thus, if there were, for example, a project or undertaking that would decrease loading from KSD, there would still exist a load allocation further up in the system. In short, if one were to devise a functional plan for providing the most benefit for beneficial uses, a very different approach would be used. Recognizing that the CWA applies, we nonetheless urge that ODEQ give meaningful attention to how plans and programs could be structured to realize cost-effective benefits.

Response: The goals of the tracking and accounting program as described in Section 5.4.1 of the draft WQMP are not limited to trades between sources. The goals are to develop a basinwide accountability program to track water quality improvements, facilitate planning, and coordinate TMDL implementation based upon a market-like system. The Tracking and accounting Program should also provide a decision tool to guide expenditure of implementation resources towards projects with greatest/earliest impact and encourage the pooling of resources to support engineered and other solutions and enable the spending of resources across state boundaries by tracking and accounting for the contribution of each project.

KWUA 5: The observations above also relate to the CWA section 303(d) list itself. As a general matter, the historic exceedance of water quality standards has occurred during certain months of the summer. It appears that listings are overly broad as to season in several circumstances. There are daunting water quality challenges in the Basin under the best of circumstances, but if the scope of the TMDLs is unnecessarily broad, the challenges are magnified unnecessarily. Thus, we urge ODEQ to revisit the CWA section 303(d) list itself (as well as the underlying standards) as part of a necessary effort to tailor water quality planning and actions to realities and needs.

Response: The 303d list of impaired water bodies are based on the State water quality standards that are protective of the designated beneficial uses for the Upper Klamath and Lost River subbasins. Revisions to the State water quality standards are not within the scope of the TMDL development process. Part of the TMDL development process includes reviewing the available data to insure that the listing is warranted. Based on DEQ review of the data, the 303d listings for the Upper Klamath and Lost River Subbasins are warranted.

KWUA 6: The Draft TMDL does not recognize potential conflicts with water conservation efforts. The Klamath Project as a whole is highly efficient in its use of water, and this should be recognized and supported. Similarly, individual water users continually improve on-farm efficiencies. Less efficient practices would in many instances lead to higher quality drainage waters. [Footnote 2: Also, for example, higher water use efficiency can results in less water in Lost River] Thus, to the extent the Draft TMDL promotes changes in water quality throughout the entire Klamath Project; it may also promote inefficient water use. Additionally, ODEQ must ensure that nothing in the TMDL impairs water rights.

Response: The TMDL does not mandate or imply that a DMA or designated source must alter water diversions in order to meet this TMDL and the water quality standard. How a DMA or designated source makes its operations consistent with the allocation is to be established later through the planning process provided through sector-specific TMDL Implementation Plans developed following TMDL issuance. Section 5.3.2 Goals and Objectives has been revised to emphasis this point.

KWUA 7: Additionally, we believe there are inconsistent and inappropriate assumptions in the Draft TMDL. To a significant degree, inconsistencies appear to result from the fact that the Draft TMDL is

model-driven. There is a need to take a broader perspective and reconcile the current inconsistencies. Some of these issues are addressed in more specific comments that follow. However, there is a general inconsistency between the various TMDLs developed or under development, which also manifests as an internal inconsistency in this Draft TMDL. That is, other TMDLs and this Draft TMDL treat certain waters as both impaired waters under the CWA for which TMDLs are developed and discharges subject to load allocations. For example, EPA and the Regional Water Board have adopted TMDLs for KSD and Lower Klamath Lake (and Ady Canal). The Draft TMDL identifies KSD and impoundments as nonpoint "sources" of water quality impairments. See, e.g., Draft TMDL at 2-6, 2-23, 2-45

Response: Impoundments are waters of the state and may be both a source of water quality impairment that receive impaired water quality from other sources and in turn discharge to other impaired waterbodies. Waters of the state" means all natural waterways, all tidal and nontidal bays, intermittent streams, constantly flowing streams, lakes, wetlands, that portion of the Pacific Ocean that is in the boundaries of this state, all other navigable and nonnavigable bodies of water in this state and those portions of the ocean shore, as defined in ORS 390.605. (ORS 196.800(14) and OAR 141-085-0010 and 141-085-0015). Klamath Straits Drain is a nonpoint source that receives pollutants from distributed nonpoint sources and subsequently discharges into the Klamath River. Thus KSD has an allocation both for the Lost River system and an allocation for the Klamath River TMDL.

KWUA 8: At the same time, the Draft TMDL and the EPA and Regional Water Board TMDLs treat KSD as an impaired water body or receiving water, and the Draft TMDL treats impoundments as receiving waters. See, e.g., id. at 1-5, 1-6, 2-6, 3-3. KWUA submits that a water body cannot be both a nonpoint source of pollution and impaired receiving water. [Footnote 3: KWUA questions the extent to which a TMDL may identify a reservoir as a source of discharge subject to load allocations, See, e.g., Draft TMDL at iii, 2-52] This is the equivalent of assigning a load allocation to a tributary of a river. The identification of KSD, Lost River Diversion Channel (LRDC), or any other feature as a pollutant source is inappropriate if these waters are themselves "impaired" receiving waters. In addition, and related to the comments above concerning feasibility, certain features such as LRDC provide flood control. The Draft TMDL does not take this important practical function into account in any meaningful manner.

Response: See response to comment KWUA 7. DMAs need to consider practical constraints when developing their respective implementation plans to address their respective allocations.

KWUA 9: Further, designation of a given water body as a nonpoint source in no way identifies the true cause of the impaired water quality. See, e.g., Draft TMDL at 2-6, 3-3. If ODEQ cannot identify actual sources, the TMDL should explain the related data deficiencies. KWUA recognizes that ODEQ does not have sufficient information to identify the impairing constituents' actual sources. However, the failure to identify sources within the TMDL can shift the burden to certain parties inappropriately and minimize the utility of any TMDL.

Response: The TMDL identifies nonpoint sources based on land uses **(**see **Table 2-1 and Table 3-1**). The identified sources are sufficient for developing implementation plans to address load reductions.

KWUA 10: In this regard, with the many TMDLs that have been or are being developed, it is difficult for anyone, let alone the parties who would be most directly affected, to understand each TMDL's ramifications. Accordingly, ODEQ, EPA, and the Regional Water Board should publish a summary of each existing and proposed TMDL, the waters it covers, the geographic areas to which it assigns allocations, the specific loads it allocates, the existing or anticipated regulatory document establishing implementation measures assigned to that TMDL, and the specific areas covered by any such implementation measures.

Response: Pages vi-vii provide a summary of the TMDLs including parameters, geographic area, season of application, sector responsibilities, and allocation quantities.

KWUA 11: The Draft TMDL was prepared without sufficient data to support the load allocations, sources, and natural background assumptions. Any TMDLs or implementation plans adopted for water bodies within the Klamath River Basin must be based on accurate, current data and reasonable assumptions. We understand that the report completed by the U.S. Geological Survey, Review of Revised Klamath River Total Maximum Daily Load Models from Link River Dam to Keno Dam, Oregon (2010) has been or will be provided to ODEQ. We are also aware that the Bureau of Reclamation (Reclamation) will submit technical comments, and join in technical concerns expressed by Reclamation. Other comments below also highlight certain technical issues.

Response: The TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act. We disagree with the assertion that the TMDL was prepared "without sufficient data".

KWUA 12: As a last general matter, it is critical to coordinate the implementation of pending and completed TMDLs and other water quality activities in the Klamath Basin. Klamath farmers and ranchers are on the receiving end of various TMDL processes. ODEQ should coordinate implementation of the Draft TMDL with the implementation of other TMDLs and other planning actions to ensure the requirements are consistent, feasible, and based on reasonable water quality standards. For example, KWUA has concerns about the combined effects of Oregon's use of implementation plans prepared by Designated Management Agencies (DMAs), which include KWUA members, California's use of conditional waivers of waste discharge requirements, and interim WQMPs. We, and the water users, also have concerns related to imposing WQMPs where there already exists an Agricultural Water Quality Management Area Plan developed in part and overseen by the Oregon Department of Agriculture (ODA). Farmers and ranchers may have even further responsibilities under programs of the Natural Resources Conservation Service or other agencies. ODEQ should go to whatever lengths are necessary to avoid inconsistency, confusion, regulatory overlap, inefficiency, and unnecessary costs.

Response: Coordination of TMDL implementation between ODEQ, California Regional Board, and USEPA is facilitated by a Memorandum of Agreement between these agencies. DEQ will work with ODA to revise the current Agricultural Water Quality Management Area Plan to address the load allocation for Upper Klamath and Lost River Subbasins. Additional MOAs may be considered to facilitate coordination of the TMDL with other federal agencies.

KWUA Specific Comments

KWUA 13: KWUA has a number of concerns related to the Draft TMDL's proposed load allocations for various sources and impoundments. As discussed in the general comments, the currently-existing and proposed TMDLs are inconsistent in their treatment of certain features such as LRDC, KSD, and impoundments. These cannot be both impaired "waters of the United States" for which TMDLs are prepared and nonpoint sources of pollutants.

Response: See response to Comment KWUA 7.

KWUA 14: The Draft TMDL also makes inconsistent assumptions related to implementation of TMDLs. It assumes, for example, immediate compliance with the Upper Klamath Lake TMDL in simulating background water quality in the Klamath River. However, the load allocations do not use the same assumption in calculating appropriate load allocations for features within the Klamath Project such as KSD or the small nonpoint sources [Footnote 4: KWUA believes that there are various, relatively small discharges to the Klamath River that have not been enumerated in the TMDL. Whether these ultimately identified individually or collectively, the TMDL should make clear that discharge is allowed from these sources] discharging to Klamath River (including PDIC and others), LRDC, discharges to Lost River, or Anderson Rose impoundment. In particular, it appears that, if water diverted from Upper Klamath Lake does not in fact meet the Upper Klamath Lake TMDL, the load allocations for these other sources could not be met unless they reduced loading that originated from a noncompliant Upper Klamath Lake. That is, the quantitative load allocations for these features would point to the Klamath Project "dischargers" if

Upper Klamath Lake failed to meet standards. To the extent that quantitative load allocations for these features are adopted, they should be applicable only after Upper Klamath Lake water in fact is compliant with the Upper Klamath Lake TMDL, or they should be adjusted such that allowable includes only "additions" to compliant incoming water quality.

Response: Ultimate implementation of the Upper Klamath and Lost River subbasins TMDL by the DMAs and designated sources does require achieving TMDLs for Upper Klamath Lake Drainage though DEQ has acknowledged this will take decades. Each DMA and designated source is responsible for developing and implementing plans that address their source specific contributions to the water quality impairment. New, expanded or previously unidentified sources may discharge pollutants at or below background concentrations of pollutants estimated by the Upper Klamath Lake baseline condition presented in **Table 2-9**. At these concentrations, it is unlikely that a source would contribute to a DO, pH, ammonia toxicity or chlorophyll *a* impairment.

KWUA 15: KWUA believes that there are various, relatively small discharges to the Klamath River that have not been enumerated in the TMDL. Whether these are ultimately identified individually or collectively, the TMDL should make clear that discharge is allowed from these sources. It also appears that the Draft TMDL, while assuming Upper Klamath Lake meets its TMDL, does not assume that the TMDLs that have been adopted for KSD in California, Lower Klamath Lake, or other features have been fully implemented.

Response: Miscellaneous discharges into the Klamath and Lost River are allowed. The commenter is correct. The TMDL analysis assumes TMDLs in the Klamath Basin will be implemented.

KWUA 16: KWUA finds the load allocations in Tables 2-9, 2-11, 2-14, 2-15, 3-11, 3-12, and 3-13 difficult to understand. In addition, assuming it is proper to assign allocations to KSD and LRDC, consideration should be given, in consultation with Reclamation, to expressing the load allocation as the combined loading from these two sources, to promote management flexibility.

Response: The draft WQMP section 5.3.7, page 5-17 states: ” DEQ encourages USBR to pursue innovative changes to project operations including reduction of discharge to the Klamath River from Lost River Diversion Channel (LRDC) to address their combined pollutant load reductions for Klamath Straits Drain and LRDC. “

KWUA 17: We question the "allocations" for impoundments, for various reasons. First, we do not believe ODEQ has authority to assign a load in this manner, where the impoundment itself does not add any pollutants. Second, the Draft TMDL tables regarding impoundments for dissolved oxygen describe "necessary increases." Draft TMDL at 3-32, 3-33, 3-35. This does not represent a "load allocation" and is confusing. Third, we do not understand inclusion of KSD as an "impoundment." Fourth, the Draft TMDL does not appropriately take into consideration the origin of water behind the impoundments, or the sources of pollutants in that water. For example, water behind Anderson-Rose Dam, at least in the irrigation season, will likely be water diverted from Upper Klamath Lake. Again, if Upper Klamath Lake does not in fact meet water quality standards, the "impoundment" should not be assigned an allocation based on mitigating that problem. Finally, to the extent the purpose of a load allocation for "impoundments" is to address the quality of downstream waters, ODEQ must consider that: water bypassed at Wilson Reservoir and Anderson-Rose Dam has not necessarily been impounded at all or affected by having been "impounded"; and limited if any water may be released below Anderson-Rose Dam during the irrigation season.

Response: The DEQ does have the authority to assign allocations for to impoundments where the presence of the impoundment contributes to the impairment. The allocations to selected impoundments represent an instantaneous increase in dissolved oxygen to address a reduction in assimilative capacity from the presence of the impoundment. The dissolved oxygen allocations assigned to impoundments address the water quality upstream of the impoundment structure. Additional allocations apply to upstream to sources discharging to the impoundments.

KWUA 18: Further, if load allocations for impoundments relate to improved water quality downstream of the impoundment, there should be a load allocation for Upper Klamath Lake, based on its influence on the water quality of all the waters that are subjects of the Draft TMDL. Upper Klamath Lake's water quality can affect the quality of Lost River or KSD directly. In fact, there is not necessarily any intervening use of water released from Upper Klamath Lake, most particularly with respect to influences of Upper Klamath Lake on Lost River water quality. Upper Klamath Lake, in other words, should not be treated differently than other impoundments for the purposes of this TMDL. Again, the effect of the load allocations as proposed in the Draft TMDL is to make the Klamath Project "responsible" for poor water quality conditions in Upper Klamath Lake.

Response: The allocation for Upper Klamath Lake is expressed as the phosphorus TMDL for Upper Klamath Lake (2002). The phosphorous TMDL for UKL demonstrates compliance with the water quality standard. The Lost River TMDLs for the impoundments demonstrate compliance with water quality standards by reductions in CBOD, DIN and dissolved oxygen offsets for KSD, Anderson Rose and Wilson impoundments.

KWUA 19: KWUA questions the assignment of loads to a district or other governmental agency rather than to actual sources. See, e.g. Draft TMDL at 3-35. The federal and state regulations do not contemplate that states will delegate source identification to other governmental agencies. Rather, the regulations suggest that a load allocation should be "attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources." 40 C.F.R. § 130.2(g); OAR 340-041-0002(30); see OAR 340-042-0040(4)(h). In accordance with the regulations, when individual nonpoint sources cannot be quantified or distinguished from natural background sources, the TMDL should assign a "gross allotment" to all the nonpoint and natural background sources contributing to a receiving water. 40 C.F.R. § 130.2(g); OAR 340-041-0002(30);OAR 340-042-0040(4)(h). However, rather than assign a gross allotment to all nonpoint and natural background sources to the Lost River system, the Draft TMDL attempts to assign loads to governmental agencies and water bodies. See, e.g., Draft TMDL at 2-45, 3-34, 3-35. ODEQ must re-evaluate load allocations to ensure it appropriately applies the federal and state regulations.

Response: The Department concurs with the reviewer. Load allocations are attributed to existing or potential sources. The TMDL complies with OAR 340-042 and policy decisions related to implementation of the Clean Water Act. The water management districts are designated sources responsible for submitting source specific implementation plans. The text was revised to clarify this designation.

Description of the Klamath Project

KWUA 20: We are concerned by an apparent lack of objectivity in the Draft TMDL's discussion of the Klamath Project generally and KSD specifically. The Draft TMDL does recognize that the Klamath Project is a "net sink" of nutrients, but appears to go out of the way to identify the Klamath Project as a source of impairment. In this regard, the Draft TMDL's argumentative discussion related to KSD includes a temporary shift from discussion of loads, to discussion of concentrations in order to advance a point. Draft TMDL at 2-30 to 2-32. The Draft TMDL also draws a generalized conclusion related to effects on assimilative capacity of the Klamath River (id. at 2-33) that does not take into account that the Klamath Project does not affect the volume of water in Lake Ewauna or the consequences of mass loading for factors such as sediment oxygen demand in the context of Lake Ewauna/Keno Reservoir. Finally, the Draft TMDL selects information from a single month (August 2002) to advance its arguments. Id. at 2-31. We understand that this lone month is the most extreme situation for which information exists. The Draft TMDL's focus on that specific month of record lacks objectivity. We encourage ODEQ to provide a more objective analysis. Further, as noted above, if the most significant periods of time are the summer months, it is inappropriate, and may detract from sensible management strategies, to generalize information for one month to justify load allocations for every month of every year.

Response: The draft TMDL takes into account the volume of water consumed by the USBR's irrigation project. Even when examining an entire year of 2002, the Klamath Project appears to be a sink of nutrients in relation to the Klamath River. Despite the higher phosphorus concentrations returning to the Klamath River than leaving it, the loading is strongly influenced by the flow and only 30% of the flow that enters the Lost River system from the Klamath is returned to the Klamath River. Even though USBR's Klamath Project appears to be a net sink of nutrients, it also appears to have detrimental impacts to the water quality of Klamath River. Higher nutrient concentration in water discharging from the Klamath Straits Drain relative to the Klamath River, increase the nutrient concentration of the Keno impoundment. Consequently, the KSD is considered a nonpoint source receiving an allocation for the Klamath River TMDL.

KWUA 21: KWUA appreciates that the Draft TMDL recognizes that the Klamath Project supports the region's agricultural economy. Draft TMDL at 1-10. Given the importance of the Klamath Project to the region, the Draft TMDL should clearly and accurately describe the Klamath Project. In particular, KWUA disputes the Draft TMDL statements with respect to Klamath Project irrigation practices affecting the quality of the waters at issue. Id. at 2-6, 2-23, 2-26, 2-30, 2-31, 2-34, 3-3, 3-14, 3-15, 4-12, 4-15, 4-17. We are not aware of scientific evidence to support that irrigated agriculture within the Klamath Project increases nutrient loads to the Klamath River or Lost River. Given that the Klamath Project's source water is the nutrient-rich Upper Klamath Lake and passes through two wildlife refuges, it is unclear what Klamath Project irrigation practices cause loading.

Response: See response to comment KWUA 20.

KWUA 22: Similarly, the Draft TMDL states without sufficient support that the KSD and LRDC caused a greater than 0.075°C impact on the Klamath River for periods between June and September. Draft TMDL at 2-56. Also without sufficient support, the Draft TMDL concludes, "reservoirs and irrigation ditches which, through their operations, increase water temperatures or otherwise modify natural thermal regimes in downstream river reaches." Id. at 4-12. ODEQ must support any statements regarding water quality effects with facts and provide the data.

Response: Thermal impacts to the Klamath River from KSD and LRDC are estimated using the calibrated water quality model. Evidence of thermal impacts to receiving water bodies from reservoirs and irrigations ditches are demonstrated in the Thermal Infrared Radiometry data.

KWUA 23: In addition, certain concentration assumptions applied to the Draft TMDL analysis are inappropriate. Draft TMDL at 2-30 ("When concentration data were not available for a specific canal, a nearby river concentration was used as a surrogate."). To the extent the analysis relies upon surrogate data, the Draft TMDL must explain the origin of the surrogate numbers, the canals to which the data were applied, and the rationale supporting such application. OAR 340-042-0040(5)(b). The Draft TMDL does not do so, and instead makes conclusions without the requisite support.

Response: The document has been modified to include information regarding the origin of estimated concentrations used in the analysis presented at page 2-30 in the Draft TMDL.

Natural Background Assumptions

KWUA 24: The Draft TMDL does not sufficiently distinguish between natural background loads and nonpoint source loads for the Klamath and Lost River TMDLs. Since Upper Klamath Lake is a large source of nutrients in waters subject to the TMDLs, any success hinges on the application of a reasonable, scientifically sound estimate of natural background. Federal regulations and policy require ODEQ to base load allocations on sound science and appropriately account for natural background conditions. 40 C.F.R. § 130.2(g); see Protocol for Developing Nutrient TMDLs, EPA 841-B-99007 (Nov. 1999) at 3-7 ("load allocations and wasteload allocations are calculated using the best available data and information"). Applicable law requires ODEQ to gather and analyze the data necessary to develop TMDLs appropriate for the subject water bodies.

Response: The Klamath River TMDL Section presents the development of natural conditions. The Upper Klamath and Lost River TMDL acknowledges natural background contributions to pollutant loading. However, the development of TMDLs for the Lost River system does not require quantification of loads from natural background sources.

KWUA 25:The model uses current flow data for Upper Klamath Lake, LRDC, and KSD to maintain consistency with the existing conditions scenario. Draft TMDL at 2-41, 2-42. However, the model assumes that water quality and temperature levels for LRDC and KSD are equal to those of Upper Klamath Lake under TMDL-compliant conditions. Id. at 2-42. These natural background assumptions are inappropriate and undermine the Draft TMDL. Basing the natural background conditions for these distinct channels on assumed compliance with the Upper Klamath Lake TMDL is unreasonable. There is no adequate justification in the TMDL or model for the use of these levels as the natural baseline. The Draft TMDL additionally does not adequately take into account the effects on water quality of factors such as waterfowl and other wildlife, and natural hot springs.

Response: The Upper Klamath Lake boundary used in the TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act.

KWUA 26: KWUA is also concerned with other aspects of the temperature TMDL for the Upper Klamath River and Lost River Subbasins. The Draft TMDL states that the cumulative effects of nonpoint source heating cannot exceed 0.2°C. Draft TMDL at 4-27. However, in identifying the responsibilities of DMAs with regard to TMDL compliance, the Draft TMDL states: "The sum of the nonpoint source impacts including agriculture, forestry, urban areas, irrigation, dam operations, and hydroelectric projects must be less than 0.2°C." Id. at 4-28 (emphasis added). Initially, then, there is a slight discrepancy in the Draft TMDL's assignment of the load allocation to water management agencies. Moreover, the Draft TMDL reads: "Because of the complexity and size of the irrigation system, it was not possible to quantify the thermal impact of each district's irrigation withdrawals, delivery and return into the Klamath River and Lost River tributaries." Ibid. If ODEQ does not fill this data gap, water management districts will lack the baseline to which to compare any management actions that might be available.

Response: Quantification of thermal impacts from individual water management districts are not necessary to assign thermal allocations and a total human use allowance of 0.2° Celsius.

Comments Regarding the Proposed WQMP, Assignment of Implementation Responsibilities

KWUA 27: The Draft TMDL inappropriately assigns expectations and responsibilities to water management agencies as DMAs to implement the TMDLs. See, e.g., Draft TMDL at 5-7 (defers required WQMP elements to water management agencies to develop and implement), 5-8 to 5-9, 5-11 to 5-13. Water management agencies include irrigation districts and other public agencies. Id at 1-20, 5-15. Under Oregon law, a DMA is "a federal, state, or local governmental agency that has legal authority over a sector or source contributing pollutants, and is identified as such by the Department of Environmental Quality in a TMDL." OAR 340-042-0030(2) (emphasis added). Irrigation districts (e.g., KID) and drainage districts (e.g., KDD) must operate in accordance with Oregon's Irrigation District Law (ORS§ 545.001 et seq.) and Drainage District Act (ORS § 547.005 et seq.), respectively. Neither of these statutes provides irrigation or drainage districts authority to enforce water quality standards with respect to constituent irrigators or pollutant loads in their system. Within the Klamath Project, there are also District Improvement Companies, Improvement Districts, a Ditch Company, and other entities, all of which also lack such authority. Additionally, these entities also lack the expertise and other resources to enforce water quality standards. ODEQ cannot expect or require water management agencies to assume the role of a water quality regulator. Inappropriately assigned actions are unlikely to be carried out effectively, if at all.

Response: The Department acknowledges that small water management districts may not function as governmental agencies. However, these smaller water management districts are sources or potential sources and are required to submit implementation plans. Larger water management districts function as governmental agencies and are considered DMAs. The TMDL document will clarify the definition of DMAs and sources. The text was revised to provide clarification regarding the expectations for smaller water management districts.

KWUA 28: Irrespective of the authority or obligations of such entities under state law, we wish to point out that the Draft TMDL is unclear as to expectations as to works which are owned and operated by the Reclamation and those owned by Reclamation but operated by a district. For example, within KID, canals and drains are owned by Reclamation but operated by KID under contracts. We encourage ODEQ to gain a more complete understanding of this issue. We also have concerns related to DMA responsibilities that may be proposed for Reclamation, since Reclamation's costs may or will be passed on to the districts and water users.

Response: Additional explanation will be added to the document explaining the responsibilities of USBR for implementing the TMDLs. USBR is responsible for developing a TMDL implementation plan to address load allocations at water management facilities owned by USBR. We encourage multiple sources to collaborate in developing implementation plans.

KWUA 29: In addition, ODEQ cannot assign responsibility for certain discharges unless the assignee is actually responsible for the subject discharges. The TMDL Implementation Guidance issued by ODEQ recognizes this limitation: "DMAs required to submit a plan are not responsible for pollution arising from land management activities that occur outside of their jurisdictional authority." TMDL Implementation Plan Guidance, ODEQ (May 2007)

Response: The Department has assigned implementation responsibilities to USBR as a water management agency responsible for management of water between the Lost River system and the Klamath River. Management of water between these two drainages is considered a source of water quality impairment requiring a TMDL implementation plan.

KWUA 30: In the WQMP, the Draft TMDL states: "Also with regard to TMDL responsibilities, [ODEQ] recognizes that organizations are not responsible for land use activities or load allocations outside of their area of jurisdictional authority." Draft TMDL at 5-14. This statement is vague and should be revised to conform to the language in the TMDL Implementation Guidance. The WQMP discussion should also state that the DMAs have no responsibility to improve the water quality coming into their systems.

Response: We disagree with the commenter. The statement in question reflects DEQ TMDL implementation policy. DMAs and sources are not responsible for reducing loads from sources upstream of their respective land or water management areas.

KWUA 31: Similarly, the Draft TMDL's WQMP should clearly state that DMAs are not responsible for regulating activities that occur on private lands within the DMAs' service areas or addressing these lands in the DMAs' TMDL Implementation Plans. Put differently, additional implementation plans related to on-farm practices are unnecessary. As explained, identified DMAs have no legal authority to regulate such activities. It isn't clear how ODEQ distinguishes between a DMA and a "responsible party".

Response: The WQMP does not require additional implementation plans related to on-farm practices.

KWUA 32: Certain private land is already covered by water quality plans. With assistance from other parties, ODA developed the Lost River Subbasin Agricultural Water Quality Management Area Plan (AWQMP) (revised April 28, 2006) as a comprehensive water quality management plan for agricultural activities within the Lost River Subbasin. See OAR 603-090-0000. The AWQMP covers the water bodies at issue in the Draft TMDL including those in the Klamath Project area. The AWQMP applies to agricultural, rural, and forest lands and lands that support agricultural activities but are not strictly in

agricultural use (e.g., private roads). The AWQMP addresses bacteria, nutrient, and temperature concerns based on relevant water quality standards. ODA received assistance from the Lost River Local Agricultural Water Quality Advisory Committee and Klamath Soil and Water Conservation District. Lost River AWQMP used to guide the AWQMP's development included using scientifically credible data and techniques; recognizing background water quality; recognizing that proper agricultural practices improve water quality; recognizing that the economic viability of agriculture is necessary to achieve improvements; emphasizing maintenance, restoration, education, and monitoring; maintaining a non-threatening, positive atmosphere; and using common sense to develop cost-effective, practical, flexible, and realistic solutions. More specifically, the AWQMP covers the Klamath River from Link River Dam downstream to Keno Dam (including Lake Ewauna), Oregon portions of the Lost River and its tributaries, and Swan Lake Valley. The Lost River AWQMP does not apply to agricultural activities on lands held by the federal government or in trust for tribes. Notably, Oregon law establishing the temperature criteria at issue in the Draft TMDL reads: For farming or ranching operations on State or private lands, water quality standards are intended to be attained and are implemented through the Agricultural Water Quality Management Act (ORS 568.900 to 568.933) and rules there under administered by the Oregon Department of Agriculture. Therefore, farming and ranching operations that are in compliance with the Agricultural Water Quality Management Act requirements will not be subject to DEQ enforcement under this rule. DEQ will work with the Oregon Department of Agriculture to revise the Agricultural Water Quality Management program to attain water quality standards. OAR 603-090-0030(1). The AWQMP finds that, "reductions in nutrient levels [in accordance with the AWQMP are expected to alleviate concerns related to low dissolved oxygen, high pH, chlorophyll a, and ammonia toxicity" that are the subjects of the Draft TMDL. Accordingly, the AWQMP was developed to ensure that landowners conduct agricultural-related activities to protect beneficial uses. The AWQMP calls for landowners to undertake voluntary activities to protect water quality and beneficial uses (e.g., best management practices). ODA has substantial authority under statute to promote water quality improvement related to private land. See, e.g., ORS §§ 568.912(2), 568.915(1) ORS § 568.921; OAR 603-090-0040. ODA also has certain authority to use regulatory tools when voluntary efforts are not taken or are deemed insufficient. ORS § 568.930; OAR 603-090-0000(5)(d), 603-090-0060(3), 603-090-0080, 603-090-0110;.To implement the AWQMP, ODA adopted "Area Rules." OAR 603-095-3900 et seq.; The Area Rules provide a straightforward way for landowners to determine if their agricultural management protects water quality in accordance with the AWQMP. The Area Rules are based on a scientific relationship between the land condition and specific water quality problems. Ibid. For example, Area Rule (3)(a) addresses those characteristics of riparian areas that provide water temperature moderation and filtration of potential pollutants. OAR 603-095-3940(3)(a); AWQMP at 23. Area Rule (3)(a) states: "agricultural activities must allow the establishment or improvement of vegetation to provide bank stability and shading of natural streams consistent with the vegetative capability of the site." OAR 603-095-3940(3)(a). Area Rule (3)(b) authorizes weed control in riparian areas where such activities are consistent with Area Rule (3)(a). OAR 603-095-3940(3)(b)." Area Rule (5) is a general waste management rule that reinforces Oregon law prohibiting pollution of public waters. OAR 603-095-3940(5); see ORS §§ 468B.025, 468B.050. The purpose of Area Rule (5) is to clarify that ODA has direct enforcement authority under the Area Rules, and has additional authority as necessary, to assess civil penalties for water quality violations. AWQMP at 23. "[Area] Rule (5) is used when agricultural activities cause conditions that significantly limit attainment of water quality standards or threaten beneficial uses of the water." Ibid. ODA may modify the AWQMP and Area Rules to fit changed circumstances or when new information becomes available supporting modifications. A local advisory committee reviews the AWQMP biennially, and amendments to the AWQMP and Area Rules must occur through a public review process. Moreover, the AWQMP states: "When a TMDL is established for the Lost River, the Area Plan [i.e., AWQMP] and [Area] Rules will be re-evaluated and revised to address the load allocation assigned to agriculture. DEQ will also evaluate the success of the Area Plan upon implementation of the TMDL." Thus, the AWQMP satisfies the adaptive management component of the Draft TMDL.

Response: Comment noted.

KWUA 33: At the March 16, 2010, workshop on the Draft TMDL, ODEQ intimated that TMDL Implementation Plans should focus on shading, weed removal, and best management practices (BMPs).

If this is ODEQ's intent, the WQMP needs to be straightforward and specific in this regard and limit such plans to addressing activities and BMPs related to shading and weed control. Further, the Draft TMDL should clearly reflect that aquatic pesticides used in weed removal operations are highly regulated and that it is difficult to use these substances in Oregon at all, substantially hindering weed control operations. The WQMP should also establish a timeline for implementing the TMDL Implementation Plans, including a schedule of reasonable and achievable actions. The WQMP requires DMAs to prepare TMDL Implementation Plans within 18 months from the Draft TMDL's adoption. This timeframe is unreasonable, especially given that KWUA members generally lack the resources to develop such plans. The Draft TMDL should clearly reflect that use of aquatic pesticides for weed removal in conveyance facilities is highly regulated and that it is difficult to use these substances in Oregon at all, substantially hindering such weed control operations.

Response: The DMAs and/or designated sources are responsible for developing and implementing the source-specific implementation plans (OAR 340-042-0080) The DMAs and designated sources shall:

- Identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading;
- Provide a timeline for implementing management strategies and a schedule for completing measurable milestones;
- Provide for performance monitoring with a plan for periodic review and revision of the implementation plan;
- Provide any other analyses or information specified in the WQMP, and
- Implement and revise the plan as needed.

The Department believes that 18 months is a reasonable amount of time to submit a draft implementation plan.

KWUA 34: KWUA appreciates that ODEQ plans to coordinate with EPA (Regions 9 and 10) and the Regional Water Board to implement the Klamath TMDLs. See Draft TMDL at 5-3 to 5-4. KWUA understands that ODEQ and these parties developed a Memorandum of Agreement (MOA) in 2009 for joint implementation of the Klamath River and Lost River TMDLs. Ibid. The WQMP's discussion of the MOA implies that implementation of the TMDLs may occur through commitments made in the MOA. See ibid. One such commitment is for the agencies to work jointly with "implementation parties" such as KWUA to develop effective implementation plans and achieve water quality standards. Id. at 5-4. KWUA is pleased that ODEQ seeks to involve KWUA in such efforts. However, it is inappropriate at this time for ODEQ to rely upon the MOA commitments to implement the TMDLs. Rather, the WQMP should be clear that the information regarding the MOA is for informational purposes only and provide for an amendment to the TMDLs in the event these types of efforts come to fruition.

Response: We believe that the information provided in the document accurately reflects the goals and objectives of the multi-agency MOA. The MOA does not supersede the State's TMDL rule.

KWUA 35: KWUA is unsure which water management districts must create a TMDL Implementation Plan. ODEQ should more clearly assign implementation responsibilities.

Response: The WQMP was revised to describe expectations for implementation plans by water management districts.

KWUA 36: Another commitment in the MOA is that the parties will explore engineered treatment options, such as treatment wetlands and algae harvesting. Draft TMDL at 5-4. With regard to treatment wetlands, KWUA notes that any wetland filtration effort would require careful consideration of temperature effects

and effects on water quantity. It is crucial that any wetland filtration area created not affect water availability for the Klamath Project. It is also crucial that the costs of the project be carefully considered in respect to how effectively it mitigates water quality concerns. With regard to algae harvesting, KWUA notes that any plan to harvest algae from the Klamath River Basin to produce biofuels would be technically infeasible. The available scientific evidence demonstrates that algae in the Klamath River Basin are not suitable for such a purpose. In addition, there is concern over the financial feasibility of construction and operation of algae harvesting projects.

Response: The WQMP does not prescribe or mandate any particular implementation action. The WQMP offered several suggestions to consider. DEQ is confident the DMAs and designated sources are committed to developing innovative strategies to address load allocations.

KWUA 37: The MOA also states that its parties will develop and implement a basin-wide water quality tracking and accounting program. Draft TMDL at 5-4. This program is to establish a framework to track water quality improvements, facilitate planning and coordinated TMDL implementation, and enable appropriate water quality offsets or trades. Ibid. The WQMP encourages the Klamath Basin DMAs to develop a basin-specific, water quality credit program to meet the TMDL allocations for the Upper Klamath and Lost River Subbasins. Id. at 5-12. KWUA does not oppose the concept of offsets. However, KWUA does not fully understand how ODEQ intends to carry out the proposed trading program and is unclear as to where offset opportunities may exist for the subject TMDL as structured. Accordingly, KWUA cautions that ODEQ should not rely upon a trading option in lieu of adequately modeling alternative load reduction scenarios and establishing technically appropriate and equitable allocations. Further, the WQMP states that a water quality credit trading program, "would allow for collaboration among basin stakeholders on common projects while earning credit towards their regulatory requirements related to TMDLs and other mandated programs . . ." Id. at 5-24. The WQMP should clearly acknowledge the potential application of any such trading program to the Klamath Project. In particular, the WQMP should ensure that irrigation discharges that reduce loading to water bodies receive a credit against any load allocation assigned in the respective TMDL.

Response: The TAP is a component of the TMDL implementation process and is not related to development of the TMDLs. Additional information about water quality trading opportunities is provided in Section 5.4.1 Water Quality Credit Trading Opportunities. Operational details of the Tracking and Accounting Program (TAP) will be developed by the cooperating agencies and stakeholders as part of the TMDL implementation process. We welcome KWUA's active participation in developing the TAP.

KWUA 38: As previously suggested, the WQMP should identify implementation measures necessary to carry out the underlying TMDLs. See section A above. Based on the measures identified, the WQMP should address financing, the time needed to implement the TMDL Implementation Plans (i.e., attain water quality standards), and the economic, social, and environmental impacts of plan implementation. See, e.g., 40 C.F.R. § 130.6(0(6); see OAR 340-042-0040(4)(1)(N), (6). The WQMP should address these measures in great detail. However, the WQMP lacks meaningful discussion of the economic and social impacts. For example, the WQMP should address the economic and social impacts of the potential measures DMAs will have to take to manage the known or suspected sources of pollution. See TMDL Implementation Guidance at C-4 to C-5. Such measures could require DMAs to conduct studies and performance monitoring, otherwise collect and analyze data, conduct public outreach, implement BMPs, or hold noticed public hearings to consider issues and adopt resolutions. DMAs may also have to update their implementation plans periodically, potentially at substantial cost. See id. at C-5; OAR 340-042-0030(6).

Response: When developing individual, source specific implementation plans, DMAs and designated sources should consider economic constraints. It is not within the scope of the WQMP to evaluate costs of each implementation plan.

KWUA 39: In addition, while KWUA appreciates the list of potential funding sources identified in the WQMP, we request ODEQ explain in more detail how ODEQ or others would assist individual dischargers

in identifying and obtaining funding for the proposed implementation measures. See 40 C.F.R. § 130.6(0(6); Draft TMDL at 5-21; see also Protocol for Developing Nutrient TMDLs, EPA 841-B-99007 (Nov. 1999) at 7-5 (nonpoint source controls must be supported by adequate funding). We also request a more complete list of funding sources rather than a "partial list of assistance programs." Ibid. Further, ODEQ must recognize obstacles outside of individual farmers' control, such as regulatory limitations, power rates, and costs associated with water operations.

Response: TMDL implementation plans should include consideration of funding constraints and recognize obstacles outside of the individual farmer's control.

KWUA 40: The WQMP should establish unambiguous performance standards. This is particularly important in the Klamath Basin where natural background and current conditions make attainment of water quality standards impossible in the foreseeable future. The WQMP recognizes that nonpoint source implementation would take several years to several decades after full implementation to reduce and control pollution (e.g., heat loads) effectively. Draft TMDL at 5-5. In this instance, we recommend that it be made clear that any responsibility ends with implementation plans, not the specific load allocations of the Draft TMDL.

Response: The DMAs and/or designated sources are responsible for developing and implementing the source-specific implementation plans (OAR 340-042-0080) The DMAs and designated sources shall implement and revise their respective implementation plans as needed.

KWUA 41: In addition, the WQMP does not adequately recognize that sources out of the control of DMAs or any entity within the Klamath Project are likely to prevent attainment of the water quality standards and TMDLs, and may require DMAs to waste resources to meet impossible load allocations. Nonpoint sources are to implement the TMDLs through TMDL Implementation Plans prepared by DMAs. Draft TMDL at 5-5. The WQMP states: "Where implementation of the implementation plan or effectiveness of the management techniques are found to be inadequate, ODEQ expects management agencies to revise the components of the plan to address these deficiencies." Id. at 5-6; see WQMP at 1-9 ("If ODEQ determines that all appropriate measures are being taken by the DMAs, and water quality criteria are still not being met, ODEQ may reopen the TMDL and revise as needed."). This implies that DMAs may have to expend scarce resources on measures that do not meaningfully improve water quality, if at all. Such a requirement removes resources from actual measures to improve water quality in the subbasin. Similarly, the WQMP states: If and when ODEQ determines that implementation plans have been fully implemented, that all feasible management practices have reached maximum expected effectiveness, and a load allocation cannot be achieved, the Department shall reopen the TMDL and adjust the load allocation and its associated water quality standard(s) as necessary. While KWUA appreciates ODEQ's assurances that the TMDLs adopted may be revised, ODEQ should reasonably ensure that the TMDLs are appropriate at the time they are adopted. Parties should not have to spend scarce resources based on TMDLs destined to fail. No amount of plan implementation by the DMAs will change the water quality coming into their conveyance systems. ODEQ should carefully consider now whether the TMDLs are achievable, especially considering the shortcomings of the natural background assumptions and modeling.

Response: We believe that the TMDLs are reasonable and achievable. Each DMA will monitor and document its progress in implementing the provisions of its individual implementation plan. This information will be provided to ODEQ for its use in reviewing the TMDL. As implementation of a plan proceeds, DMAs will develop benchmarks which can be used to measure progress towards meeting allocated loads. Where implementation of the implementation plan or effectiveness of management techniques are found to be inadequate, DMAs will revise the components of the plan to address these deficiencies.

Comments from: City of Klamath Falls (CKF)

CKF General Comments

CKF 1: The planned phosphorus load reductions from Upper Klamath Lake are extreme, unprecedented, and not likely to occur. The downstream wasteload allocations are therefore unreasonable because they are premised on the false assumption that the upstream load reductions will occur.

Response: The Department believes that the TMDL allocations are significant but achievable. Achieving any measure of reduction will take several years.

CKF 2: The data clearly show that the phosphorus loading from the Upper Klamath Lake ("UKL") is the dominant factor that has caused the water quality impacts downstream in the Klamath River. Compliance with the phosphorus Wasteload Allocations ("WLAs") by the City and other point sources will not produce a perceptible improvement in river water quality without significant reduction in the UKL loads. DEQ therefore needs to prioritize non-point source pollution controls in the upstream UKL. Downstream point sources should not be issued WLAs at this time or the WLAs should be phased in over time to prioritize non-point source controls.

Response: We believe that it is necessary to implement TMDLs in Upper Klamath Lake Drainage as well as the Upper Klamath and Lost River subbasins to restore water quality that is protective of the designated beneficial uses.

CKF 3: Phased in WLAs would also allow DEQ and NPDES permittees to address significant uncertainties surrounding prospective arsenic standards, and to resolve unknowns as to the effects of dam decommissioning on water quality. DEQ should also clarify what controls, if any, will be required for arsenic before it implements the WLAs.

Response: The Federal Clean Water Act requires implementation of wasteload allocations as soon as possible. The schedule for TMDL implementation and other NPDES requirements will be specified in the new NPDES permit. We acknowledge that effluent improvements by dischargers may occur in advance of nonpoint source controls.

CKF 4: The water quality data for the portion of the Klamath River from the City of Klamath Falls to Keno Dam indicates that that portion should not be listed as water quality impaired for dissolved oxygen in the winter months and is not water quality impaired for pH during the winter months. Further, agreements between California, Oregon, federal agencies, tribes, and others indicate that the downstream dams will be removed, which, assuming this occurs, would address concerns about nutrients stored in these impoundments. Based on this, the WLAs for nutrients do not need to be set for the winter months. DEQ should further analyze the potential for summer-only WLAs for these nutrients and recognize there are significant environmental and pragmatic benefits to summer-only WLAs.

Response: DEQ believes that year round allocations are necessary to protect water quality. Data presented in the draft TMDL shows pH excursions in Link River during the winter (Figure 2-13). We expect these high pH concentrations to continue into Lake Ewauna to your discharge locations (less than 1 mile from the mouth of Link River). Additionally, the draft TMDL presents dissolved oxygen data downstream of Keno Dam that shows impairment during the trout spawning season (i.e. winter and spring).

CKF 5: It is unclear whether the most appropriate data was used to develop the TMDL. DEQ should better clarify the data relied on to develop the TMDL and data should be presented or available to evaluate in a way it can be compared to other local datasets to determine whether the most appropriate data was selected.

Response: All available data from the modeled period was considered prior to initiating the analysis. The dataset used to calibrate and validate the water quality models is considered sufficient to analyze the current condition and develop pollutant load reductions necessary to attain water quality standards.

CKF 6: The WLAs for nitrogen and phosphorus are predicated on model output that is not reliable and, in turn, the WLAs themselves are unreasonable. Key steps in the modeling effort must be re-done to ensure that model output can reasonably be relied on to support allocation decisions.

Response: The Department disagrees. The WLAs for nitrogen and phosphorus are based on the best available data and are appropriate for setting allocations.

CKF 7: There should be no temperature WLA to the City because the Lake Ewauna stretch of the river is not impaired for temperature. Further, small temperature impacts from above the dams do not have any discernable effects below the dams.

Response: Temperature wasteload allocations are necessary because the Klamath River is 303d listed for temperature downstream of Keno dam. Consequently, thermal load allocations from anthropogenic sources upstream of Keno dam are required. The WLAs are based on rule language (OAR 340-041-0185(2)) specific to this reach.

CKF 8: DMA responsibilities should be measured by compliance with TMDL Implementation Plans. Greater attention needs to be placed on the control of non-point source pollution on private lands.

Response: Responsibilities for implementation of TMDLs for private landowners is described in Section 5.3.7 Implementation of Sector Specific Implementation Plans.

CKF 9: There are significant opportunities for water quality trading in the Klamath basin. The Department should further analyze the potential for trades within Oregon and also across state lines, and for credit banking.

Response: Section 5.4.1 Water Quality Credit and Trading Opportunities describes trading options available to address allocations. Section 5.4.1 will be revised to reflect the most recent developments in the Water Quality Improvement Accounting and Tracking Program.

CKF 10: DEQ needs to take sufficient time to fully address the concerns raised by stakeholders on this TMDL. The decision-making process should not be unduly influenced by TMDL related activities in California.

Response: The Department has held public information meetings, met with key stakeholders including the city of Klamath Falls, conducted a public hearing and extended the public comment period by 90 days. These actions have allowed adequate opportunity for the public to comment on the proposed TMDLs.

CKF 11: There are technical and factual errors in the TMDL that should be corrected.

Response: Refer to the response to specific comments below.

CKF Specific Comments

CKF 12: The planned phosphorus load reductions from Upper Klamath Lake are extreme, unprecedented, and not likely to occur. The downstream wasteload allocations are therefore unreasonable because they are premised on the false assumption that the upstream load reductions will occur.

The Klamath River is one of the more unique hydrologic systems in North America. Unlike many other rivers, the nutrient phosphorus is naturally very high in the upper reaches of the river, including the Upper

Klamath Lake ("UKL"), and considered a cause of downstream algal blooms and associated impacts on stream acidity (pH) and dissolved oxygen (DO). These are the main parameters for which the Klamath River is listed as impaired downstream on the Keno impoundment, which includes the Lake Ewauna segment of the river where the City is located.

The significant upstream loading of phosphorus into the Klamath River is perhaps best understood with reference to Figure 2-38 of the TMDL, which depicts the annual loading of total phosphorus into Lake Ewauna and other segments of the river. For "existing conditions" on the river, DEQ estimates there are 818,049 pounds of phosphorus each year that enter Lake Ewauna from the UKL from natural or anthropogenic sources.

Under the "allocation" segment of the diagram, the Department's analysis assumes that, once the UKL TMDL is implemented, only 70,786 pounds of total phosphorus will enter Lake Ewauna from the UKL. That is a planned 91 percent reduction in phosphorus loading from the upstream UKL, which is extreme, unprecedented and not supported by water quality trends in the region or by similar efforts in other states.

The Department acknowledged this later point when it stated "despite restoration efforts, regular sampling of phosphorus concentrations in Upper Klamath Lake has not revealed a statistically significant temporal trend...." TMDL at 2-27. This is evident by TMDL Figure 2-18, which is a time series of mean total phosphorus concentrations from the UKL from 1990 through 2002 (the time the UKL TMDL was approved) and through 2009. Over this period, the record does not show reductions in phosphorus loading from the UKL.

On related note, the UKL TMDL targets a 40 percent reduction in phosphorus loading into the UKL (see TMDL 2-27), but the Klamath TMDL calls for a 91 percent reduction in phosphorus loading into Lake Ewauna from UKL. We find no explanation in the TMDL as to how the Department could have concluded that the planned 40 percent reduction of phosphorus coming into the UKL would yield a 91 percent reduction for phosphorus coming into Lake Ewauna from UKL. Further, no matter how one looks at the targets, they are highly unlikely to ever be met.

Thus, there is no scientific or technical basis to support DEQ's planned reduction targets for phosphorus entering Lake Ewauna from the UKL. The draft load allocations ("LAs") and waste load allocations ("WLAs") in the Klamath TMDL are based on the premise that these upstream reduction targets will be met. Therefore, these allocations are themselves not supported by sound scientific or technical information.

Response: The Upper Klamath Lake boundary used in the TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act. The Klamath River TMDLs are considered reasonable and achievable. The Upper Klamath Lake TMDL model predicts a range of conditions. For reasons outlined in the draft, and further clarified in the final, we chose a subset of those conditions to use as a baseline for the Klamath River TMDL. This subset of conditions represents better water quality than the average predicted conditions and hence the subset is not expected to occur every year. Due to the phosphorus stored in the sediment of Upper Klamath Lake, there will likely be a time lag between the reduction in loading to Upper Klamath Lake and improved water quality conditions at the outlet. The Upper Klamath Lake TMDL model (Walker 2001, see TMDL document for complete reference) is the scientific and the technical basis for developing estimates of a restored Upper Klamath Lake. It is the best predictive tool available for Upper Klamath Lake. Pending the availability of adequate resources, DEQ will review the water quality model used to develop the Upper Klamath Lake TMDL and work cooperatively with USGS, USBR, and other stakeholders for revising the TMDL for Upper Klamath Lake

CKF 13: The data clearly show that the phosphorus loading from the UKL is the dominant factor that has caused the water quality impacts downstream in the Klamath River. Compliance with the phosphorus WLAs by the City and other point sources will not produce a perceptible improvement in river water quality without significant reduction in the UKL loads. DEQ therefore needs to prioritize non-point source

pollution controls in the upstream UKL. Downstream point sources should not be issued WLAs at this time or the WLAs should be phased in over time to prioritize non-point source controls. This would also allow DEQ and NPDES permittees to address significant uncertainties surrounding prospective arsenic standards, and to resolve unknowns as to the effects of dam decommissioning on water quality. DEQ should also clarify what controls, if any, will be required for arsenic before it implements the WLAs.

Response:. See response to CKF 3. This TMDL addresses the 303d listed parameters which do not include arsenic. DEQ will work closely with the City in developing effluent limits.

CKF 14: The cause of water quality impairments is upstream of the City. The upstream loading from the UKL is the dominant factor affecting downstream water quality. This is demonstrated by TMDL Figure 2-25, which shows the DO impact of various sources of nutrients, including the UKL, on the Keno impoundment, which includes Lake Ewauna. The graph shows that UKL loading is the major influence on this system and the point sources have little or no impact on DO levels. This is confirmed by DEQ when it stated "[t]he combined impact of point sources under current conditions is minimal when compared to other source categories." TMDL at 2-37.

The TMDL nonetheless imposes extremely restrictive phosphorus WLAs on the City. If left as is, the City would be required to meet a burdensome phosphorus WLA simply because it is downstream from other sources in the UKL, which has a phosphorus load that controls algal dynamics in the river and dwarfs the City's load. The City opposes introducing an allocation strategy in the TMDL that will never result in actual improvements to water quality. This allocation process also conflicts with what we view as the purpose of a TMDL, which is to identify the sources of pollutants responsible for impairments and to control those sources.

Response: The Klamath River TMDLs were developed in accordance with Oregon's TMDL rule (OAR 340-042). The Department believes that the TMDL allocations are significant but achievable. Achieving any measure of reduction will take several years.

CKF 15: The phosphorus WLA imposes a disproportionate burden on the City. This concern is magnified by the fact that the City is being asked to reduce its annual total phosphorus discharge from its Spring Street treatment facility from 35,617 pounds (this appears to be a DEQ estimate of phosphorus loading from 2000) down to only 3,496 pounds. TMDL Figure 2-38. This is a 90.2 percent reduction in total phosphorus. The proposed reduction requirement is immense and confusing in light of the fact that, during a February 2009 meeting with the Department, DEQ informed the City that its WLA for phosphorus would likely be capped at the TMDL model input levels based on the City's plant discharge in 2000. However, the actual limit in the TMDL is less than 10 pounds per day or approximately one tenth of the WLA the City anticipated based on the February 2009 meeting. This enormous and restrictive downward adjustment in the WLA remains unexplained in the TMDL.

The City's draft WLA also appears to impose a disproportionate reduction burden on the City as compared to other point sources on Lake Ewauna because other point sources received a higher WLA as compared to their existing discharge. For example, the Collins Forest project phosphorus loading allocation of 1,263 pounds/year is a 14 percent increase over existing loading of 1,104 pounds per year. Absent a proper explanation for this increase in allocation, it is not equitable to set higher WLAs to sources that may not actually need them, while having drastic effects on the City.

Response: In February 2009, DEQ met with the City and discussed preliminary TMDL results. Through this discussion and follow up investigation, DEQ realized that there was an error in how the Spring Street WWTP was represented (i.e. nitrogen concentrations) and its impact was calculated (i.e. pH standard compliance). When these errors were corrected, it resulted in changes to the proposed allocations. This is one of many examples of how the model and its interpretation evolved through development process. DEQ presents the final model and interpretation in the document and chooses not the present interim steps or preliminary results. DEQ met with the City to inform the City of the error correction and subsequent revisions to the allocations.

Allocations were developed to meet water quality standards and water quality standards could be achieved without reductions from 2000 discharge conditions for Columbia Plywood and Collins Forest Products. The moderate increase for Collins Forest is an artifact of how their discharge is represented in the current condition model and the allocation model (time varying versus static concentrations). Comparing actual waste load allocations (rather than percent reductions), shows the City of Klamath Falls with the largest allocations.

CKF 16: The financial impacts of the phosphorus WLA create dire economic consequences for the City. The City has begun financial planning analysis of the cost of complying with the proposed phosphorus WLA. The costs are exceedingly high and, when passed on to ratepayers, would result in profound adverse economic impacts in our community. While it is unclear the exact technology the City could employ to address this small of a WLA (potentially filtration and ultraviolet disinfection), the City estimates the infrastructure to meet this WLA alone would cost at least $12 million or more.

These TMDL-driven costs are extremely burdensome. When combined with the other near-term costs the City will incur to continue to discharge to the river, the costs are prohibitively high. On this point, the City now faces a staggering $87 million in near-term costs to address NPDES permit issues and to build capacity to support economic development in the region ($12 million for TMDL, $34 million for immediate plant upgrades, $6 million for plant reliability, $17 million for operations and growth, and $18 million to address other water quality criteria).

The anticipated multi-million dollar expenses have already required the City to significantly raise user rates and may require it to increase taxes, and if this TMDL were ever adopted as proposed, this increase could be staggering. These measures could also adversely affect the City's ability to sell bonds to pay for this infrastructure at a reasonable interest rate. If the WLA is left as is, the City is trapped because it must continue to provide its wastewater treatment services at higher treatment costs, but it is likely to confront significant difficulties raising the money to pay for these costs. The City cannot bear this burden alone.

There is no question that important investments need to be made in the City's treatment works, but the simple fact is that the City cannot pay for all these investments all at once. Thus, the projects need to be prioritized and, frankly, the $12 million cost to meet the phosphorus WLA is the one that should not be made or should be significantly delayed because it is the least likely to address any real water quality objectives.

Response: DEQ appreciates the burden carried by the City. Though the TMDL requirements account for approximately 14% of the total upgrade costs, this is still significant. DEQ will work closely with the City to minimize the impacts to the City through the permitting process and will allow a compliance schedule if possible.CKF 17: The phosphorus WLA could result in unintended negative consequences.
The phosphorus WLA is set so low that the City must also now seriously consider whether to forgo discharges to the Klamath River all together and to invest its limited resources in an irrigation program. The City estimates an irrigation program would cost at least $118 million or more, which would be a horrendous economic burden.

While new NPDES and future TMDL-related requirements could ultimately force the City to go down this route, at the moment, the economic and environmental indicators suggest that the City and the Department should do everything they can to ensure that the City can stay in the river. For the City's part, it cannot pay for an irrigation program, which would include the high costs of storing treated effluent through the winter months. Further, the no river discharge option should be avoided if at all possible because the loss of the City's flow could adversely affect downstream water quality and quantity as this discharge likely increases the level of DO concentrations in the river and, in the summer months, the discharge augments flow which likely has beneficial effects on downstream temperature and fisheries.

On a related note, as the Department is aware, the City and Pacific Klamath Energy ("PKE") have an innovative and environmentally beneficial contractual relationship whereby the City sends a significant

amount of its treated effluent to the PKE power plant for use as non-contact cooling water for power plant operations. The power plant, in turn, sends this cooling water back to the treatment plant for discharge through the City's outfall on Lake Ewauna. If the TMDL forces the City to cease discharging to Lake Ewauna, this will add costs to the City's treatment operations which will be passed on to all users of the City's system and might affect the City's environmentally beneficial water use agreement with the power plant.

Response: If the City chooses to discontinue discharge to the Klamath River, then the adverse impacts to water quality downstream should be evaluated as part of the facilities plan. Evaluation of potential impacts from hypothetical implementation strategies are not within the scope of the TMDL development process.

CKF 18: DEQ needs to prioritize low-cost non-point source controls and to take an incremental approach to point source reductions.

The most promising and low-cost approach to improve water quality in the Klamath River is to significantly invest in programs to address non-point source pollution in the UKL. However, and unfortunately, as shown in Table 5-3 of the TMDL, one of the Department's first proposed actions to implement the TMDL is to modify NPDES permits to implement the WLAs. This might make sense for river systems where the influence of point sources are clear and significant, but the influence of downstream point sources on the Klamath River are not so clear because, unlike other rivers, the upstream loading of phosphorus from UKL is the primary driver of water quality conditions.

This unique circumstance calls for a different NPDES permitting response and timeline. It is reasonable to take an incremental approach to point source reductions by addressing the lowest cost control mechanisms first (non-point sources) and to evaluate progress over time before forcing substantial reductions from existing point sources. The City therefore requests that the Department either: (1) not issue WLAs for nutrients at this time; (2) set them higher; or (3)phase them in over time. Such an approach would allow the Department (and stakeholders in the basin) to focus first on low-cost non-point source controls and to see their effect on water quality. A phased-in approach could also potentially allow for low-cost nutrient trades between point sources and non-point sources (discussed further below) before new and expensive treatment facilities need be constructed. A phased-in approach to implementing the WLAs is also necessary due to other circumstances unrelated to the TMDL and beyond the City's control. As the Department is aware, the City faces significant risk that it will soon be required to meet strict controls on the amount of naturally-occurring arsenic that can be discharged into the Klamath River. These restrictions could have significant ramifications for the type of treatment facilities the City can construct or whether the controls will require the City to forego discharges to the river all together.

Without a phased-in WLA, the City could be forced to invest its resources to construct facilities to meet a low phosphorus limit and, shortly thereafter, be forced to abandon this investment to meet a strict arsenic limit that requires a redesign of the treatment works. There is therefore a clear need for the Department to provide certainty as to what controls, if any, will be required for arsenic before it implements the WLAs. The City has limited public resources to build treatment works and has a duty to its ratepayers to make strategic investments in facilities that will be used for decades. The Department should recognize in the TMDL that there are significant near-term uncertainties with respect to arsenic standards and it will resolve these uncertainties before it implements the WLAs in NPDES permits.

The fact that there are four downstream hydroelectric dams planned to be decommissioned along the Klamath River in the near term is another significant reason to not issue or to delay issuing final WLAs at this time. Dams alter the physical, biological, and chemical properties of a river and the removal of these dams may have beneficial effects in the Klamath River. For instance, once the dams are removed, nutrients will no longer be impounded in several reaches of the river, which would likely help determine whether year-round or summer only WLAs are warranted. During this time of uncertainty, it is sensible to focus strategies on low-cost and highly effective non-point source controls that have synergistic benefits on the river (e.g., create fish and wildlife habitat) in lieu of requiring permittees to immediately construct

high cost infrastructure that would have minimal beneficial effects and may not be necessary when the dams are removed.

Response: See response to CKF 13. The decommissioning of the four dams proposed in the KHSA is dependent on the outcome of the Secretarial Determination EIS/ER process. DMAs and designated sources are responsible for implementing the TMDL with or without implementation of the settlement agreements.

CKF 19: The water quality data for the portion of the Klamath River from the City of Klamath Falls to Keno Dam indicates that that portion should not be listed as water quality impaired for dissolved oxygen in the winter months and is not water quality impaired for pH during the winter months. Further, agreements between California, Oregon, federal agencies, tribes, and others indicate that the downstream dams will be removed, which, assuming this occurs, would address concerns about nutrients stored in these impoundments. Based on this, the WLAs for nutrients do not need to be set for the winter months. DEQ should further analyze the potential for summer-only WLAs for these nutrients and recognize there are significant environmental and pragmatic benefits to summer-only WLAs.

There is very limited data available to support the need for year-round WLAs for nitrogen or phosphorus. Below are two graphs that present information from DEQ's Analytical Storage and Retrieval Database ("LASAR") for water quality data. The graphs depict DO levels and pH levels over the last ten years during the months of December through March on locations on the Keno impoundment, which includes Lake Ewauna. In no instance was DO measured below the state criteria of 6.5 mg/l. OAR 340-041-0016(3). The data show only one instance where pH measured above the normal Klamath basin criterion of 9. OAR 340-041-0185(1)(a). Further, as made clear by OAR 340-041-0021(2), waters impounded by dams, which have pHs that exceed the criteria are not in violation of the standard, if the Department determines that the exceedance would not occur without the impoundment and that all practicable measures have been taken to bring the pH in the impounded waters into compliance with the criteria.

The graphs also demonstrate the dearth of data upon which DEQ could have relied to model the impacts of nutrients on water quality conditions in the winter. This undercuts the value of relying on the model to simulate year-round water quality conditions and, in particular, wintertime conditions where nutrients are not likely to cause algal growth. In the winter time, the factors that limit algal growth are likely to be cool stream temperatures and short daylight hours.

A TMDL should not impose new restrictions in streams that are not water quality impaired or on sources that are not contributing to impairments. While DEQ may view year-round nutrient WLAs as warranted because winter-time nutrient loads can be stored in dam impoundments and released in the summer, as noted, assuming the four dams are removed, nutrients will no longer be impounded in several reaches of the river. This would likely influence whether year-round or summer only WLAs are needed. Thus, if WLAs are to be issued for nutrients, there is a reasonable basis to only apply them in the summer (June through September). DEQ should perform further analyses of the environmental effects of a summer only WLA for nutrients.

A summer nutrient WLA also has two significant practical benefits. First, under a summer WLA, a permittee can discharge treated effluent into the river for the majority of the year. Second, permittees have more wastewater treatment options available to them in the summer so, while still costly, a permittee can potentially forgo discharging treated effluent in the summer and arrange to irrigate effluent onto farm fields when irrigation is in high demand. This would also have beneficial effects by providing a source of water to farmers during the drought season, potentially alleviating the need for some downstream water withdrawals. Further, with a summer WLA, there would be no need to construct expensive facilities for the storage of treated effluent because the effluent could be immediately used for irrigation. Irrigation of treated effluent is less practical in winter because of colder temperatures and reduced demand.

Response: DEQ believes that year round allocations are necessary to protect water quality. Data presented in the draft TMDL shows pH excursions in Link River during the winter (Figure 2-13). We

expect these high pH concentrations to continue into Lake Ewauna to your discharge locations (less than 1 mile from the mouth of Link River). Additionally, the draft TMDL presents dissolved oxygen data downstream of Keno Dam that shows impairment during the trout spawning season (i.e. winter and spring). Lastly, as of writing this TMDL, there has been no decision to remove the dams by the Department of the Interior We examined your data analyses presented in the comments however DEQ considered additional datasets in making its determination, as presented in the draft TMDL.

CKF 20: It is unclear whether the most appropriate data was used to develop the TMDL. DEQ should better clarify the data relied on to develop the TMDL and data should be presented or available to evaluate in a way it can be compared to other local datasets to determine whether the most appropriate data was selected.

Appendix B of the TMDL includes a list of data sources used in the TMDL. The text lists data from the City, but does not identify which data was reviewed or used. See Table 3-7 in Appendix B to the TMDL. The City requests clarification as to what data from the City was used and whether it was used for site characterization, model calibration, or any other purpose.

On a related note, the City also requests that the Department present data in the TMDL or provide it in a way so that users can compare what data was used by the Department and how that data compares to other available local data sets. For instance, there is a summary of water quality data shown in Figures 3 and 4 of a technical memorandum on the TMDL model prepared in 2005 by Brown and Caldwell on behalf of the City. The report depicts the location and seasonal variability of data in the river reach that includes Lake Ewauna. DEQ's TMDL shows box and whisker plots for a number of parameters at river mile location and seasonally (see e.g., TMDL Figures 2-4 to 2-12), and these should be compared to other local data sets, including the sets used by Brown and Caldwell, to determine if the most appropriate data was used for TMDL development.

Response: The database Tetra Tech developed contains 7216 samples which are attributed to City of Klamath Falls which includes a variety of physical and chemical constituents including nutrients. Although DEQ did not track the source of the data in generating figures, these samples were incorporated in Figures 2-4, 2-5, 2-6, 2-7, 2-12, 2-13 and 2-14 as appropriate (if parameter existed for that location / time period). Likewise, appropriate data from 2002 was used to check the calibration of the model (see Appendix C). The database is available upon request.

CKF 21: The WLAs for nitrogen and phosphorus are predicated on model output that is not reliable and, in turn, the WLAs themselves are unreasonable. Key steps in the modeling effort must be re-done to ensure that model output can reasonably be relied on to support allocation decisions.

The TMDL load and wasteload allocations were derived through the use of a water quality model. TMDL at 2-44. A TMDL model is used to attempt to simulate and predict physical, chemical, and biological processes, which are particularly complex in the Klamath River. As DEQ acknowledges, models are affected by uncertainty such as the amount of data available and how well natural processes in the river are understood. According to the Department, this uncertainty is addressed by establishing a "margin of safety" in the TMDL.

Below we describe a number of concerns that relate to the modeling effort. The big picture concern is that the WLAs for the TMDL are predicated on model output that is not reliable and, in turn, the WLAs themselves are unreasonable. As background, we note that in 2009, the U.S. Geological Survey ("USGS") performed a review of the Klamath River TMDL models from Link River Dam to Keno Dam in Oregon ("USGS 2009"). The USGS also another review of revised Klamath River TMDL models from Link River Dam to Keno Dam ("USGS 2010"). The USGS identified errors with the Klamath River TMDL model including parameter value inconsistencies among model scenarios, incorrect natural conditions, initial concentrations (water quality conditions specified when model was run) and many others. USGS 2010 Report at 8 - 27.

Response: The model and documentation has been revised since the USGS 2009 review, in part to addresses their concerns. We recognize that there are uncertainties and possibilities for improvement of the model. However, we firmly believe that we have reached the point of diminishing returns for the TMDL modeling effort, particularly after re-calibrating the model in response to the USGS 2009 comments and seeing only modest changes in the TMDL allocations. This perspective played an important part in the technical team's determination that the model was adequate for TMDL purposes. We believe that the model equals or surpasses most TMDL water quality models in terms of technical sophistication, peer review, documentation, and project team collaboration.

CKF 22: In light of these flaws, the City is concerned that the TMDL model was developed in the absence of a real Quality Assurance Project Plan ("QAPP"). The U.S. Environmental Protection Agency ("EPA") in its report, Guidance for Quality Assurance Project Plans for Modeling, provided detailed information for using a QAPP for model development and application. A QAPP should have been used and followed for the Klamath River TMDL modeling effort to address key quality assurance needs regarding data quality objectives, model suitability, data validation and usability, model performance and acceptance criteria and uncertainty. Without adherence to QAPP protocols, the technical defensibility of the model's output is questionable. DEQ should explain if and how it followed QAPP requirements and, if it did not, it should revisit its use and application of the TMDL model to meet these requirements.

For instance, in the USGS 2009 model review, USGS identified "several parameters for which inconsistent values were specified for the year 2000 and 2002 current conditions scenarios and the natural conditions scenario…." These inconsistencies existed for the nitrification rate (NH4DK), dissolved oxygen half-saturation constant (O2LIM), labile dissolved organic matter (DOM) and particulate organic matter (POM) decomposition rates (LDOMDK, LPOMDK), and the POM settling rate (POMS)." USGS 2010 at 11. While USGS notes in its 2010 review that "[t]he revised models have been changed to use consistent values for all these parameters" and that "[t]he only remaining inconsistency among the revised model parameters is the maximum SOD [sediment oxygen demand] rate...," it appears that DEQ did not provide documentation for the values selected for NH4DK, O2LIM, LDOMDK, LPOMDK, and POMS in the revised models. USGS 2010 at 11. As USGS notes, "[a]ll these parameters are relatively important to the simulation of ammonia, DO, and OM [organic matter]..." USGS 2010.

Response: Tetra Tech developed the TMDL model under a QAPP developed for their contract with EPA . This QAPP includes all required elements and addresses model development, model modification and model calibration for TMDLs. The NH4DK, O2LIM, LDOMDK, LPOMDK, and POMS model parameters are within literature range, consistent between model runs and tested through model calibration.

CKF 23: Thus, DEQ should have performed and provided sensitivity analyses or model calibration exercises to determine the best set of final values for these parameters. Sensitivity analyses are important to determine whether a small change in the information used to model a parameter (such as DO) will result in a large change in model output. If that is the case, such information requires a much higher degree of scrutiny and review. Sensitivity analyses are standard practice to identify which parameters are more sensitive than others and, when adjusted up or down, which parameters result in disproportionately large changes in model output when compared to other parameters. It appears that the Department failed to perform these analyses and we request that such analyses be performed and the results explained. This is critical to understand water quality and algal dynamics in the Klamath River and how well the model predicts the natural system and, in turn, whether the model can properly be used for allocating waste loads.

Response: The model sensitivity analysis was performed as needed throughout model calibration and source assessment phases of model scenarios to better understand model predictions and limitations. Since it was not a formal process with defined output and metrics, it is not presented in this document. Discussion of uncertainty as it relates to the TMDL is discussed in the Margin of Safety Section (Section 2.8). We believe the model can properly be used for allocating waste loads.

CKF 24: The upstream boundary conditions used in the Klamath River model are derived from the model used for the 2002 UKL TMDL. Model review by the USGS in their 2009 and 2010 Reports and Brown & Caldwell in their 2005 Technical Memorandum identified these boundary conditions as the greatest source of uncertainty. Further, the boundary conditions for the TMDL model under review today are also uncertain because the model output relies on a highly uncertain natural conditions scenario, which simulated the background levels of water quality in the Klamath River without human impact. The model extrapolated output from these estimated natural conditions, but these estimates of natural conditions are based on the highly simplified model used for the UKL TMDL. That UKL model was based on unrealistic and near oligotrophic (e.g., undernourished) conditions, which in fact are not the conditions in the UKL.

Response: The uncertainty of model predictions and how this uncertainty impacts allocations was discussed in the Margin of Safety section of the draft TMDL. The Upper Klamath Lake boundary used in the TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act. The estimated natural condition of Upper Klamath Lake varies considerably from year to year. Your trophic status discussion ignores years with higher phosphorus concentration.

CKF 25: DEQ's current modeling approach also improperly relies on a very simple upstream mass balance model of the UKL (a 1-D model) to drive an extremely complex hydrodynamic model (the CE-QUAL-W2) on the Lake Ewauna segment of the Klamath River. The upstream model operates on a biweekly time-step (less simulated information) while the downstream model has a sub-hourly time-step (more simulated information). The Lake Ewauna stretch is a dynamic system with fluctuations in temperature and other water quality parameters. DEQ therefore needs a model that properly simulates these conditions, but the use of the upstream model to drive the downstream model output fails to properly do so. Thus, the modeling was conducted in a very data poor situation, or at least without full consideration of all of the available data that could have been used had DEQ used a different model or model approach to simulate the upstream UKL conditions and the downstream Lake Ewauna conditions. DEQ is effectively extrapolating information from the upstream model to the downstream model beyond a reasonable limit in this modeling exercise.

Response: The Department believes that the water quality model used for development of the Upper Klamath Lake TMDL represents the best available analysis of nutrient loading to Link River.

CKF 26: DEQ should subject the upstream boundary conditions used in the Klamath TMDL model to full scientific peer review to address and resolve these significant concerns. As the USGS points out, "efforts to re-evaluate the available models of algal growth and nutrient cycling in UKL would be highly beneficial to downstream modeling efforts in the Klamath River." Without such thorough reviews and necessary adjustments made to the models, the validity of the Klamath TMDL's model output is questionable and the model should not be used as a tool on which to base wasteload allocations.

Response: The Upper Klamath Lake boundary used in the TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act. The Klamath River analytical tool went through multiple rounds of peer review. Staff with modeling expertise from DEQ, NCRWQCB and EPA worked as a team with Tetra Tech reviewing and advising on model development and application. In 2005, the calibrated model was also reviewed by Merlynn Bender of U.S. Bureau of Reclamation (USBR), Dr. Scott Wells of Portland State University, and Brown and Caldwell under contract with the City of Klamath Falls. The NCRWQCB also had their TMDL go through an external scientific peer review in 2009 (NCRWQCB 2010). Lastly, USBR contracted the USGS to review the Keno impoundment portion of the model (Rounds and Sullivan 2009 and Rounds and Sullivan 2010). DEQ, along with EPA and NCRWQCB, considered all peer review comments and made changes to the model and documentation when appropriate.

CKF 27: The City is also concerned that data used in the modeling effort was not representative of actual environmental conditions in the region. For instance, the Data Review and Monitoring report that accompanied the TMDL summarizes precipitation data from 1996 to 2002 at the Klamath River mouth

and Tule Lake to provide a general sense of hydrologic conditions in the area (see TMDL Appendix B Table 4-2). The report says that it represents "...a range of hydrologic conditions and inherently considers seasonal variability and critical conditions...." However, during the period 1999 to 2002 the rainfall totals at the Klamath mouth station (the precipitation norm for that location and data record) is below normal and is as low as the 27th percentile for one of the key modeling and data years. A review of data at the Keno weather station finds below mean rainfall every year from 1999-2004 (there is no comparable data record at Klamath Falls). Thus, the modeling period represents a very low precipitation period, with no data points above normal and most years well below normal. The summer of 2002, June, July, and August, at Keno recorded almost no rainfall (0.11 inches total). There was almost no rain recorded in August of 2000, 2001, and 2002. This does not reflect representative hydrologic conditions.

Response: As shown in Figure 2-15 of the draft TMDL, flows in the Klamath River model years were at times above the median flow and at times below the median flow for a particular date. Therefore, the hydrologic conditions appear to be representative.

CKF 28: As made clear from these concerns, there remain significant and unresolved questions as to whether the DEQ model can provide reliable information on which to base management decisions, such as how to allocate WLAs to point sources. The Department appears to have dealt with these uncertainties by allocating strict WLAs to wastewater permittees to force significant new investments in infrastructure. A more prudent approach would be for the Department (and all stakeholders in the region) to focus much more attention and collaborative action to address the underlying causes of nutrient loading into the UKL.

Response: The Department is required to develop waste load allocation for all facilities with NPDES permits. We disagree with the assumption that strict WLAs were developed to force significant new investments in infrastructure. Collaborative actions by the DMAs and designated sources to reduce nutrient loads to UKL are fully endorsed by the Department.

CKF 29: There should be no temperature WLA to the City because the Lake Ewauna stretch of the river is not impaired for temperature. Further, small temperature impacts from above the dams do not have any discernable effects below the dams.

The temperature WLA to the City is neither necessary nor appropriate. As shown on Table 1-2 of the TMDL, the river reach at River Mile 251 is not listed as water quality impaired for temperature. Table 2-4 appears to suggest that a WLA for temperature is necessary due to downstream water quality impairments, but the linkage between the City's outfall and downstream impairments is not explained and it is not at all clear that there is such a link.

The City recognizes there are rules that limit the ability of a point source to cause temperature increases in a water body after mixing. However, a separate WLA for temperature is unnecessary for a stream segment that is not temperature impaired, and in any event, any temperature-related restrictions can be based on existing statutes and rules and put into a revised permit. The temperature WLA should be eliminated.

Response: Although the Keno impoundment is not water quality impaired for temperature, the Klamath River downstream of Keno Dam is 303d listed for temperature. Consequently, temperature allocations are necessary to control thermal loads from anthropogenic sources upstream of Keno dam and downstream of Upper Klamath Lake. See also OAR- 340-041-0185 (2): “From June 1 to September 30, no NPDES point source that discharges to the portion of the Klamath River designated for cool water species may cause the temperature of the water body to increase more than 0.3°C above the natural background after mixing with 25% of the stream flow. Natural background for the Klamath River means the temperature of the Klamath River at the outflow from Upper Klamath Lake plus any natural warming or cooling that occurs downstream. This criterion supersedes OAR 340-041-0028(9)(a) during the specified time period for NPDES permitted point sources.” The WLA is based on the above rule language.

CKF 30: DMA responsibilities should be measured by compliance with TMDL Implementation Plans. Greater attention needs to be placed on the control of non-point source pollution on private lands.

Response: Each DMA and designated source is responsible for its contribution to pollutant loading through their respective implementation plans. Implementation of TMDLs for nonpoint sources is described in Section Progress toward achieving the TMDL allocations will be tracked using DEQ's IMD for TMDL implementation and

CKF 31: The City must and will make significant expenditures to address its responsibilities as a DMA. The TMDL states that, for DMAs, their respective TMDL Implementation Plans are due 18 months after DEQ issues the TMDL and are expected to fully describe the efforts of DMAs to achieve their applicable TMDL allocations.

Response: The Department concurs. DMAs have 18 months to submit an implementation plan with the required elements specified in OAR-340-042-0080.

CKF 32: It is unclear in the TMDL what each DMA's applicable TMDL allocation is, and if there is a number, how that would be measured. The City suggests that, as a DMA, its compliance with any load allocation under the TMDL for non-point sources should be measured by compliance with its TMDL Implementation Plan, rather than any numeric targets or limits. DEQ also expects DMAs to develop benchmarks for attaining water quality improvement. It is also unclear what is meant by such benchmarks. The proper benchmark for a DMA should also be measured in relation to implementation of a TMDL Implementation Plan.

Response: Source specific TMDL implementation plans prepared by individual DMAs and designated sources will set benchmarks for tracking progress towards achieving their respective allocations.

CKF 33: According to DEQ, 81 percent of the land in the Upper Klamath Subbasin is privately owned with the remainder managed by federal agencies. Greater attention should be afforded in the TMDL to explain how non-point source pollution will be addressed on private and public lands, including what legal mechanisms are available to do so.

Response: DMAs and designated sources are required by law to submit implementation plans for approval by DEQ. ODA has primary responsibility for implementing TMDLs on private agricultural lands through a 1998 Memorandum of Agreement (MOA). The MOA (ODA 1998) states that "Load allocations for agricultural nonpoint sources will be provided by DEQ to ODA which will then begin developing an AgWQMAP, or modifying an existing AgWQMAP, to address the load allocation" and, specific to situations where AgWQMAP development has proceeded a TMDL: "At the time that DEQ develops load allocations for agricultural nonpoint sources or groups of sources, ODA will evaluate the AgWQMAP previously developed plan to assure the attainment of DEQ's load allocations for agriculture."

Coordination between Oregon Department of Forestry and DEQ is guided by a Memorandum of Understanding (MOU) signed in April of 1998. This MOU was designed to improve the coordination between the ODF and the DEQ in evaluating and proposing possible changes to the forest practice rules as part of the TMDL process. ODF and DEQ are involved in several statewide efforts to analyze the existing FPA measures and to better define the relationship between the TMDL load allocations and the FPA measures designed to protect water quality.

The US Forest Service (USFS) and Bureau of Land Management (BLM) are DMAs for federal lands in the Subbasin in Oregon. In July 2003, both agencies signed memorandums of agreement with DEQ defining how water quality rules and regulations regarding TMDLs will be met. The agencies generally respond to TMDLs by developing and implementing Water Quality Restoration Plans (WQRPs) which will be the equivalent of TMDL Implementation Plans. The U.S. Forest Service and BLM have developed a protocol to be used to guide the development of WQRPs (USFS 1999). The WQRPs are revised as needed in order to implement TMDLs.

CKF 34: The Department's regulations state that if Best Management Practices ("BMPs") or other non point source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent. OAR 340-041-0002(65). There is therefore a need to focus attention on what BMPs or other control mechanisms can be implemented on private and public lands before the Department implements a point source control program that costs a great deal of money with limited to no environmental benefit.

Response: The Department will consider proposals by point sources to trade load reductions from non point sources in exchange for waste load reductions by the point sources. Trading programs allow facilities facing higher pollution control costs to meet their regulatory obligations by exchanging environmentally equivalent (or superior) pollution reductions from another source at lower cost, thus achieving the same water quality improvement at lower overall cost. The successful trading process allows a source with high TMDL implementation costs to exchange the same or greater level of load reduction from other sources with lower costs. For more information please refer to DEQ's web page on water quality credit trading at http://www.deq.state.or.us/wq/trading/faqs.htm.

CKF 35: There are significant opportunities for water quality trading in the Klamath basin. The Department should further analyze the potential for trades within Oregon and also across state lines, and for credit banking.
The City supports the Department's efforts to develop, promote, and enable water quality credit trading. This work is consistent with ORS 468B.555, which directs the Department to develop and implement a pollutant reduction trading program as a means of achieving water quality objectives and standards in the state.

As the Department points out in its Fact Sheet on Water Quality Trading, the best opportunities for improving water quality are not always at the end of an NPDES permitee's discharge pipe. The premise behind water quality trading is that an NPDES permittee can obtain pollutant reduction credits from other pollutant dischargers or from pollution-reduction activities within the same geographic area. For instance, treatment plants can potentially trade pollution reduction credits for constituents like nutrients, biological oxygen demand, ammonia, and heat impacts between themselves so that one plant can discharge more of a particular constituent provided another plant discharges less. Alternatively, a wastewater treatment plant can offset its potential impact on a river by either performing activities or purchasing credits from others who perform activities that reduce pollutants from entering a river at a different location from the plant. DEQ has authorized Clean Water Services ("CWS"), the agency that operates treatment plants in Washington County, to trade between its plants that discharge to the Tualatin River and also allows CWS to plant trees and other vegetation to shade streams that flow to the Tualatin River rather than install wastewater chillers. In other states, such as Pennsylvania, nutrient reduction credits may be traded for the Pennsylvania portion of the Chesapeake Bay Watershed.

Given the upstream loading of nutrients into the Klamath River from the UKL, the region is particularly well suited for nutrient trades between point sources (e.g., one treatment plant to another) and point and non-point sources (e.g., one treatment plant to individuals or organizations in the agricultural and forestry sector). Indeed, it is our understanding that the Willamette Partnership, a coalition working to promote water quality credit trading, recently received a grant to support pilot projects on water quality trading and considers the Klamath basin a potential region to further pilot trading initiatives.
From the City's view, near term trading opportunities are critical to identify and implement low cost measures to address water quality needs in lieu of forcing high cost investments in wastewater treatment infrastructure. Given the fact that the river crosses into California, there are benefits to enlarging the market for trading to include individuals and organizations in California to address multiple segments of the river.

In light of all these important developments, the City requests that the Department discuss in the TMDL the potential for trades between point and non-point sources in both Oregon and California, and on tribal lands. The City also requests that the Department address in the TMDL the potential for nutrient credit

banking, which could support projects to be implemented by point sources in the near term that yield credits to be used for compliance in future years.

Response: The Department concurs with the City of Klamath Falls. Section 5.4.1 Water Quality Credit and Trading Opportunities will be expanded to provide additional information about the scope of the proposed tracking and trading program. The Department expects the DMAs and designated sources will develop specific credit and trading proposals. The Department looks forward to reviewing innovative water quality trading proposals from the City of Klamath Falls.

CKF 36: While the City strongly endorses the concept of water quality credit trading as a potential low-cost method to achieve water quality objectives, it is critical that the Department not consider this emerging market when determining what WLA to allocate to a permittee. The fact that there can be water quality trades does not mean there will be and does not justify allocating to a point source a low WLA simply because it might at some point be able to purchase credits from another. Water quality trading can be a low-cost mechanism to achieve water quality objectives, but it should function like a real market and not be considered in TMDL load allocation decisions.

Response: The TMDL load allocations were developed in accordance with Oregon's TMDL rule and the State's policies for TMDL development without consideration of water quality trading opportunities. The proposed water quality tracking and trading program is described in section 5.4.1 Water Quality Credit Trading Opportunities.

CKF 37: DEQ needs to take sufficient time to fully address the concerns raised by stakeholders on this TMDL. The decision-making process should not be unduly influenced by TMDL-related activities in California.

Response: Oregon's TMDL process is not impeded by California's TMDL development and implementation process.

CKF 38: We understand that the EPA, the agency that will review and potentially approve this TMDL, is under a court order to ensure completion of TMDLs for the California portion of the Klamath River by December 31, 2010. We do not know what effect that order has had or will have on DEQ's own deliberations and decisions and timeline to finalize this TMDL. We emphasize here that DEQ needs to take the time required to fully consider the City's (and other's) comments in light of DEQ's own responsibilities before promulgating any final TMDL.

Response: DEQ's schedule is not affected by California's Consent Decree schedule.

CKF 39: The interests of all downstream users are best achieved where DEQ and stakeholders focus attention on the most significant underlying cause of water quality impairments — the phosphorus load from the UKL. It is also logical to ensure that all designated beneficial uses, including those in California, are evaluated to determine what uses can reasonably be met for this river.

Response: The TMDLs were developed based on Oregon's water quality standards that are protective of the designated beneficial uses. If the City of Klamath Falls wishes to apply for the UAA or the development of site specific criteria, please send a letter of request to the regional water quality manager, Eric Nigg and the manager of the water quality standards program, Jennifer Wigal to initiate the process per DEQ's Use Attainability Analysis and Site-Specific Criteria Internal Management Directive (available at http://www.deq.state.or.us/WQ/standards/docs/uaa/imd.pdf).

CKF 40: The temperature TMDL only applies between June 1 and September 30. TMDL at 2-54. However, the Executive Summary indicates this TMDL is applicable year-round. The Executive Summary should be corrected accordingly.

Response: Chapter 2, the Klamath River TMDL, is correct. The allocations to address the temperature impairment for the Klamath River from Link River to the Stateline applies June 1 to September 30. The executive summary was revised to reflect the comment.

CKF 41: Table 2-10 presents the mass load WLAs for phosphorus and nitrogen for the City and indicates that the flow rate average used in the calculations for the City is based on treatment of 3.25 million gallons per day ("MGD") based on flow in the year 2000. The phosphorus load, however, appears to be calculated using a flow of 3.29 MGD, whereas the nitrogen load appears to be calculated using a flow of 3.22 MGD. For consistency purposes, the City believes the mass load calculations for both nutrients should be calculated based on the same amount of gallons being processed.

Response: The loading calculations were completed in a spreadsheet with additional significant figures. The same flow was used for the mass load calculations.

CKF 42: The City's NPDES outfall is at River Mile 251 (not River Mile 252.6). Table 1-5 of the TMDL should be adjusted accordingly.

Response: Table 1-5 was corrected.

CKF 43: The reference on page 5-16 to the Henley School is incorrect. That school will not be piping their waste water to the City.

Response: Sanitary waste water from Henley school will be piped to the South Suburban Sanitary District facility. The text was revised o reflect the comment.

CKF 44: There is a reference on page 5-5 of the TMDL to OAR 340-41-026(3)(a)(D)(ii), but that regulation does not appear to exist. Please clarify what regulation is being referenced.

Response: The text was revised to reflect the comment.

CKF 45: The introduction to Table 5-1 states that the table provides a description of current water quality conditions; however, no current water quality conditions are presented in the table. Please clarify what DEQ considers the current water quality conditions of these stream reaches and on what data source it relies to determine these conditions.

Response: Table 5-1 was revised to reflect the comment.

Comments by: Klamath County Board of Commissioners

KCBC 1: In the Executive Summary of the Draft Upper Klamath and Lost River Sub basins Total Maximum Daily Load and Water Quality Management Plan on page iii, the second paragraph under Klamath River TMDLs states "The analysis indicates that reductions in phosphorus, nitrogen and biochemical oxygen demand loading from point and nonpoint sources are necessary to attain water quality standards " We believe it would be more realistic to indicate that reductions in demand loading will improve water quality; however, given the existing natural background conditions, even removal of all anthropogenic influences would not result in attainment of water quality standards. To establish actual attainment of water quality standards as the objective of the WQMP would adversely affect the credibility of the document with DMAs and informed members of the public.

Response: The Department believes that the TMDL allocations are significant but achievable. Achieving any measure of reduction will take several years.

KCBC 2: TMDL's administered by ODEQ follow directives from the Environmental Protection Agency (EPA) and are regulated by Federal rules. Therefore, since the TMDL process is to comply with federal regulations, the TMDL analysis should consider socioeconomic impacts of implementation in accordance

with NEPA guidelines. There was no socioeconomic analysis done for the Upper Klamath and Lost River TMDL. If ODEQ chooses not to complete this analysis, then Klamath County is requesting a written explanation as to why the socioeconomic analysis is not pertinent to the TMDL decision. To implement this TMDL, it will cost all parties involved anywhere from thousands to millions of dollars, and this is based on assumptions and uncertainties of the model used or establishing the TMDL.

Response: The TMDL development process complies with Oregon's TMDL rule (OAR 340-042) which does not require analysis of socioeconomic impacts. The economics of implementation can be considered as part of developing individual TMDL implementation plans and wastewater permits.

KCBC 3: Designated Management Agency's (DMAs) — Irrigation Districts should not be listed as DMAs, their role is to deliver water and they do not have the legal authority to regulate water going in and out of their systems. The agricultural lands serviced by Irrigation Districts are currently subject to SB 1010 which oversees agricultural practices and is managed by The Oregon Department of Agriculture. Under this Bill, plans are required for each landowner located within these irrigation districts to implement Best Management Practices promoting improved water quality.

Response: Water management districts are considered sources of water quality impairment and are required to submit implementation plans under OAR 340-042-0080.

KCBC 4: The Draft Upper Klamath and Lost River TMDL is based on the Upper Klamath Lake, Williamson and Sprague River TMDL so the base assumptions may hold inherent limitations and uncertainties that were incorrect in the first TMDL. Using the same base assumptions as the Upper Klamath Lake, Williamson and Sprague River TMDL is potentially using the wrong base once again. A base set of data needs to be appropriate to the stream covered by the specific TMDL. This base data must consider the stream specific background levels. This consideration must be based on peer reviewed data, more than an assumption. There needs to be documented evidence that goes into the modeling to determine what is attainable.

Response: The Upper Klamath Lake Drainage TMDL is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act. The TMDL may be revised in response to new or additional data collected through time.

KCBC 5: In ODEQ's Management Plan designating points of observation (measurement points) these need to be established with public input on the locations. Klamath County needs to be involved when designating these points, to help ensure that the observation points which are chosen to best represent the stream system and provide an accurate depiction of the conditions.

Response: The reference the management plan is unclear. Assuming that the commenter is referring to the Water Quality Management Plan, DEQ agrees with the County.

KCBC 6: Klamath County recommends that ODEQ requires only those goals which are attainable, as shown by the appropriate science with approved peer review.

Response: The Klamath River TMDLs were developed in accordance with Oregon's TMDL rule (OAR 340-042). The Department believes that the TMDL allocations are significant but achievable. Achieving any measure of reduction will take several years

KCBC 7: The Klamath and Lost River TMDL (more specifically Klamath River) are based on the assumptions of load capacity and pollutant levels from the UKL Drainage. Using the data collected for this TMDL and by using Klamath Lake in its natural condition for load allocations requires that this TMDL be reviewed every five years as required by law. If the UKL Drainage TMDL is not re-evaluated as required there is no way for ODEQ to know if water quality is improving as would be expected based on implemented BMPs and wetland restoration projects that have occurred over the past 10-15 years. This

TMDL has the potential to cost our community tens of millions of dollars — all on assumptions. Once again science needs to be accurate and current.

Response: The Upper Klamath Lake boundary used in the TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act.

Comments by: Columbia Forest Products

These comments revolve around dissatisfaction with the calculation of Columbia FP's WLA which is viewed as not representative of typical discharge levels.

CFP 1: Draft TMDL Assumptions: According to discussions with DEQ, the public meeting held on March 16, 2010 in Klamath Falls, and the Draft TMDL, DEQ has indicated it does not intend to reduce Columbia's wasteload, based on the 2000 baseline year used for the model. DEQ has stated in correspondence with Columbia, "It is our intent that Columbia Plywood's allocation would be their current loading because, using the representation in the year 2000, they did not impact dissolved oxygen." During the March 16, 2010 meeting similar comments were reiterated. The Draft Allocations presented at the meeting in the Klamath River slide show "0%" reductions for Columbia Forest Products for Total Phosphorus, Total Nitrogen and Total BOD5. The Draft TMDL states that, "Since Columbia Plywood and Collins Products have no detectable impact on dissolved oxygen levels, their discharge concentrations were not adjusted."

These statement are clear regarding the intention, however the waste load allocation as written significantly reduces its discharge, as described below. Columbia respectfully requests that DEQ revise its allocation for Columbia to preserve its current discharge load.

Response: Comments noted. See response after CFP 5.

CFP 2: Historical Columbia Discharge Data: Table 1 presents discharge data, including flow and BOD5, for calendar years 2000 to 2009 for the Columbia Plywood facility. It presents the following data:

The number of days that Columbia discharged
The average flow per discharge day
The total annual discharge
The average daily BOD load in lbs/day
The monthly average daily BOD load in lbs/day
The average monthly BOD load in lbs/month
The annual BOD load in lbs/year
The existing NPDES permit limits, where applicable

The proposed TMDL waste load allocation (WLA) as presented in Table 2-10 of the Draft TMDL (page 2-46)

Columbia does not discharge every day but intermittently, typically during the wet season. During the calendar year of 2000, Columbia discharged only three days. The annual BOD load presented in the Draft TMDL assumes only three days of discharge for an entire year. The annual load is then divided by 365 days to derive the daily allocation presented in Table 2-10 of the Draft TMDL. From a scientific and modeling perspective, the daily allocation used in the modeling should have represented a typical daily discharge for intermittent discharges and not the sum of three discharge events over the course of a year divided by 365 days.

Table 1. Summary of Annual Discharge Data

Year	Number of Days of Discharge (days)	Average Flow Per Discharge Day (gal/day)	Total Annual Discharge (gal)	Average Daily BOD Load (lb/day)	Monthly Average Daily BOD Load (lb/day)	Average Monthly BOD Load (lb/mo)	Annual BOD Load (lb/ r)
2000	3	7,680	23,040	38.9	38.9	38.9	110
2001	16	3,697	59,149	9.3	9.8	16,6	151
2002	8	3,978	31,824	8.6	9.1	11.4	67
2003	16	3,492	55,872	7.1	7.5	19.0	113
2006	31	4,441	137,659	32	28	124	889
2007	20	1,476	36,036	11	10	25	264
2008	12	1,428	17,892	4.5	4.5	4.5	56
2009	8	1,701	13,608	3.3	3.1	5.3	29
Existing NPDES Permit		NA	NA	80	40	1,200	14,600
Proposed TMDL WLA		9,100	3,321,500	0.30	0.30	9.00	110
WLA Percentage of Existing Permit			14.3	0.38%	0.75%	0.75%	0.75%

Notes: A - From Table 2-10 in the Proposed TMDL.. Annual values are the daily value times 365. Value exceeds Draft TMDL WLA Calculated from the Daily BOD WLA in the bran TMDL

Columbia's discharge data for the year 2000 does not adequately represent a typical year. Table 1 demonstrates that the number of discharge days and flow per day varies from year to year. The variability is due to changes in weather conditions and production. Table 1 shows that the proposed WLA in the Draft TMDL does not represent current loading nor does it represent "no change" or "0% reductions" for Columbia, as has been stated by DEQ.

Response: Comments noted. See response after CFP 5.

CFP 3: Proposed Draft TMDL Waste Load Allocations: As Table 2 shows, the proposed WLA for Columbia in the Draft TMDL is less than 1% of the BOD5 allowable discharge limit in the existing NPDES permit (a 99.3 % reduction from the current discharge allowable limits).

Table 2. NPDES Discharge Limits and Proposed WLAs

Source	NPDES Daily Maximum Limit for BOD5 (lbs/day)	NPDES Weekly Average Daily Limit for BOD5 (lbs/day)	NPDES Monthly Average Daily Limit for BOD5 (lbs/day)	Draft TMDL BOD WLA (lbs/day)	TMDL Reduction front Monthly Average
Klamath Falls WWTP	2000	1500	1000	488	51%
South Suburban WWTP	1000	750	500	308	38%
Columbia Plywood	80	NA	40	0.3	99.3%
Collins Forest Products	680	NA	NA	105	85%

Notes: Collins limit is the sum of its limits for Outfalls 00I (process wastewater) and 003 (sanitary wastewater)

The WLA in the TMDL as written is not representative of the existing discharge limits and is not consistent with DEQ's stated intention of not impacting Columbia; the daily BOD WLA presented in Table 2-10 would essentially eliminate Columbia's ability to discharge.

As shown on Table 2, it appears that the BOD5 allocation in lbs/day that was used in the Draft TMDL for Columbia was derived differently than the BOD5 allocation in lbs/day that was used in the TMDL for the other three point sources identified in Table 2-10. To further evaluate how the WLAs were established, DMR data for the four facilities for calendar year 2000 were compared. The results are summarized in Table 3.

Table 3. Annual Average DMR Data for 2000

Source	Monthly Average Flow (mgd)	Monthly Average **BOD5** (lb/day)	Daily Maximum **BOD5** (lb/day)	Draft **TMDL** WLA for **BOD5** (lb/day)	Percent Reduction in WLA **vs.** Actual **2000 Data**
Klamath Falls WWTP	166	300	435	488	-63%
South Suburban	2.04	522	701	308	41%
Columbia Plywood	0.21	39	39	0.3	99.2%
Collins	0.86	140	204	105	25%

Notes: DMRs for July to December 2000 were not available for the Klamath Falls WWTP.

As shown in Table 3, the WLA's for the four facilities were not developed in an equitable manner. Table 2 shows that the proposed WLA for all four sources is lower than the existing permit limit; but the proposed WLA for Columbia is only 0.7% of the existing permit limit and the WLA for the-other sources are 49%, 62%, and 15% of their existing permit limits.

Table 3 shows that the proposed WLA is lower than the monthly average daily loading reported on DMRs for three sources and is actually higher for one source (Klamath Falls WWTP). For Columbia, the

proposed WLA is 0.8% of the average daily loading reported on DMRs from year 2000, and for the other two facilities that have lower WLAs, the WLA is 59% and 75% of the average reported daily loading from year 2000. It appears that when the WLA was developed for Columbia, the modeler took the daily maximum values reported on the three DMRs submitted by Columbia in 2000 and added those three numbers together to derive a WLA for the entire year, i.e. assuming Columbia only discharged three days because they only submitted three DMRs. However, for the other three point source dischargers — who each submitted 12 DMRs — the proposed WLA appears to have been calculated as a simple percentage of the monthly average BOD5 values reported on the DMRs.. There is no obvious rationale as to why Columbia was penalized for discharging only three days in that particular year and treated differently than the other three point source dischargers.

Response: Comments noted. See response after CFP 5.

CFP 4: Seasonal Variability in Water Quality: Water quality data gathered by the USGS in 2007, 2008, and 2009 was reviewed for the Keno Reach of the Klamath River (the portion of the river to which Columbia discharges). Provisional data files were downloaded from the USGS web site in April 2010, and dissolved oxygen (DO) and flow were graphed versus time for the three years. The graphs, which are attached to this comment letter, also show the 6.5 mg/L DO water quality criteria.

The DO concentration versus time was graphed for the KRS 12a monitoring station (Number 420615121533600, referred to as Station 3600 hereafter). As shown on the three graphs, the DO concentration generally stays above the 6.5 mg/L water quality criteria from December through June, and DO concentrations are above 8 mg/L during most of that time period. This segment of the river should not be listed as water quality impaired for DO during the winter months, and DEQ should incorporate seasonal variability into the allocation.

This data is relevant to Columbia's discharge because Columbia generally discharges during the winter months due to seasonal factors such as increased precipitation and reduced evaporation. During summer months, Columbia typically does not discharge due to higher evaporation rates and lower precipitation.

Response: We reviewed the information presented above. However, the documentation with the Draft TMDL presents information showing upstream impairments (Link River, pH) and downstream impairments (Klamath River downstream Keno Dam, dissolved oxygen) which are of concern year-round. Furthermore, there are downstream reservoirs that can hold nutrients discharged in the spring potentially causing an impairment in the summer. See also response to CKF 19.

CFP 5: Conclusions: Columbia concludes, based on its review of the Draft TMDL:

- DEQ has stated that it does not intend to impose changes to Columbia's discharge limits or waste loading for BOD5; however, the proposed WLA in the TMDL imposes highly restrictive changes.
- The proposed WLA for Columbia for BOD5 does not appear to have been derived in an equitable manner with respect to the proposed WLAs for other point source dischargers.
- The listing of the Klamath River and Lake Ewauna as water quality limited for DO during winter months is counter to extensive monitoring data compiled by the USGS.

Based on these factors, Columbia Plywood requests that DEQ propose an equitable WLA for Columbia, taking into consideration the data presented regarding the proposed WLAs for the other sources and considering seasonal variations in DO in Lake Ewauna. Columbia typically does not discharge every day. During the past decade the maximum number of days discharged in a year was 31. Considering this low frequency of discharge and DEQ's stated consideration that it does not intend to reduce Columbia's ability to discharge, Columbia proposes a daily WLA equal to Columbia's current NDPES permit Daily Average discharge limit of 40 lbs/day.

Maintaining Columbia's WLA as the monthly average daily BOD limit in its current NPDES permit will not result in Columbia's discharge having a measureable effect to the overall loading to Lake Ewauna or the DO concentration in the Klamath River. Figure 2-28 in the Draft TMDL presents the CBOD loading for Link River to Stateline. The total CBOD loading to Lake Ewauna is greater than 63 million lbs/year; Columbia's portion of that total is entirely negligible and certainly within the margin of error for the method that was used to estimate the total CBOD discharging from Lake Ewauna:

- Total CBOD discharge to Lake Ewauna = 63,763,886 lbs/year
- Columbia Plywood CBOD WLA in the TMDL 284 lbs/year (0.00045% of the total entering Lake Ewauna)
- Columbia's Current Discharge Permit = 14,600 lbs BOD5/year = 37,700 lbs CBOD/year (0.059% of the total) assuming 365 days of discharge.

Response:
It was DEQ intention to use Columbia Plywood's current loading as a starting point to computing its WLA. The draft TMDL was calculated using year 2000 loading (averaging the three discharge events over the entire year). Because of the comments received on the draft TMDL, DEQ conducted further sensitivity analyses on the impact of Columbia Plywood's effluent.
The sensitivity analysis was based on the draft TMDL, allocation without dams scenario (TOD2RN). The flow and concentration inputs for Columbia Plywood were changed to represent the discharge from 2006 (the year with the greatest loading between 2000 and 2009, per comment). The reported BOD5 measurements were converted into CE-QUAL-W2 variables using the same assumptions stated in the draft TMDL (i.e. ratios between organic matter and specific nutrients). The source's effluent was represented dynamically, so that intermittent nature of the discharge was captured. Model results indicate that the 2006 representation of Columbia Plywood's effluent does not impact water quality. The maximum instantaneous increase in BOD5 concentrations between the two scenarios is 2% where the average change in BOD5 concentration <0.01% (see Figure 1). The variability in the difference between the two scenarios during the summer, with positive and negative changes, is likely due to the slight change in flow regime resulting in travel time changes. Changes to phosphorus and nitrogen concentrations are even less. This change in BOD5, nitrogen and phosphorus concentrations does not cause nor contribute to a DO or pH impairment (see Figure 2, for example).

Figure 1. Comparison of the model results for the allocation (without dams) scenario using the year 2000 effluent data (averaged of year) and 2006 effluent data (dynamic) at Miller Island.

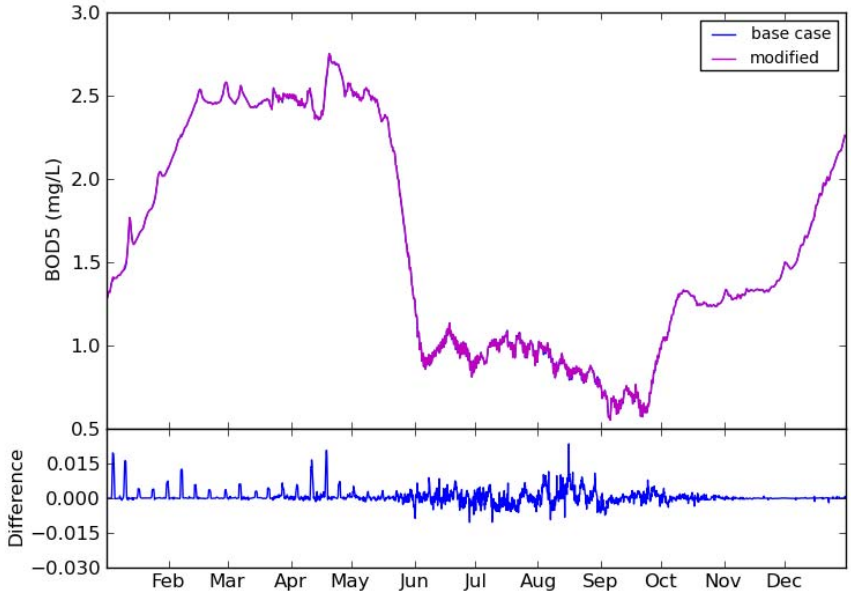
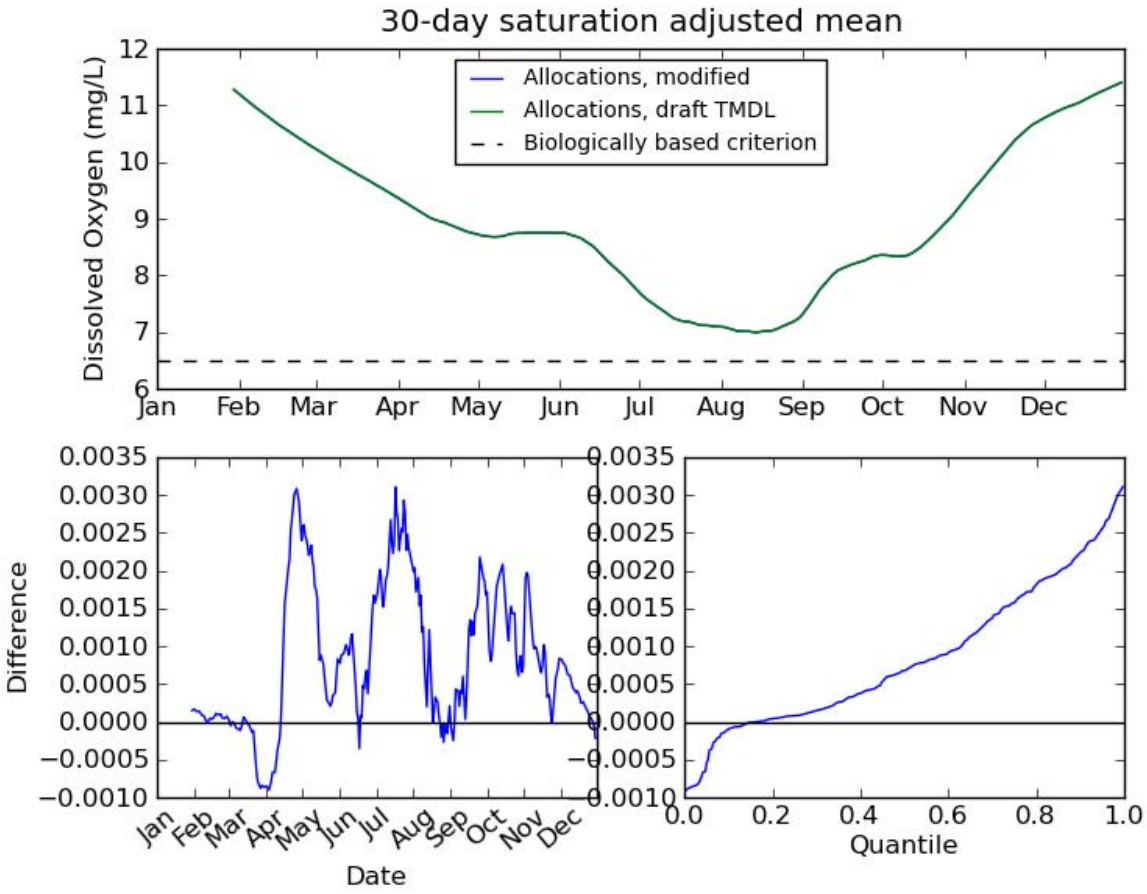


Figure 2. Comparison of the model results for the allocation (without dams) scenario using the year 2000 effluent data (as presented in the draft TMDL) and 2006 effluent data (dynamic) at Miller Island.



Based on the model results presented above, DEQ has increased the WLA for Columbia Plywood. The conceptual derivation of the WLA remains the same: current loading. However, the representation of 'current loading' has changed to be more reflective of actual discharge rates and concentrations. The WLA per discharge event is the current loading restrictions in the permit: 40 lbs / day BOD5 monthly average with a maximum of 80 lbs / day BOD5. Because the discharge is intermittent the WLA also restricts the frequency of discharge: shall not exceed 5 events per month in November through May and 2 events per month June through October. These frequencies are based operations reported between 2000 and 2009 and would have been exceeded in only 2 out of 120 months.

Table 2-2. Partial (revision). Point Source Waste Load Allocations using flow-weighted averages. Red ~~strikeouts~~ indicated draft TMDL values.

Source	Flow Rate Average 2000 (cfs)	Flow Rate Average 2000 (MGD)	Total Phosphorus Average (mg/L)	Total Phosphorus Allocation (lb/day)	Total Nitrogen Average (mg/L)	Total Nitrogen Allocation (lb/day)	BOD5 Average (mg/L)	BOD5 Allocation (lb/day)
Columbia Forest Products	Intermittent discharge		~~0.25~~	~~0.019~~ 2.1*	~~0.99~~	~~0.08~~ 10*	~~3.9~~	~~0.30~~ 40

*based on assumed ratio with BOD5

Comments from: Bureau of Reclamation, Klamath Basin Area Office Staff

General Comments:

USBR 1: The author refers to the "Klamath Irrigation Project" in several locations throughout the TMDL document. There is no such entity as the Klamath Irrigation Project. The reviewer believes the author is referring to Reclamation's Klamath Project. Please replace "Klamath Irrigation Project" with "Reclamation's Klamath Project", "Klamath Reclamation Project", or "Klamath Project" as appropriate.

Response: The document will be edited to reflect the federal agency (U.S Bureau of Reclamation) responsible for the irrigation project.

USBR 2: The author refers to the "Lost River Diversion Canal" in several locations throughout the TMDL document. The reviewer believes the author is referring to the "Lost River Diversion Channel". Please replace "Lost River Diversion Canal" with "Lost River Diversion Channel".

Response: Text was changed to reflect the comment.

USBR 3: The author refers to "Wilson Dam" in several locations throughout the TMDL document. The reviewer believes the author is referring to the "Lost River Diversion Dam". Please replace "Wilson Dam" with "Lost River Diversion Dam".

Response: Text was changed to reflect the comment

USBR 4: The draft Upper Klamath and Lost River Subbasins Total Maximum Daily Load (TMDL) does not address the increase in temperatures likely to occur in the near future due to climate change. Climate change driven increases in air and water temperatures may have a significant effect on nutrient cycling and water temperatures relative to suitable fish habitat.

Response: Climate change is a global phenomenon and will influence factors addressed or used in this TMDL (water temperature, flow, vegetation, fish distribution, etc). TMDLs are developed based on the use of historical data and current conditions to meet current water quality standards. We develop allocations to meet these water quality standards. Water quality standards are reviewed periodically and are revised when appropriate. In addition, TMDLs are revisited and revised based on new information and conditions. If or when climate change affects water quality we expect to address those changes when we revisit TMDLs or revise water quality standards.

USBR 5: The alteration of key boundary conditions between the previous draft Klamath River TMDL model (June 2009) and the revised draft TMDL model (December 2009) is substantial. It appears that some of the changes were made in response to comments about model representation being inconsistent between reaches, while other changes have been made for reasons that are not clear. Due to the substantial and significant changes that were made to the TMDL model, the model should be considered a "new model" and not a revision of the previous model. The extensive changes will likely cause the model to simulate significantly different water quality conditions in the Klamath River. This "new model" has not been subject to formal peer review and not undergone an appropriate level of sensitivity analysis and testing.

Response: DEQ respectfully disagrees.

USBR 6: The Lost River TMDL model source code was modified to keep track of the minimum, maximum, and mean temperatures and water-quality concentrations, which could be optionally output by the model user. An analysis of the modifications to the source code indicate that the mean was computed as a layer-average. The utility of this computation is debatable. It is not a flow-weighted mean, depth-weighted mean, or volume-weighted mean, but simply a layer-weighted mean. In other words, if three layers were

active at a segment, the temperatures in each layer were simply averaged to obtain the mean, regardless of how much water or flow was represented in each layer. Such a number is not meaningful and will not provide an accurate representation of simulated water quality conditions in a particular model segment.

Response: The calculation is meaningful if one is comparing to an average of measurements by depth. Furthermore, the calculation was not used to set allocations.

USBR Specific Comments:

USBR 7: Chapter 1, Section 1. 1, page 1-4, 2nd paragraph states "Oregon DEQ completed the Upper Klamath Lake Drainage TMDL in 2002 (ODEQ 2002), California NCRWQCB completed a TMDL analysis of the Upper Lost River from Malone dam at the state border upstream to the headwaters of the Lost River above Clear Lake Reservoir (NCRWQCB 2006), and U.S.EPA is developing the TMDLs for the Lower Lost River in California which includes Tule Lake watershed and the Lower Klamath Wildlife Refuge."

This paragraph should be updated to reflect that EPA has completed the TMDLs for the Lost River in California for nitrogen and biochemical oxygen demand to address dissolved oxygen and pH impairments. The TMDL was finalized in December 2008.

Response: Text has been changed to reflect the comment.

USBR 8: Chapter 1, Section 1.2.2, page 1-7, 4th paragraph states "ODEQ has the regulatory authority to take enforcement action to compel a DMA to develop and implement a TMDL implementation plan." Please provide the specific statute or law, in this section of the TMDL document, that grants ODEQ the regulatory authority to determine DMA implementation responsibilities and for the selection, establishment, and regulation of DMA's.

Response: See **Oregon Administrative Rules (OAR) Chapter 340 Division 042 – Total Maximum Daily Loads (TMDLs).**

USBR 9: Chapter 1, Section 1.3.4.1, page 1-17, states "Figure 1-12 depicts the hydrology of the Lost River prior to the draining of Lower Klamath Lake."
The map shown in Figure 1-12 inaccurately portrays historic Lower Klamath Lake prior to drainage. The USRS map in Figure 1-12 was published in 1905 but was based upon survey data collected in the 1880's and 1890's when flood water dominated the landscape. This information is confirmed through historic records and accounts from the 1890's when flood waters often overtopped the natural river banks. A map derived from surveys conducted in the early 1900's that is more accurate and representative of typical historic conditions is attached.

Response: Figure 1-12 was changed to reflect the comment.

USBR 10: Chapter 1, Section 1.3.4.2, page 1-18, states "1936 Reclamation Service completes construction of a tunnel to carry excess agricultural runoff from Tule Lake Sump to the dry bed of Lower Klamath Lake."

This statement is inaccurate. The "D " Pumping Plant and Sheepy Ridge Tunnel were built primarily to prevent flooding in the Tule Lake area by transporting winter and spring flood waters from the lower Lost River watershed to the Klamath River.

Response: Text was changed to reflect the comment.

USBR 11: Chapter 1, Section 1.3.4.3, page 1-19, 5th paragraph states "During irrigation season, water is delivered from the Klamath River using the Miller Hill Pumping Plant near the Station48Drop into the Lost River." This statement is inaccurate. During irrigation season water is diverted from the Klamath River via

the Lost River Diversion Channel (LRDC). Water is pumped from the LRDC to the C-4-E canal by the Miller Hill Pumping Plant. Water is gravity diverted to the Lost River from the LRDC through Station 48.

Response: Text was changed to reflect the comment.

USBR 12: Figure 2-1. Klamath River and major tributaries in Oregon.
The map in Figure 2-1 shows the Miller Island location at river mile 244. However, Miller Island is also given the river mile location of 245 and 246 later on in the document. These discrepancies should be resolved so that the correct and consistent river mile is used for the Miller Island location.

Response: Text was changed to reflect the comment.

USBR 13: Chapter 2, Section 2.2.5, page 2-9, 2nd paragraph states "OAR 340-041-033 (2): Levels of toxic substances may not exceed the criteria listed in Table 20. Table 20 states...."
This statement apparently refers to Table 20 in Oregon Administrative Code. This is confusing as upon first reading it seems to be referencing a table within the TMDL document. This should be rewritten to provide better clarity.

Response: Text was changed to reflect the comment.

USBR 14: Chapter 2, Section 2.6.4, page 2-30, states "A number of studies have concluded that the USBR's Klamath Project is a net sink of nutrients in relation to the Klamath River (Rykbost and Charlton 2001, Danosky and Kaffka 2002, and Hicks 2009)"
The reference to "Hicks 2009 " is incorrect. This should read "Cameron 2009" or "Reclamation 2009".

Response: Text was changed to reflect the comment.

USBR 15: Chapter 2, Section 2.6.4, page 2-31, states "Even though USBR's Klamath Project appears to be a net sink of nutrients, it also appears to have detrimental impacts to the water quality of Klamath River."

This sentence makes a very strong statement about the Klamath Project having "detrimental impacts to the water quality in the Klamath River", but provides no data or analyses to support this statement. There is no existing data showing degraded water quality in the Klamath River downstream of the Klamath Straits Drain under current conditions, due to discharges from the Klamath Straits Drain. The largest driving factor influencing Klamath River water quality are the massive amounts of nutrients and organic matter released from Upper Klamath Lake to the Klamath River. Reclamation is unaware of any analyses of existing water quality data showing further water quality degradation, beyond that which is caused by the nutrients and organic matter released from Upper Klamath Lake, due to Klamath Straits Drain discharges.

Response: The Department respectfully disagrees. Section 2.6.4 clearly demonstrates that the Klamath Straits Drain impacts water quality in the Keno impoundment by discharging water with a greater concentration of pollutants when compared to the receiving waterbody (Keno impoundment).

USBR 16: Chapter 2, Section 2.6.4, page 2-31, states "Based on mean August 2002 flows, approximately 1255 cfs was diverted out of the Upper Klamath Lake and the Klamath River, leaving approximately 182 cfs in Keno impoundment just upstream of Klamath Strait Drain (Figure 2-21). The sum of the gages inflows and outflows did not equal the observed downstream flow, so a 'flow balance' source was included in the graph. The 'flow balance' is 4 percent of the measured flows and might represent uncertainty in flow measurements (typically considered about 10 percent), un-gauged withdrawals and/or evaporation. During this time period, Klamath Straits Drain discharge contributes approximately half the flow of the Klamath River at Keno Dam. Therefore, its higher concentration of nutrients relative to the Klamath River increases the nutrient concentration of the reach (Figure 2-22)."

This statement implies that the specific example provided for Klamath River and Klamath Straits Drain flows is representative of typical conditions. The 2002 water year was far from average and represents a statistical anomaly for the month of August. The percentage of Klamath Straits Drain flows to Keno flows in August 2002 (52%) was the highest ever recorded since complete records began in 1961. When a similar comparison is made using all August flows from 1961-2009, the mean value is 18%. It would be more appropriate to evaluate for the entire year and present the data as a table. To base this discussion in the TMDL document on just one month is not appropriate. This statement is also misleading in that it leads the reader to believe that if diversions did not take place, all of the water would contribute to increased flows in the river. Another important point for consideration is that there is no flow measurement point immediately upstream of Klamath Straits Drain. In addition, there are dozens of un-gaged non-Project diversions and returns, accretions, and evaporation that take place along the 21 miles of river between Upper Klamath Lake and Keno Dam. For the comparison in Figure 2-22, the constituent concentrations should have been set at concentrations consistent with the nutrient increase due to internal nutrient loading processes that exist in the Klamath River, and not to Link River where concentrations are typically much lower.

Response: The referenced statement is specific about the time period and makes no reference to typical conditions. The point of the analysis was to show that Reclamation's Klamath Project is a potential source of pollutants. We were not attempting to analyze average or typical conditions. The Lost River inputs to the Klamath River were represented with concentrations from Link River because a significant portion of the water in the Lost River system originates from Upper Klamath Lake (which should have a similar concentration to Link River).

USBR 17: Chapter 2, Section 2.6.14, page 2-37, 1st paragraph states "A loading analysis for the point and non point sources was developed, where flow and water quality data were available. Estimates of un-gaged agricultural drains and subsurface (hyporheic flows and springs in bypass reach) were estimated by accounting for the other external sources (by difference). Figure 2-26, Figure 2-27, and Figure 2-28 provide estimates of total phosphorus, total nitrogen and CBOD loading from Upper Klamath Lake downstream to the Stateline."

The current loading analysis section appears to be based on loading during the year 2000 only. As stated in the prior section of the TMDL document as a personal communication, "In 2000, USBR's operations of Lost River Diversion channel was unique compared to other years, in that flows were diverted into the Klamath River during September (Jon Hicks, USBR, personal communication)." As this appears to be somewhat of an anomalous year, shouldn't this be accounted for in the analysis? Reclamation recommends a multiple year approach to determine more representative loading numbers in particularly for the Lost River Diversion Channel and Klamath Straits Drain. Considering that the year 2000 had anomalous hydrology, it isn't good science to base the TMDL analysis on the year 2000 findings.

Response: The TMDL shows that USBR's Klamath Project is a potential source of pollutants. If the operations responsible for impacts are anomalous, it suggests significant benefits maybe realized through operational changes.

USBR 18: Chapter 2, Section 2.7.1, page 2-42, 1st paragraph states "The Lost River Diversion Channel and Klamath Straits Drain were represented using current conditions flow but their water quality characteristics and temperature were set to be the same as Upper Klamath Lake."

The caption for Figure 2-22 states that the water quality characteristics were set to the values for the Link River, which is inconsistent with the statement made on page 2-42.

Response: The comment is unclear. These statements refer to separate analyses.

USBR 19: Chapter 2, Section 2.7.1, page 2-42, 2nd paragraph, last sentence states "The natural conditions of spring flow and water quality are assumed to be generally equivalent to the existing condition."

This sentence is confusing to the reader and should be rewritten. Does the author mean existing conditions of the impoundment or the springs? The reader assumes that the author is referring to the springs. However, the sentence should be revised to better convey this to the reader.

Response: The text was revised to provide greater clarity.

USBR 20: Chapter 2, Section 2.7.3.1, page 2-45, paragraph 3 states "Upper Klamath Lake is represented under its TMDL conditions (as discussed in Section 2.7.1). However, even under restored conditions, its water quality condition is expected to be variable. The load allocation for LRDC and KSD was calculated by keeping the ratio between nitrogen, phosphorus and BOD5 constant. The Upper Klamath Lake TMDL condition was used a starting point and concentrations were adjusted upward until the DO and pH loading capacity was exhausted. For all other anthropogenic nonpoint sources, including lands with agricultural, forestry and urban/residential uses, a concentration target is used as a surrogate measure for their load allocations (Table 2-9)."

The total reductions based on concentrations listed for phosphorus and nitrogen for the Lost River Diversion Channel and Klamath Straits Drain are likely unattainable given that the bulk of the source water is nutrient rich Upper Klamath Lake (UKL). Too much emphasis is placed on the TMDL conditions for UKL which in the reviewer's opinion needs a more exhaustive review of the dynamic mass balance model used to determine UKL TMDL conditions. Also, the concentration values used to calculate the percent reductions should be added to Table 2-9 and the calculations, current condition concentration values, and methods used to determine these reductions should be thoroughly documented within this section of the TMDL document.

Response: The Upper Klamath Lake boundary used in the TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act. Pending the availability of adequate resources, DEQ will review the water quality model used to develop the Upper Klamath Lake TMDL and work cooperatively with USGS, USBR, and other stakeholders for revising the TMDL for Upper Klamath Lake,

USBR 21: Chapter 2, Section 2.7.4.3, page 2-57, 4th paragraph states "Both Keno Dam and JC Boyle Dam increase the river temperature during the summer (Figure 2-44 and Figure 2-45)." After reviewing model temperature outputs for both the "with and without" Keno Dam scenarios, there appears to be an anomaly in the model coding that is creating a significant temperature difference between model nodes 106 and 107. The "with and without" Keno Dam model run temperatures are essentially identical until node 107, where an abrupt shift in modeled temperature occurs. There is no rational explanation for this abrupt shift in modeled temperature that appears to be the cause for a temperature allocation in the Link River to Keno reach. This anomaly could be inappropriately creating the need for a temperature allocation for Keno Dam.

Response: This issue is discussed in detail in the response to "PacifiCorp 62". DEQ has resolved this issue by setting the compliance location to the outlet of Keno Dam, rather than the last segment. The allocations in the final have been modified.

USBR 22: Chapter 2, Section 2.8.1, page 2-63, last paragraph states "The largest source of uncertainty in this system is the highly variable loading from Upper Klamath Lake, not the numeric water quality model, environmental data or water quality impact caused by point sources in this study area."
This statement should be qualified by providing details as to how this determination was made. What analyses were conducted to determine that the variable loading from UKL is the largest source of uncertainty in the model?

Response The model sensitivity was performed as needed throughout model calibration and source assessment phases of model scenarios to better understand model predictions and limitations. Since it

was not a formal process with defined output and metrics, it is not presented in the document. Discussion of uncertainty as it relates to the TMDL is discussed in the Margin of Safety Section (Section 2.8).

USBR 33: Chapter 3, Section 3.3.2.4, page 3-7, 2nd paragraph states "OAR 340-041-033 (2): Levels of toxic substances may not exceed the criteria listed in Table 20. Table 20 states...."
This statement apparently refers to Table 20 in Oregon Administrative Code. This is confusing as upon first reading it seems to be referencing a table within the TMDL document. This should be rewritten to provide better clarity.

Response: The text was revised to reflect the comment.

USBR 34: Chapter 3, Section 3.5, page 3-11, 1st paragraph states, "Because Klamath Straits Drain is the most impaired, regularly-sampled monitoring location, it was chosen to show the seasonal variation."
The author should be more specific when making commentary about what water bodies are most impaired. Such statements could be interpreted by the reader as a bias of the author. Based on the box plots in Figure 3-5, it appears that Anderson-Rose and Lost River Diversion Dam locations have statistically worse dissolved oxygen. Based on Figure 3.5, pH levels look worse at Lower Klamath Lake. Also, based on the number of samples used for the plots it appears that Klamath Straits Drain is by far the most heavily sampled, whereas some locations have minimal data available, especially in regard to ammonia samples. Only two ammonia samples are utilized for Tule Lake and only three for Harpold Dam for this comparison. The statistical validity of such a comparison is at minimum highly questionable.

Response: The text was revised to: ""Because Klamath Straits Drain is one of the most impaired and this location is a regularly-sampled monitoring location by multiple agencies, it was chosen to show the seasonal variation."

USBR 35: Chapter 3, Section 3.6.1.2, page 3-14, 1st paragraph states "Analysis of available data indicates that nitrogen is the nutrient most limiting growth in the Lost River (Figure 3-10). The horizontal line in Figure 10 represents a ratio of 7 where points above this line indicate possible phosphorus limitation and points below this line indicate possible nitrogen limitation." How did the author determine that a ratio of 7 was appropriate? How this was determined should be explained in the text of the TMDL document. Literature should be cited about research that supports this determination.

Response: The text was revised to address this comment.

USBR 36: Chapter 3, Section 3.6.1.2, page 3-15, 1st paragraph states "The major sources of nitrogen in water are municipal and industrial waste water, stormwater, failing septic systems, animal waste runoff and fertilized fields and lawns. Delivery of nitrogen to the Lost River can occur through tributaries, canals, drains and shallow and deep groundwater."

The TMDL document recognizes that cycling of nutrients and organic matter from water body bottom sediments is a principal loading source for the high nitrogen and CBOD loads, yet does not take internal loading into consideration for TMDL development. Reclamation believes that internal nutrient loading within all reaches of the Lost River, especially Tule Lake and Lower Klamath National Wildlife Refuges, is significant. Internal loading is a substantial source of nutrients that isn't adequately addressed by this TMDL. Significant internal nutrient loading from the organic bed sediments within Tule Lake and Lower Klamath Lake Refuges will likely continue indefinitely. The sediments of Tule Lake and Lower Klamath Lake Refuges are extremely deep organic deposits (Tule Lake in particular due to the fact that it was historically the terminus for the Lost River watershed) that have accumulated large reservoirs of nutrients over thousands of years. Research conducted on similar sediments in Upper Klamath Lake has shown that very large quantities of bio-available nutrients are released on an annual basis. Researchers have speculated that the internal nutrient loading occurring in Upper Klamath Lake will continue for decades. The internal nutrient loading from bed sediments throughout the Lost River Watershed will likely continue for a comparable time frame. In addition, substantial additional nutrient inputs also include waterfowl excretion. Waterfowl are responsible for a substantial nutrient contribution to all reaches of the Lost River,

especially Tule Lake and Lower Klamath Lake National Wildlife Refuges. Research conducted by Post and others (1998) at the Bosque del Apache National Wildlife Refuge found that waterfowl can contribute a significant portion of the annual nutrient budget to a water body that's heavily utilized by large populations of migratory birds. This study estimated the nutrient load to a 1,200 acre wetland by approximately 40,000 Lesser Snow Geese and Ross' Geese. "Of the estimated total amount of N and P excreted by geese, about 60% was loaded into the wetlands..." (Post and others, 1998). This research estimated a total of 15 metric tons of nitrogen was excreted by geese in one winter, of which 8.8 metric tons were estimated to have been loaded to the adjacent water body. The study only estimated the nutrient loading from geese, which underestimated the actual bird-borne nutrient loading rates. Tule Lake and Lower Klamath Lake National Wildlife Refuges are utilized by larger populations of geese (and other waterfowl) than at the Bosque del Apache National Wildlife Refuge. "Over the long-term period (1953-2001) the [Lower Klamath Lake Refuge] supported an average of about 45% (about 450,000 birds per day) of Klamath Basin NWR complex waterfowl during autumn and about 54% (nearly 200,000 birds per day) in spring" (Gilmer and others, 2003). "Over the long-term period (1953-2001), the [Tule Lake Refuge] supported an average of about 50% (about 500,000 birds per day) of the Klamath Basin refuge complex waterfowl during autumn and about 38% (nearly 140,000 birds per day) in spring" (Gilmer and others, 2003). Tule Lake Refuge has approximately 13,000 acres of open water/wetlands and Lower Klamath Lake Refuge has up to 32,000 acres of open water/wetlands, which is considerably greater than the 1,200 acres of wetlands studied by Post and Others at the Bosque del Apache National Wildlife Refuge. The larger surface area of Tule Lake and Lower Klamath Lake Refuges increases the likelihood of deposition of waterfowl excretions in Tule Lake and Lower Klamath Lake Refuges. In addition, the populations of geese and other waterfowl that utilize Tule Lake and Lower Klamath Refuges are greater than the populations studied during the Post and others (1998) research, therefore the nutrient transport and load to Tule Lake and Lower Klamath Lake Refuges is likely greater than that which was estimated by Post and others (1998). Waterfowl are responsible for loading several metric tons of nitrogen and CBOD to the refuges each year. The Lost River TMDL modeling and analysis effort fails to consider this substantial source of nitrogen and CBOD. The nutrient loading from waterfowl and internal sources (bed sediment) must be quantified to accurately identify the proportion of nutrient input from the various sources (agricultural drainage, refuge operations, waterfowl, and internal loading). Without an accurate representation of loading sources incorporated into the TMDL modeling and analysis effort, the recommended TMDLs will not provide attainment of water quality standards.

Response: We disagree with the speculation that internal loading from sediments in the Lost River system is "comparable" to Upper Klamath Lake. The hydrology and limnology of the Lost River system and Upper Klamath Lake are significantly dissimilar.

Waterfowl excrement was considered as a source within the refuges included as part of the gross allocations to the refuges, not as background. The implementation process is expected to further distinguish among sources and identify the required reductions to meet the "edge of stream" reduction requirements. Internal loading, including waterfowl excrement, is explicitly included in the model and the additional sources noted are inherently considered in boundary conditions to the model. While contributions from these sources are not individually quantified throughout the basin, due to insufficient data, boundary conditions assigned ultimately enabled the model to be calibrated for the river itself.

USBR 37: Chapter 3, Section 3.6.3.1, page 3-20, Table 3-5 Model Configuration; and Chapter 3, Section 3.6.3.3, page 3-22, last bulleted item of key assumptions associated with the Lost River model states "The horizontal water quality gradients within Tule Lake and Lower Klamath Lake are insignificant; therefore, each can be considered as a single, mixed segment."

The Tule Lake and the Lower Klamath Lake systems were simulated with only one model segment and without sufficient detail to capture the most important water-quality processes in the systems. The modelers recognized this deficiency, and a reading of the model documentation and an evaluation of measured data and simulated results leads us to believe that most of the water-quality boundary conditions downstream of those lake reaches were reset to measured data, thus splitting the water-quality predictions of the model into multiple separate modeled reaches. If the models are/were truly used in this

fashion, then water-quality predictions from the Lost River are not translated through to the Klamath Straits Drain. This bifurcation of the water-quality predictions presumably was done because the modelers recognized some lack of predictive capability of the Tule Lake and Lower Klamath Lake segments of the model, and did not wish to propagate those predictive uncertainties downstream. This makes it difficult, if not impossible, to link modeled Lost River water quality to the water quality of the Klamath Straits Drain.

Response: Insufficient data were available to fully represent heterogeneities in the Tule Lake and the Lower Klamath Lake systems. Additional monitoring to better characterize water quality in various areas including those mentioned is proposed in the implementation recommendations included in the Lost River TMDL (US EPA 2008). Implementing the TMDLs developed for the Lost River within California is the responsibility of the North Coast Regional Board; and the North Coast Regional Board has indicated that wetland treatment will be considered in the development of implementation.

USBR 38: Chapter 3, Section 3.6.3.3, page 3-23, 1st sentence states “Modeling assumptions and limitations are specified in the document Lost River Model for TMDL Development (Tetra Tech 2005), presented in Appendix F.”
The reference to Appendix F is incorrect.

Response: The text was changed to reflect the comment.

USBR 39: Chapter 3, Section 3.6.3.5, page 3-24, 1st paragraph states “The water quality model demonstrated that the hypothesis of nitrogen limitation of aquatic plants and algae is consistent with observed water quality conditions. In addition, the model demonstrated that algae growth and respiration and observed BOD were not sufficient to cause the DO deficits observed. This supports the concept that SOD is an important factor in determining observed DO concentrations.”

It appears that Sediment Oxygen Demand (SOD) rates used in the model were not corrected for water-column biochemical oxygen demand (BOD). The Eilers SOD study reports uncorrected SOD rates of 3.8 g/m2/d for Harpold and 2.5 g/m2/d for Wilson, and these rates are used in the model and spatially interpolated against some background SOD rate that assumed a value of 1.0 g/m2/d. The blank-corrected SOD rates from the Eilers study were 2.7 g/m2/d for Harpold and 1.3 g/m2/d for Wilson. If reasons exist for using the uncorrected SOD values, they were not stated in the model documentation. Also, the values of 3.8 and 2.5 g/m2/d were from cores incubated at 21-22°C, and the temperature-adjusted SOD rates used in the model do not agree with those laboratory values at that temperature. It is important to account for the temperature adjustment factors used by the model when specifying maximum SOD rates for the model.

Response: Measured (un-corrected) SOD was used as a starting point for the SOD value used in model. Given the variability in SOD values spatially and temporally as well as the correction issue and temperature influence, model calibration was ultimately adopted as the approach to determine the appropriate SOD throughout the simulation period.

USBR 40: Chapter 3, Section 3.9, page 3-33, 2nd paragraph states “The surrogate load allocation of dissolved oxygen augmentation in the impoundments [is] presented in Table 3-13 and Table 3-11. Nonpoint Source Allocation Summary by River Mile Segment.

The reviewer finds it interesting that dissolved oxygen augmentation is being called for in the Klamath Straits Drain and Wilson and Anderson-Rose Reservoirs, but not for the water bodies actively managed as part of Lower Klamath National Wildlife Refuge (LKNWR) and Tule Lake National Wildlife Refuge (TLNWR). The current operations of LKNWR and TLNWR are actively managed and controlled by the U.S. Fish and Wildlife Service to accomplish specific goals associated with each refuge. These controlled operations are not consistent with natural or historic hydrology and have significantly altered the retention time of water to an extent that dissolved oxygen concentrations are likely negatively influenced to a much greater degree due to the managed operations of TLNWR and LKNWR, compared to the Klamath Straits Drain and the Lost River impoundments. If dissolved oxygen augmentation is required in the Klamath

Straits Drain and the Lost River impoundments due to controlled operations, then dissolved oxygen augmentation should also be required for the other controlled water bodies within the Lost River Watershed. At a minimum, an analysis should be conducted to identify and quantify the negative impact on dissolved oxygen concentrations due to the controlled operations of TLNWR and LKNWR as compared to natural baseline conditions.

Response: This Upper Klamath and Lost River TMDL include waterbodies in Oregon. The commenter should refer to the Lost River California TMDLs for Nitrogen and Biochemical Oxygen Demand (December 2008) for information regarding allocations for the Tule Lake Sumps and Lower Klamath National Wildlife Refuges..

USBR 41: Table 3-12. Overall Nonpoint Source Load Allocation for Designated Management Agencies Discharging to the Lost River System.

How was it determined that all three DMAs have the exact same reduction of 50 percent? It would seem that since the majority of nonpoint source nitrogen is coming from agriculture, the largest reductions would be from agriculture. It would be more appropriate that ODA work with the farming community to implement BMPs to get at the source of anthropogenic nitrogen sources. Furthermore, if the UKL TMDLs are achieved, the nutrient loading to the Klamath Project, and subsequent nutrient loading from the Klamath Project, will be significantly reduced. Therefore, these large reductions would not be necessary to meet water quality standards since much of the water and nutrients in the Lost River system originate from UKL.

Response: The nonpoint allocations were distributed across the landscape with equal responsibilities shared by the DMAs. Load allocations for the Lost River system were developed with the assumption that Upper Klamath Lake TMDLs were achieved.

USBR 42: Chapter 4, Section 4. 1, page 4-5, 4th paragraph states “All land uses and ownerships are included in this TMDL: lands managed by the State of Oregon, U. S. Bureau of Reclamation, irrigation and drainage districts...”

The Bureau of Reclamation does not actively manage or own large amounts of land that would influence water quality conditions in the Lost and Klamath River Watersheds

Response: The text was revised to reflect Reclamation’s responsibility for control of water and limited land ownership.

USBR 43: Chapter 5, Table 5-4. List of organizations with TMDL responsibilities.
The Bureau of Reclamation is listed as the DMA for the “Operation of Lost River Diversion Channel and Reservoir, Anderson Rose Impoundment, and Klamath Straits Drain facilities.” The irrigation districts and private land owners operate almost all of the water delivery facilities within the Klamath Project and Reclamation doesn’t operate any of the drainage systems within the irrigation districts or on private lands. Also, Reclamation doesn’t deliver water to the irrigation districts or private land owners within the Klamath Project. The individual irrigation districts and private land owners divert water from Upper Klamath Lake, the Klamath River, and Lost River for delivery to private land owners within each district. The irrigation districts are also responsible for operation of the drainage systems within their district. The water delivery and drainage systems are operated at the sole discretion of the irrigation districts. Reclamation has no authority to dictate how private land owners and irrigation districts operate these facilities. The only facilities in question that Reclamation operates are the Lost River Diversion Dam on the Lost River and Pumping plants E-EE and F-FF on the Klamath Straits Drain. All other facilities are operated by the irrigation districts and private land owners.

Response: We have based our designation on the Reclamation Act of 1902 (Act of February 9, 1905, Ch. 567, 33 Stat. 714). The Project was authorized to drain and reclaim lake bed lands in Lower Klamath and Tule Lakes, to store water of the upper Klamath and Lost Rivers, including storage of water in the Lower

Klamath and Tule Lakes, to divert and deliver supplies for Project purposes, and to control flooding of the reclaimed lands.

Comments from: PacifiCorp

General Comments

PacifiCorp 1: **The Draft TMDL model – the analytical tool relied upon to develop the TMDL's allocations and targets – includes inappropriate boundary condition values. The Draft TMDL's unrealistic assumptions regarding upstream boundary conditions is one of the most important issues affecting the accuracy of this Draft TMDL.** The Draft TMDL model's upstream boundary conditions fundamentally drive the results, analyses, targets, and allocations made in the Draft TMDL. The Draft TMDL states that nutrient concentrations used in assigning upstream boundary conditions in the TMDL model reflect median conditions expected upon attainment of Oregon's Upper Klamath Lake TMDL. However, the selected values used in the model are not consistent with the median values predicted by the Upper Klamath Lake TMDL model, but instead are unrealistically low and do not properly account for inter-annual variability because data were arbitrarily excluded. As such, the allocations and targets set using the Draft TMDL model are biased and unrealistic.

Response: The Upper Klamath Lake boundary used in the TMDL model is based on the best available data and science and is informed by policy decisions related to the implementation of the Clean Water Act. We disagree with your assertion that the TMDL used "inappropriate boundary condition values", "unrealistic assumptions", "unrealistically low" nutrient concentrations and that allocations are "biased and unrealistic". You do not explain the statement "fundamentally drive" and fail to present evidence that allocations are inappropriate or not protective of water quality standards. Specifics regarding the Upper Klamath Lake boundary condition are discussed in the responses to the comments that follow.

PacifiCorp 2: **The Draft TMDL's Klamath River temperature modeling includes erroneous reductions in solar radiation of 20 percent in certain modeled river reaches and scenarios. As a result of this modeling error, the Draft TMDL overestimates the maximum temperature effects of Keno and J.C. Boyle dams, resulting in calculations of excessive temperature offsets for the dams.** The reservoir reaches are modeled with 100 percent of solar radiation (no reduction). For example, where J.C. Boyle, Copco, or Iron Gate reservoirs are included in an analysis, 100 percent solar radiation is applied. For the same reaches under a no-dams analysis, 80 percent solar radiation is applied. This results in a bias in which the downstream temperature effects of the reservoirs and their required offsets are overstated. The TMDL model should be corrected with consistent solar radiation applied to all reaches, and temperature offsets in the Draft TMDL should be updated accordingly.

Response: This assertion is shown to be incorrect and that there is no bias.

PacifiCorp 3: **PacifiCorp's diversions from Spring Creek do not add any thermal load to Spring Creek or Jenny Creek. Accordingly, the diversions may not be regulated through a TMDL.** TMDLs regulate "loads" to a waterbody (specifically, the additions of pollutants, including thermal energy and solar radiation). Although the withdrawal of water from Spring Creek may affect its temperature, the withdrawal does not add any substance or energy to the creek. Moreover, the Draft TMDL's Heat Source Model of Jenny Creek and Spring Creek contains several errors and incorrect assumptions. As a result, the Draft TMDL substantially overstates the effect on water temperatures in Jenny Creek of PacifiCorp diversions for Fall Creek powerhouse operations**.** The Draft TMDL erroneously estimates that PacifiCorp diversions from Spring Creek result in the warning of Jenny Creek by an average of 2.6ºC. This does not agree with the empirical data that has been collected in Spring Creek and Jenny Creek.

Response : DEQ does not regulate water withdrawals as part of TMDLs. DEQ does take into account the effect that these diversions have on water quality. As part of determining the Natural Thermal Potential of a given waterbody, we commonly mathematically add the diverted water back into the river to estimate the relative effect having less water in the stream has on water temperature.

Thermal load allocations have been issued in TMDL orders from DEQ to designated management agencies whose activities cause a violation of a water quality standard. Though some of these activities involve withdrawing water from a waterbody, the allocations do not state or assume that the DMA must cease withdrawing water, or any other activity in order to meet the allocation, and the water quality standard. The allocation is a portion of the allowable pollutant load for the entire waterbody that the DMA is allowed for their operations. How they make their operations consistent with the allocation is to be established later through the planning process provided through an associated Water Quality Management Plan issued along with each TMDL order.

The model results agree with BLM's field study in *Bureau of Land Management Comments on PacifiCorp's "Spring Creek Water Quality Investigations" Report for the Klamath Hydroelectric Project (FERC Project #2082) (2004).* Other data were not provided for evaluation.

PacifiCorp 4: **The Draft TMDL assigns allocations that would require enormous nutrient load reductions that are not achievable, practicable, or enforceable.** The Draft TMDL assigns nutrient allocations that call for reductions in total phosphorus (TP) of 88 percent, total nitrogen (TN) of 62 percent, and organic matter (as biochemical oxygen demand; BOD5) of 62 percent from Klamath River at Stateline. The Draft TMDL's resulting targets would require in-water nutrient concentrations that are impossibly low – so low, in fact, as to be substantially less than naturally-occurring groundwater concentrations that discharge to the Klamath River. Under the Clean Water Act's implementing regulations, load allocations must be "attributed" to nonpoint sources, including natural sources. Moreover, the regulations require such an attribution to be based on a reasonable estimate of the pollutant loadings from the source. An estimated loading is not reasonable if it cannot be shown to be reasonably achievable (e.g., because the source's pollutant loadings are not regulated or because the loading is technically or economically impracticable). The Draft TMDL is base on load allocations that are improper because they have not been demonstrated to be reasonably achievable and are not achievable. These include load allocations that would require reductions from natural loadings; reductions that cannot be enforced because the source is not regulated; and reductions that are not technically or economically practicable. The CWA anticipated situations where water quality standards (WQS) or a TMDL would not be achievable by including processes such as Use Attainability Analyses (UAA) or development of site-specific criteria. In fact, use of the UAA process is the first recommendation by the National Research Council (NRC 2001) on improving the TMDL program, whereby "States should develop appropriate use designations for waterbodies in advance of assessment and refine these use designations prior to TMDL development".

Response: Allocations are assigned to sources or source groups. The Draft TMDL does not assign a general basin-wide allocation in the form of a percent reduction based on one location in the river. Allocations should therefore be evaluated on a source-by-source basis. See responses to comments PacifiCorp 40, PacifiCorp 47, and PacifiCorp 66 in regards to groundwater concentrations. Load allocations are consistent with Oregon TMDL's rule: 340-042-004(h) (see response to PacifiCorp 57) and do not require reductions from natural loading. If PacifiCorp wishes to apply for the UAA or the development of site specific criteria, please send a letter of request to the regional water quality manager, Eric Nigg and the manager of the water quality standards program, Jennifer Wigal to initiate the process per DEQ's Use Attainability Analysis and Site-Specific Criteria Internal Management Directive (available at http://www.deq.state.or.us/WQ/standards/docs/uaa/imd.pdf).

Specific Comments: Chapter 1: Introduction

PacifiCorp 5: Page 1-4, Paragraph 1, Lines 8-9. The Draft TMDL states, "ODEQ and NCRWQCB agreed to meeting downstream water quality standards or water quality objectives, as appropriate." If this statement means that the Draft TMDL's wasteload and load allocations must or may be set at levels necessary to achieve California water quality objectives, PacifiCorp respectfully disagrees. (But see page 2-5 of the Draft TMDL, which states that the Draft TMDL is based on Oregon standards and implies that California standards and objectives are only coincidentally achieved.) The waterbodies addressed by the

Draft TMDL are waterbodies in the Upper Klamath and Lost River Subbasins of Oregon. The Draft TMDL's wasteload and load allocations must be based on the applicable water quality standards in those subbasins. DEQ does not have the authority to establish TMDLs, including wasteload allocations and load allocations, for waterbodies in other states.

Response: Oregon and California formed a technical team in conjunction with USEPA and its contractor Tetra Tech, Inc. to develop a uniform water quality model of the basin and conduct joint analyses to ensure compatible TMDLs. However, the states will establish independently the TMDLs for those portions of the basin within their respective jurisdiction. The Oregon-issued TMDLs will be based on Oregon's water quality standards. Because these TMDLs (and their anticipated load and wasteload allocations) are being developed by Oregon as part of a comprehensive multistate analysis of pollutant loadings to the Klamath River, they are also being designed to meet California water quality standards at stateline.

PacifiCorp 6: Page 1-5, Table 1-1. "Hydro Power" and "Commercial Navigation and Transportation" also are designated as beneficial uses in the Klamath River from Klamath Lake to Keno Dam. OAR 340-041-0180, Table 180A. In addition, fish uses under the general designation of "Fish and Aquatic Life" are specified in OAR 340-041-0180, Figure 180A.

Response: The text was changed to reflect the comment.

PacifiCorp 7: Page 1-8, Section 1.2.5. PacifiCorp entered into the Klamath Hydroelectric Settlement Agreement (KHSA) on February 18, 2010. Among the other parties to the KHSA are the State of Oregon, DEQ, the U.S. Department of the Interior, the National Marine Fisheries Service, other Oregon and California agencies, tribal and local governments, and non-governmental organizations. The KHSA, subject to several conditions, provides a process for the removal of J.C. Boyle Dam in Oregon and three PacifiCorp dams on the Klamath River in California. These conditions include but are not limited to a future determination by the U.S. Secretary of the Interior that dam removal will advance the restoration of salmonid fisheries in the Klamath River Basin and is in the public interest and that certain funding and other requirements of the KHSA have been satisfied. In addition, both the States of Oregon and California must concur in an affirmative determination. The KHSA also contemplates that PacifiCorp will: (1) transfer Keno Dam to the U.S. Department of the Interior under the terms of an agreement to be negotiated between PacifiCorp and the Department of the Interior; (2) apply to the Federal Energy Regulatory Commission to decommission the East Side and West Side hydroelectric facilities just downstream of Upper Klamath Lake; and (3) continue to operate the Fall Creek hydroelectric facility in California, which diverts water from Spring Creek in Oregon.

Response: Comment noted.

PacifiCorp 8: Page 1-9, Paragraph 5, Lines 1-4. The Draft TMDL states "DEQ recognizes a time period from several years to several decades will be necessary after full implementation before management practices identified in a TMDL implementation plan become fully effective in reducing and controlling certain forms of pollution, especially heat loads from lack of riparian vegetation". PacifiCorp agrees that it likely will take several decades for riparian vegetation measures to become fully effective. DEQ should also recognize that the reduction of nutrients and organic matter that will be required to achieve the TMDL will likely take at least several decades—if the TMDLs are achievable at all. On page 2-27, the Draft TMDL indicates that the Upper Klamath Lake TMDL (DEQ 2002) calls for a substantial 40 percent reduction in phosphorus loading to meet water quality standards. The Draft TMDL points out that phosphorus concentration in Upper Klamath Lake have not shown any reduction over recent years despite restoration efforts (as shown in Figure 2-18 on Page 2-28). The Draft TMDL also recognizes that, even if this 40 percent reduction in phosphorus loading is achieved, massive algae blooms will still occur in about 2 out of 8 years.

Response: Comment noted.

PacifiCorp 9: Page 1-27, Table 1-8. Regarding this table of sucker and redband trout periodicity, we suggest that more recent sources of information on periodicity be considered, including FERC (2006) and PacifiCorp (2004). For example, it seems incorrect for Table 1-8 to indicate that sucker incubation is present in February, but not sucker spawning.

Response: The text was changed to reflect the comment.

Specific Comments: Chapter 2. Draft Klamath River Dissolved Oxygen, Chlorophyll a, pH, Ammonia Toxicity, and Temperature TMDL

PacifiCorp 10: Page 2-6, Table 2-1. The Table identifies "human caused temperature increases and hydraulic modification" as "pollutants" under OAR 340-042-0040(4)(b). Pollutants under the TMDL program are limited to substances or heat added to waterbodies. *See* OAR 340-042-0030(8); 33 U.S.C. § 1362(6). "Human caused temperature increases" are pollutants only to the extent that they are additions of heat load, and "hydraulic modification" is not itself a pollutant at all.

Response: The table has been updated to include the following verbiage: "and other factors contributing to impairment".

PacifiCorp 11: Page 2-8, Table 2-3. In the waters potentially influenced by PacifiCorp's Project, the salmonid spawning criteria apply only to the Klamath River between J.C. Boyle dam and the J.C. Boyle powerhouse (the bypass reach) during the period January 1 through May 15. As discussed in PacifiCorp's 2008 401 Application (PacifiCorp 2008), these criteria are met, and the salmonid spawning criteria should be 9.0 mg/l, not 11.0 mg/l, as described in Table 2-3.

Response: No intergravel dissolved oxygen (IDGO) measurements were presented in the 401 Application. Therefore, DEQ cannot make a determination of whether the IGDO criterion is being achieved and the applicable instream criteria are presented in the TMDL.

PacifiCorp 12: Page 2-8, Table 2-3. The table should indicate that cold water aquatic life criterion is 90 percent saturation when altitude, barometric pressure, or temperature precludes attainment of the applicable on concentration criterion.

Response: The 90% saturation criterion modifies to the absolute minimum criterion of 8.0 mg/l which was not used as a target in this TMDL. Therefore, it will not be included in the summary table.

PacifiCorp 13: Page 2-9, Section 2.2.5, Paragraph 2, Lines 4-6. The Draft TMDL states that ammonia criteria are calculated based on the assumption that salmonids or other sensitive cold water species are present. This assumption is inappropriate because the only segment of the river that is listed as water quality-limited for ammonia—the segment between Keno Dam and Upper Klamath Lake—has no salmonid designation and is designated only for cool water species. *See* OAR 340- 041-0180, Figure 180A.

Response: The "salmonids or other sensitive cold water species" criteria was used for the following reasons: (1) to be consistent with the assessment methodology for the 303(d) list, (2) insure protection downstream where salmonids are present, and (3) to be conservative. This decision did not result in more stringent allocations because total nitrogen allocations necessary to address the dissolved oxygen and pH impairments lead to compliance with the ammonia toxicity criteria using the "salmonids or other sensitive cold water species" calculation.

PacifiCorp 14: Page 2-10, Paragraph 1. The Draft TMDL should also set out OAR 340-041-0028(12)(b)(B), which provides: "Following a temperature TMDL or other cumulative effects analysis, waste load and load allocations will restrict all NPDES point sources and nonpoint sources to a cumulative increase of no greater than 0.3 degrees Celsius (0.5 Fahrenheit) above the applicable criteria after complete mixing in the water body, and at the point of maximum impact."

Response: The document has been updated to include the suggested verbiage.

PacifiCorp 15: Page 2-14, Figure 2-4. Please explain data marked as circles on Figure 2-4.

Response: Circles are explained in preceding figure which is an explanation of box and whisker plots.

PacifiCorp 16: Page 2-15, Paragraph 1, Lines 1-2, and Figure 2-7. As discussed at page 2-9 of the Draft TMDL, the chlorophyll *a* concentration of 15 micrograms per liter is an action level, not a water quality criterion. To avoid confusion, the references on this page to a chlorophyll *a* "criterion" should be changed to "action level" or "guideline."

Response: The document has been updated to include the suggested verbiage.

PacifiCorp 17: Page 2-15, Last sentence on page. The Draft TMDL states "JC Boyle Reservoir experiences anoxic conditions during the summer months at the deepest area of the reservoir". This statement exaggerates the situation. J.C. Boyle is never anoxic (lacking in oxygen) at any depth, but rather hypoxic (low dissolved oxygen) at the deepest parts of the reservoir, and not "for the summer months" but rather for approximately one month during the summer. Further, the volume of water under consideration is small compared to the entire reservoir volume.

Response: The document has been updated to include the suggested verbiage.

PacifiCorp 18: Page 2-17, Figure 2-9. The applicable saturation percentage for the period May 16 to December 31 is 90 percent, not 95 percent. *See* OAR 340-041-0016(2). Please adjust the figure and values presented accordingly.

Response: The figure and caption have been clarified.

PacifiCorp 19: Page 2-17, Paragraph 1, Line 1. The Draft TMDL states "Water temperature in Keno impoundment is largely controlled by the natural temperature regime of water discharging from Upper Klamath Lake." Meteorological conditions, including solar radiation and ambient air temperature, also have an important influence on temperature in Keno impoundment. Nonetheless, these are natural conditions that influence water temperature in Keno reservoir because Upper Klamath Lake is at equilibrium temperature with atmospheric conditions.

Response: Comment noted.

PacifiCorp 20: Page 2-17, Paragraph 2, Lines 2-5. The Draft TMDL states "Peaking operations at the JC Boyle Power house combined with the constant temperature spring inputs to the Klamath River also impose unique temperature signals on the river downstream of the Powerhouse with non-peaking flows dominated by cooler spring water and peaking flows dominated by warmer water from JC Boyle reservoir (PacifiCorp, 2006)". The citation to PacifiCorp (2006) is not appropriate to this statement. PacifiCorp (2006) did not address water temperatures "signals" in the J.C. Boyle peaking reach.

Response: The reference has been changed.

PacifiCorp 21: Page 2-19, Paragraph 1, Line 7. The Draft TMDL states "The following plots present data from 1995 to 2003…". There has been considerable data collected since 2003. It would be appropriate to include the additional, more-recent data in the analysis for this TMDL.

Response: The figures include the readily available data at the time they were generated. Unfortunately, there is no central data repository for the Klamath basin, so updating the figures would require significant resources. DEQ has not reviewed any data that indicate present conditions in the river are different than the period of analysis.

PacifiCorp 22: Page 2-19, Paragraph 1, Line 8. The Draft TMDL states "If multiple measurements were collected at various depths…or on the same day, these were averaged for each site." It is not appropriate to directly compare data when some represent individual measurements and some represent averaged values. It biases both the range and the variance. It is also inappropriate when constructing box plots because the purpose of box plots is to represent the whole of the distribution.

Response: We disagree and believe that the averaging is appropriate. Since sampling plans varied (some collected vertical profiles and some collected a 1 meter depth), we believed the best way to represent the vertical profiles was to treat them as one data point which was represent by their average. Without the averaging, the vertical profiles would bias the central tendency and the depth averaged variability. Some data submitted for this TMDL did not document duplicate samples for quality assurance or sampling times, and the same results appear to be submitted by different entities. For these graphs, we assumed grab samples on the same day were duplicates. Otherwise, the duplicate samples would have biased the central tendency and variability present in the box plots. Changing the methodology would trade type of bias for another and therefore, we are not going to update these figures.

PacifiCorp 23: Page 2-20, Figure 2-14. For representing eight years of data, there appears to be quite a large discontinuity from December to January in this seasonal plot of ammonia. The text should explain why the transition from December to January, averaged over eight years of data, is not smoother.

Response: There are only 5 samples in the December box and 6 samples in the January box. Given the small sample size, it doesn't seem surprising that there is an apparent "large discontinuity". We respectively disagree that additional text is necessary.

PacifiCorp 24: Page 2-21, Last paragraph. The Draft TMDL states "The model was set up to reproduce conditions observed in 2000 and 2002 from Upper Klamath Lake to the Pacific Ocean". The Draft TMDL does not use the model results to adequately address the "without dams" effects on Klamath River water quality downstream of Upper Klamath Lake during the period of up to "several decades" before the Upper Klamath Lake and Klamath River TMDLs are achieved.

The Draft TMDL should make clear that, until Upper Klamath Lake TMDL compliance is met, the quality of water from Upper Klamath Lake will contain high loads and elevated concentrations of nutrients and organic matter. Without the reservoirs (created by the dams), these high loads will be transported faster downstream and without being subject to reductions from reservoir retention. The Draft TMDL's "natural" condition is based on a single set of boundary conditions that assumes dams are absent (removed) and conditions comply with the Upper Klamath Lake TMDL (e.g., 40 percent reduction in existing phosphorus loading). Given that TMDL-compliant conditions will take a long time to be achieved (a period of up to "several decades"), a logical assessment would include analysis of intermediate conditions en route to compliance. No such analyses were presented in the draft TMDL. For example, if Upper Klamath Lake is not in compliance with the Upper Klamath Lake TMDL when dams are removed, water quality in the Klamath River will be notably different than that described in the Draft TMDL. To evaluate these conditions further, PacifiCorp requested that Watercourse Engineering conduct model simulations assuming that the Draft TMDL's "existing conditions" water quality at Upper Klamath Lake is applied at the river's headwaters at Link River dam, instead of Upper Klamath Lake TMDL-compliant water quality at the headwaters. Simulations also assume absence of PacifiCorp dams and reservoirs, which represents the likely condition that TMDL-compliant water quality will not be achieved for a substantial period of time after dams are removed as envisioned in the KHSA. Results of these simulations demonstrate the importance of using realistic boundary conditions in the Draft TMDL's analysis. They also illustrate the likely water quality of the Klamath River after dams are removed. Comparing results from the assumed "natural" conditions (T1BSR) and an "existing conditions without dams" scenario, it is clear that nutrient-enriched water quality in Upper Klamath Lake is transported faster downstream and without being subject to reductions from reservoir retention that would occur with dams in place. With the quality of water from Upper Klamath Lake as it is now, and as long as water quality from Upper Klamath Lake is highly nutrient-enriched, existing dams can have beneficial effects on the Klamath River by reducing nutrients and

organic matter through deposition and extended transit time. As such, when dams are removed, water quality will be markedly worse than portrayed in the Draft TMDL, which assesses absence of dams only under TMDL-compliant conditions. Figures 1 to 3 show TN at three locations along the Klamath River (i.e., Link River dam boundary, below Keno dam, and at Stateline) under both the T1BSR and "existing conditions without dams" simulations. Figures 4 to 6 show total phosphorus (TP) at these three locations under the T1BSR and "existing conditions without dams" simulations. As illustrated in these figures, conditions represented by the "existing conditions without dams" simulation contain significantly more total nitrogen (TN) and TP at all locations than the Draft TMDL's "natural" conditions simulation. The Draft TMDL's "natural" baseline simulation (T1BSR) was the basis for setting targets and allocations. But the "existing conditions without dams" simulation, which assumes realistic interim water quality boundary conditions, shows substantially higher baseline concentrations. Clearly, more reasonable assumptions about likely upstream boundary conditions completely change the predictions of water quality all along the river. DEQ should include an assessment of these interim conditions in the Draft TMDL, and describe how these interim conditions affect the steps made toward achieving water quality target and load allocations during the period of "up to several decades" until TMDL compliance at Upper Klamath Lake is achieved. [*Figures not reproduced here*]

Response: The draft presents the relative magnitude of Upper Klamath Lake current loading and TMDL loading (see Sections 2.6.2, 2.6.14 and 2.7.3.1) and makes clear the importance of Upper Klamath Lake loading to the concentration of pollutant in the Klamath River. The analysis of interim conditions is not a requirement of the TMDL. Thank you for the information which could be used to assess implementation activities. Pending the availability of adequate resources, DEQ will review the water quality model used to develop the Upper Klamath Lake TMDL and work cooperatively with USGS, USBR, and other stakeholders for revising the TMDL for Upper Klamath Lake

PacifiCorp 25: Page 2-22, Paragraph 1, Lines 1-2. The Draft TMDL should further define and discuss the results of the "replicative model validation".

Response: The definition and reference was provided and further discussion of the model was included in Appendix D.

PacifiCorp 26: Page 2-22, Paragraph 1, Lines 3-5. The Draft TMDL states "The model was generally able to reproduce observed water quality in the Klamath River". What does "generally able" mean in this context? Model sensitivity should be presented with defined output and metrics, and provide an interpretation of model uncertainty.

Response: The model was discussed in detail in Appendix C and the uncertainty analysis in Section 2.8.1.

PacifiCorp 27: Page 2-22 Paragraph 2, Line 6. The Draft TMDL refers to "model corroboration (qualitative and/or quantitative evaluation of a model's accuracy and predictive capabilities)". The Draft TMDL should further define and discuss the results of "model corroboration". Model sensitivity should be presented with defined output and metrics.

Response: The model was discussed in detail in Appendix C and the uncertainty analysis in Section 2.8.1.

PacifiCorp 28: Page 2-24, Paragraph 5, Lines 8-9. Contrary to the Draft TMDL's statement that "the model predicts that phosphorus is limiting the growth of attached algae", studies suggest that the upper Klamath River system is not significantly limited by phosphorus, or only periodically phosphorus-limited (Kuwabara et al. 2010). Thus, the Draft TMDL's model prediction of phosphorus limitations may be a result of erroneous boundary condition assumptions at Link River dam.

Response: You misquoted the draft TMDL. The correct and complete quote is: "However, under restored conditions, the model predicts that phosphorus will mostly limit algae growth with possible nitrogen

limitation as some locations." The quote refers to the restored, riverine portions of the Klamath River downstream of Keno impoundment.

PacifiCorp 29: Page 2-25, equations. Only labile organic matter is included in these equations. Refractory organic matter is not represented.

Response: The document has been clarified.

PacifiCorp 30: Page 2-25, Paragraph 3, Lines 1-2. The Draft TMDL states "The equations above ignore the BOD of ammonia derived from the decay of organic nitrogen because of the time lag introduced by the two decay cycles". What is the implication of ignoring ammonia derived from the decay of organic matter? Organic matter concentrations are remarkable in the system during the warmer periods of the year. As illustrated by the equations on page 2-25, the oxygen demand from NBOD is considerable at 4.57 g-O/g-N. Neglecting this demand, or at a minimum neglecting to provide sensitivity around this assumption, calls into question the dissolved oxygen assessment given the high levels of organic matter in the system.

Response: The BOD calculation would be an underestimate due to ignoring the BOD from ammonia that is derived from the decay of organic matter. Therefore, deriving allocations from this formulation would be conservative. These equations allow for the calculation of allocations in a commonly measured metric from model constituents and, therefore, this term is not neglected in the dissolved oxygen assessment.

PacifiCorp 31: Page 2-25, Paragraph 3, Lines 2-3. Combining labile and particulate OM is erroneous – these are subsets of each other. Perhaps the Draft TMDL means to state that labile dissolved OM and labile particulate OM are combined.

Response: The document has been clarified.

PacifiCorp 32: Page 2-25, Paragraph 3, Lines 2-3, continued. Also, including algae in organic matter is erroneous. In the model, algae are a separate state variable with separate processes, namely photosynthesis, respiration, and excretion. Thus, including algae in the oxygen demand is double counting the dissolved oxygen demand of respiration. In the model, algal mortality contributes to organic matter. Although there are times when algae diminish rapidly in Keno reservoir, there are periods when this is not the case.

Response: Recall that these formulations are not the model but a method to estimate loading from model inputs in a form that is commonly measured. Therefore, there is no 'double counting'. The algal mortality contributing to organic matter and BOD is a significant process in Keno impoundment and should be included in the BOD calculations.

PacifiCorp 33: Page 2-26, Paragraph 1. The Draft TMDL should state the specific range of SOD rates used in the model.

Response: See Appendix C.

PacifiCorp 34: Page 2-27, Paragraph 3, Line 1. The Draft TMDL states "The Upper Klamath Lake TMDL identified phosphorus as the pollutant that controls algal growth…". However, this general statement is not supported by literature published since the Upper Klamath Lake TMDL. For example, Kuwabara et al. (2010) identify light and trace elements as potential limiting factors in Upper Klamath Lake. Kuwabara et al. (2010; page 522) also state: "It may be reasonable to initially hypothesize that a macronutrient like phosphorus is a limiting nutrient when the dominant phytoplankton species is a nitrogen fixer or that light can limit photosynthesis even in a lake as shallow as Upper Klamath Lake because of intermittent high turbidity and formation of algal scum by winds and currents. However, we provide initial trace-element information for Upper Klamath Lake that identifies dissolved iron (a micronutrient) as a potential regulator of primary production in this hypereutrophic lake."

Response: The quote PacifiCorp presents does NOT exist in Kuwabara et al. 2010. There were no conclusions in the report that state that phosphorus is not a pollutant in Upper Klamath Lake. Nor could we locate suggestions of alternative pollutants in Kuwabara et al. 2010.

PacifiCorp 35: Page 2-27, Paragraph 3, Lines 9-10 and Figure 2-17. The predicted modeling results shown in Figure 2-17 are disconcerting in that two separate years (1993 and 1996) indicate massive algae blooms under TMDL-compliant loading conditions, while other years algal production is practically non-existent. If the model considers phosphorus to be limiting, these blooms must correspond to large influxes of phosphorus, but such likely causes are not discussed in the Upper Klamath Lake TMDL (DEQ 2002) or in this Draft TMDL. A discussion of these divergent modeled conditions is needed, particularly because this model output was used as a critical modeling boundary condition in the Draft TMDL.

Response: Walker 2001 discusses these conditions and states: "Phosphorus concentration at the start of the growing season has a strong influence on the spring algal pulse and on the likelihood of triggering the recycling mechanism that results in summer pH excursions". Because of the association of pH and algae, the statement also applies to algae concentrations.

PacifiCorp 36: Page 2-27, Last Paragraph. The Draft TMDL states "Despite restoration efforts, regular sampling of phosphorus concentrations in Upper Klamath Lake has not revealed a statistically significant temporal trend". Considering that restoration efforts to-date have led to no reductions in phosphorus concentrations, DEQ should clarify plans for altering or adjusting the strategy and timeline for the phosphorus reductions required by the Upper Klamath Lake TMDL. The strategy and timeline of the Upper Klamath Lake TMDL is particularly important to this Draft TMDL because the Draft TMDL's modeled "compliance scenario" is based on upstream boundary conditions that assume the Upper Klamath Lake TMDL is fully achieved.

Response: Thank you for the comment and we will consider it during the implementation phase of both TMDLs.

PacifiCorp 37: Page 2-33, Paragraph 5, Line 12. The Draft TMDL states "…the operation of Keno Dam appears to decrease dissolved oxygen by 0.1 mg/L in Keno impoundment…." On page 2-7, the Draft TMDL indicates that a change of 0.1 mg/L dissolved oxygen is not measureable. Given that, it is appropriate for the Draft TMDL to conclude that the operation of Keno dam has no measurable effect on dissolved oxygen in Keno impoundment. In addition, there is no discussion of the variability of the Draft TMDL model that likely would indicate that a difference of 0.1 mg/L is greater than the inherent variability of the model itself, or of instrumentation used to measure dissolved oxygen in field settings.

Response: The comment does not suggest changes to the document. Thank you for the information.

PacifiCorp 38: Page 2-33, Paragraph 5, Lines 13-14. The Draft TMDL states "The impact of JC Boyle development is more complex because of the removal and return of water from the river". This sentence should be expanded to be more precise since effects of J.C. Boyle operations vary by conditions (such as, time-of-year and flow conditions, among other conditions), and it is unclear as to what is meant by "more complex".

Response: The general nature of the text is appropriate for the source assessment section.

PacifiCorp 39: Page 2-34, Paragraph 1, Line 1: "Within the reservoir, average DO concentrations are depressed by 0.4 mg/L when compared to predicted conditions without a dam." It is not clear what conditions are being compared here. Is it existing conditions compared to "natural" conditions plus dams, or existing conditions to "TMDL compliant" conditions plus dams?

Response: This impact was derived from the allocation analysis. The document will be updated to be made more specific.

PacifiCorp 40: Page 2-34, Last sentence of page. The Draft TMDL states "…we estimated an inorganic phosphorus concentration of 0.07 mg/L ….". If this is representative of the background concentration of phosphorus in area groundwater (noting that groundwater via springs dominates the baseflow in the majority of Upper Klamath Lake tributaries), the TMDL should clarify how compliant conditions of 0.027 mg/L (see Figure 2-46 on page 2-60) can ever be achieved.

Response: There are processes that remove phosphorus from the water column resulting in lower concentrations than measured in groundwater.

PacifiCorp 41: Page 2-37, Paragraph 2, Lines 1-5. The Draft TMDL states "The evaluation shows that the complete remediation of any one source will not result in compliance with the numeric DO criteria". The Draft TMDL further states "The most influential source is Upper Klamath Lake causing a sustained dissolved oxygen deficit of up to 5.1 mg/L during the summer". These statements point to the substantial impacts to water quality in the Klamath River from the very large organic matter loads from Upper Klamath Lake. As previously discussed in these comments, the Draft TMDL properly acknowledges that the effectiveness of TMDL implementation likely will not be known for several decades. Given this, DEQ should consider the water quality consequences of dam removal and other potential substantial modifications to the river before the allocations to Upper Klamath Lake are achieved. [*footnote*: Because load allocations to nonpoint sources and natural background sources are "attributed," not allocated, to those sources, and because load allocations are based on "best estimates" and "predictions" of loadings, it is not appropriate to "allocate" a loading to Upper Klamath Lake that cannot reasonably be expected to be achieved within a reasonable time. *See* 40 C.F.R. § 130.2. The Draft TMDL does not identify any controls for nutrients from Upper Klamath Lake that are likely to achieve the load allocation to the lake.]

Response: The Upper Klamath Lake TMDL was approved by EPA and is appropriate to consider in the Klamath River TMDL. See response to PacifiCorp 24.

PacifiCorp 42: Page 2-38, Figure 2-26. The loads shown in this diagram do not maintain a quantitative loading balance going downstream. For example, in the area marked "Lake Ewauna," there is a total load in of 491,242 kg phosphorus (P) from Upper Klamath Lake and other sources, but a load out of 305,630 kg. What happened to the other 185,612 kg – more than 1/3 of the load? There are missing loads and sinks on this figure. It is not possible to understand the basis of the TMDL without a clear explanation of the sources and sinks of nutrients in the system.

Response: The apparent difference in loading depicted in the vector diagram is due to loss through the in-stream process such as decay and settling as well as withdrawal from the Lost River Diversion Chanel (LRDC).

PacifiCorp 43: Page 2-39, Figure 2-27. This figure suffers from the same shortcoming as Figure 2-26. The sources and sinks don't balance. For example, the figure indicates a total load of 2,953,900 kg nitrogen (N) from Upper Klamath Lake and other sources, but the total load of N at Stateline is 1,360,905 kg. Therefore, about 50 percent of the load of N from Upper Klamath Lake and other sources is not accounted for at Stateline.

Response: See response to PacifiCorp 42

Page 2-40, Figure 2-28: This Figure suffers from the same shortcoming as Figure 2-26 and 2-27. Again, the sources and sinks don't balance. For example, the figure indicates a total load of 29,077,964 kg CBOD from Upper Klamath Lake, but 7,936,798 kg at Stateline, indicating that more than 70 percent of the load from Upper Klamath Lake is not accounted for at Stateline. In addition, the widths of the arrows, obviously intended to convey quantitative information, are misleading. For example, the load from Spring Street STP is 100,000 kg smaller than the load from South Suburban Sanitary District, but the Spring Street arrow is twice as wide.

Response: See response to PacifiCorp 42

PacifiCorp 44: Page 2-41, Paragraph 1, Lines 1-6. The Draft TMDL states: "The results of model scenarios demonstrate that dissolved oxygen, pH and temperature biologically-based, numeric criteria cannot be achieved under the estimated natural condition. Oregon's water quality standards stipulate that, in this case, the natural condition becomes basis for the water quality criteria. These targets vary in time and space and are, therefore, conceptually much different than a typical target. Consequently, the anthropogenic loading capacity is calculated based on an allowable degradation to the natural condition." Only one "natural condition" is defined in this Draft TMDL. More care should be taken to build and present a natural condition (or, rather a set of natural conditions) that include a range of possible or likely conditions. This is particularly important given the wide range of conditions produced by the Upper Klamath Lake TMDL model at Link River dam.

Response: The "natural condition" was an appropriate base to calculate allocations.

PacifiCorp 45: Page 2-41, Paragraph 4. The Draft TMDL's assumption regarding upstream boundary conditions is one of the most important issues affecting the accuracy of the Draft TMDL. These upstream boundary conditions fundamentally drive the results, analyses, targets, and allocations made in the Draft TMDL. The Draft TMDL states that "The Upper Klamath Lake boundary condition for the natural conditions baseline model was based on the existing Upper Klamath Lake TMDL". The Draft TMDL further states:

> "For the purposes of the Klamath River TMDL, one of the moderate years was chosen because it would provide for more conservative assumptions (see Section 2.8.2). Specifically, concentrations for water quality constituents were based on 1995 Upper Klamath Lake model output which represents a median year (Figure 2-29). Choosing a specific year, rather than averaging the eight years of model results, allowed for the removal of the influence of the two extreme years and their lingering impact in the following winters."

The Draft TMDL's decision to base upstream boundary conditions on Upper Klamath Lake TMDL model output for the single year 1995 raises several issues. First of all, 1995 is not representative of a "median year" as DEQ indicates. Spreadsheets released with the Draft TMDL show that "natural" boundary conditions were calculated from a subset of the simulations made for the Upper Klamath Lake TMDL. These simulations produced bi-weekly estimates of TP in Upper Klamath Lake on conditions over the seven years of 1992-1998, assuming a 40 percent reduction of external phosphorus load into Upper Klamath Lake. Annual mean TP concentrations for the seven years of 1992-1998 resulting from these simulations (Walker 2001) are shown in Figure 7. The figure shows annual mean TP concentrations calculated by both water year and calendar year because the Draft TMDL did not use the same averaging period as did the Upper Klamath Lake TMDL. The Upper Klamath Lake TMDL used simulated bi-weekly results averaged over water years, from October through the following September. The Draft TMDL uses calendar-year averages of these same bi-weekly results.

DEQ reviewed calendar-year average TP concentrations for each of the seven years of Upper Klamath Lake simulations (as shown in Figure 7), and chose 1995 as a representative year upon which to base natural conditions. Prior to choosing 1995, DEQ removed two years from consideration, 1993 and 1996, which had appreciably higher average TP concentrations than the other five years. From the other 5 years, DEQ chose 1995, and described it as the "median" year. However, describing 1995 as the "median" year is misleading because it is clearly not the median year of the seven years of expected outcomes presented in the Upper Klamath Lake TMDL analysis. Rather, it is based on a pre-selected subset of five years that excludes two years with the highest TP values.

By choosing TP concentrations from 1995 results only, the Draft TMDL assumes water quality boundary conditions that are substantially biased toward lower concentrations. The exclusion of two years with the highest TP concentrations means that higher boundary conditions are not taken into account that nonetheless will occur relatively frequently, or nearly 30 percent of the time (i.e., 2 out of 7 years). These relatively-frequent higher concentrations should not be ignored. The values shown in Figure 7 indicate

that there is about a 4-in-7 or 60 percent likelihood that nutrient, algae, and OM concentrations under Upper Klamath Lake TMDL compliant conditions will exceed the "natural" condition derived from 1995 results as assumed in the Draft TMDL. Thus, the approach proposed in the Draft TMDL is not conservative because it is inconsistent.

Spreadsheets released with the Draft TMDL show that "natural" boundary conditions were calculated from a subset of the simulations made for the Upper Klamath Lake TMDL. These simulations produced bi-weekly estimates of TP in Upper Klamath Lake on conditions over the seven years of 1992-1998, assuming a 40 percent reduction of external phosphorus load into Upper Klamath Lake. Annual mean TP concentrations for the seven years of 1992-1998 resulting from these simulations (Walker 2001) are shown in Figure 7. The figure shows annual mean TP concentrations calculated by both water year and calendar year because the Klamath
River TMDL did not use the same averaging period as did the Upper Klamath Lake TMDL. The Upper Klamath Lake TMDL used simulated bi-weekly results averaged over water years, from October through the following September. The Draft TMDL uses calendar-year averages of these same bi-weekly results. Therefore, by using 1995 values only, the Draft TMDL assumes that there will still be 60 percent of the years when downstream reaches will be out of compliance even when the Upper Klamath Lake TMDL is assumed to be successfully achieved.

[Figure 7 not reproduced]

Response: Additional text in the final TMDL explains the rationale for choosing the Upper Klamath Lake representation.

PacifiCorp 46: Page 2-41, Paragraph 4, continued. The Draft TMDL's intentional "removal of the influence of the two extreme years" (1993 and1996) indicates that the Draft TMDL is assuming and acknowledging that the conditions sought by implementation of this Draft TMDL will not be achieved in nearly 30 percent (i.e., 2 out of 7)of years. In fact, on page 2-27, the Draft TMDL acknowledges "2 out of the 8 years analyzed are predicted to have massive algae blooms under TMDL loading conditions". The prospect that water quality objectives would not be met at such a relatively high frequency suggests that the Draft TMDL's water quality objectives are not appropriately realistic for this system.

Response: DEQ's water quality objective for dissolved oxygen is based on the natural condition criteria, not a biologically-based, static numeric value. Therefore, dissolved oxygen (DO) concentration in the Klamath River will meet the water quality objective if the DO concentration is due to natural loading. This is the case even if the DO concentration is lower than concentrations presented in Section 2.7.

PacifiCorp 47: Page 2-41, Paragraph 4, continued. The Draft TMDL relies on simulations that use these "natural" boundary condition assumptions to establish targets and allocations made in the Draft TMDL. By using Upper Klamath Lake TMDL model output for the single year 1995, the Draft TMDL's "natural" water quality boundary conditions and associated targets are uncharacteristically and unrealistically low. These conditions and associated targets do not fully reflect the documented historical evidence of the Klamath system, which has been nutrient enriched throughout recorded history (Wee and Herrick 2005). The National Research Council (NRC) (2004) determined that the natural baseline phosphorus concentration in water flowing to Upper Klamath Lake was approximately 0.06 mg/L – over two times the value assumed in the Draft TMDL. Several years of data collected at the bottom of the bypass reach above the J. C. Boyle powerhouse and available on PacifiCorp's website [footnote: See Water Quality Reports & Data available at http://www.pacificorp.com/es/hydro/hl/kr.html.] show that the natural total phosphorus concentration of baseline groundwater flow from springs to be 0.07 – 0.08 mg/L. The Draft TMDL presents no evidence to demonstrate how this natural background concentration in the Klamath River at approximately River Mile (RM) 221 could be reduced to 0.025 mg/L (a factor of more than three-fold) by RM 209 in a pre-disturbance "natural conditions" scenario. A simple mass balance suggests that to attain such a concentration at Stateline, total phosphorus concentrations above the large springs complex below J.C. Boyle dam would have to be on the order of 0.01 mg/L or less - approximately an order of magnitude less than natural groundwater contributions that dominate the Upper Basin hydrology.

Response: You are incorrect in a number of regards. The water quality models in the Upper Klamath Lake TMDL and the Draft Klamath River TMDL are the 'evidence to demonstrate how this natural background concentration in the Klamath River at approximately River Mile (RM) 221 could be reduced to 0.025 mg/L'. You make the incorrect assumption that water column phosphorus concentration cannot decrease in your 'simple mass balance'.

PacifiCorp 48: Page 2-41, Paragraph 4, continued. The low nutrient values assumed in the Draft TMDL's "natural" conditions baseline are unrealistic in the context of current conditions at Upper Klamath Lake, which is naturally eutrophic (NAS 2004, Eilers et al. 2004, Walker 2001) and currently hypereutrophic (due to very high nutrient levels and primary production rates). In fact, on page 2-27, the Draft TMDL acknowledges that "the Upper Klamath Lake TMDL recognized the large amount of natural phosphorus loading and that prior to 1900s the lake was likely eutrophic (enriched with nutrients)". The Draft TMDL then goes on to state "Since that time, though, the lake has become hypereutrophic due to increased phosphorus loading from anthropogenic sources and draining of surrounding wetlands". Nonetheless, nutrient values assumed in the Draft TMDL's "natural" conditions baseline conditions spreadsheet suggest that Upper Klamath Lake would be classified as mesotrophic to oligotrophic (Horne and Goldman 1994, Wetzel 2001). Shifting Upper Klamath Lake from the current hypereutrophic state to mesotrophic is not only unrealistic to achieve, but would also shift the lake to a lower trophic status than that which existed naturally (Eilers et al. 2004). To our knowledge, there have been no documented cases in which nutrient load reductions on such a large scale have been achieved elsewhere, or even determined to be feasible and achievable for planning and implementation purposes, particularly where nutrient sources are overwhelmingly nonpoint source-dominated as in the case of the Klamath Basin.

Response: You incorrectly portray our estimated natural condition of Upper Klamath Lake, presented in Sections 2.6.2 and 2.7.1. The estimated natural condition of Upper Klamath Lake varies considerably from year to year. Your trophic status discussion ignores years with higher phosphorus concentration.

PacifiCorp 49: Page 2-41, Paragraph 4, continued. The Draft TMDL does not acknowledge the likely impossibility of the huge nutrient reductions in the Klamath River downstream of Upper Klamath Lake that would be required to achieve its water quality goals. The federal Clean Water Act (CWA) anticipated situations where water quality standards (WQS) or a TMDL would not be achievable by including processes such as a UAA or development of site-specific criteria. In fact, use of the UAA process is the first recommendation by the NRC on improving the TMDL program, which says that "States should develop appropriate use designations for waterbodies in advance of assessment and refine these use designations prior to TMDL development" (NRC 2001).

Response: This comment does not suggest changes to the TMDL and is based on the incorrect portrayal of the TMDL (see previous response).

PacifiCorp 50: The Draft TMDL's unrealistically low TP concentrations chosen to represent "natural" conditions are compounded by the Draft TMDL's use of inappropriate ratios for converting TP to estimates of other important water quality boundary conditions, including soluble reactive phosphorus (SRP) [footnote: SRP is the biologically available fraction of TP that is most readily taken up by algae], total nitrogen (TN), ammonia (NH3), nitrate (NO3), and non-living organic matter (OM). The Draft TMDL assumed constant fractions of TP throughout the year and across implied trophic shifts to develop "natural" boundary concentrations for these other nutrient and organic matter concentrations. These constant fractions were calculated from one partial year of data. The Draft TMDL (in Appendix D) states that "average ratios…were calculated based on Pelican Marina, UKL monitoring data…(with a sample size of n=15). These annual ratios were then used to generate boundary conditions from assumed TP concentrations. For example, the annual ratio of SRP:TP in Upper Klamath Lake was calculated to be 0.245, the average value from the 15 samples collected at Pelican Marina. This ratio was then assumed to apply throughout the year. Using this annual ratio, SRP values were derived as 24.5 percent of assumed TP values.

The Draft TMDL's use of these constant ratios causes errors in calculation of OM. During summer months under the Draft TMDL's assumed "natural" conditions, SRP concentrations calculated using these constant ratios are greater than TP estimates (non-algal portion) from the Upper Klamath Lake TMDL. Non-algal TP is the sum of inorganic and non-algal organic phosphorus. Subtracting the SRP from non-algal TP values reported for July through September produces negative values, which are physically impossible. To circumvent this problem, the Draft TMDL places a minimum value of 0.24 µg/L on non-algal TP whenever a negative concentration is calculated. This approach results in calculation of inappropriately low values for non-algal OM in the summer months when they actually tend to be high, as illustrated in Figure 8. These non-algal OM concentrations under "natural" conditions represent reductions of over 97 percent from "existing" conditions in June, July, August and September, respectively. Furthermore, setting a minimum value (to overcome the calculated negative values) artificially adds phosphorus and OM to the boundary condition, and means that the mass of these constituents is not properly conserved over the annual simulation period at Link Dam. Conservation of mass is an important fundamental principle in any modeling analysis.

Using constant conversion ratios to develop SRP, NO3, NH4, and OM concentrations from TP also ignores seasonal variability in these ratios. Such ratios are not constant across seasons under actual existing conditions. Recent studies from the U.S. Geological Survey (USGS) have shown that these ratios indeed vary seasonally during the year by up to a factor of approximately five (Sullivan et al. 2008, Sullivan et al. 2009) as illustrated in Figure 9. During periods of algae blooms, the SRP:TP ratio may be very low due to uptake by primary production. Following a bloom crash and subsequent senescence, the inverse may occur.

[Figures 8 and 9 not included here]

In addition to the drawbacks of using constant ratios throughout the year, the average ratios that are used in the Draft TMDL are likely not relevant for Upper Klamath Lake TMDL compliant conditions. The ratios that are used would not be expected to remain constant under the trophic shifts that are implied to meet the Draft TMDL's nutrient targets (i.e., from hypereutrophic to mesotrophic or oligotrophic trophic conditions). Water chemistry that is fully compliant with the Upper Klamath Lake TMDL would almost certainly lead to different SRP:TP, NO3:TN and NH4:TN ratios, and also different temporal distribution of such ratios.

Response: The comments point out some of the difficulties is deriving boundary conditions for scenarios. However, the resulting imbalance in total phosphorus is very low, with less than a 1% difference in the average concentrations. This slight difference is caused by the assumption of a static ratio between constituents tracked in the Upper Klamath Lake model and the constituents tracked in the Klamath River model. The commenter does not propose alternative ratios or methodologies. DEQ used the best available information and methods to develop a representation of a restored Upper Klamath Lake.

PacifiCorp 51: Page 2-41, Paragraph 4, Last sentence. The Draft TMDL states "For 1995, the average March – May total phosphorus concentration was 27 µg/L and the annual average was 23 µg/L." These concentrations, which are the basis for the "natural conditions" baseline scenario, are less than 40 percent of what is the probable real baseline concentration of 60 – 70 µg/L based on groundwater concentrations. Previously, on page 2-34, the Draft TMDL cites an inorganic P concentration of 70 µg/L for springs in the basin. Also, in Table 2-9 on page 2-45, the Draft TMDL cites a total P concentration of 0.069 mg/L for "springs (natural)". Therefore, what is the justification for using the 40-percent lower P values for the "natural conditions" baseline scenario?

Response: The logic behind your estimation of 'probable real baseline concentration' is faulty because you do not consider dilution and sinks of phosphorus (see also response comments PacifiCorp 40 and PacifiCorp 66).

PacifiCorp 52: Page 2-42, Paragraph 2, Line 3. The Draft TMDL states "Accretion and depletion flows in Keno impoundment that were necessary for reproducing water surface elevations in the current condition

model were removed for the natural conditions model". Accretion and depletion (A/D) are surrogates for un-gauged flow that could come from agricultural returns, groundwater, spring flows, etc. The A/D coming from "natural" sources, such as groundwater and spring flows, should be retained in the model.

Response: The purpose of the natural condition baseline scenario was to provide a baseline to estimate the impact of different loading scenarios (not simply as a comparison to current condition). Keeping the hydrology consistent between these scenarios allowed us to focus on how pollutant loading to the system impacts water quality rather than how a change in hydrodynamics would impact water quality. We decided not to include the accretion / depletion flows of Keno Reservoir in these scenarios because of their potential to alter concentrations in the stream. These accretion / depletion flows are highly variable but their impact on the overall water balance is minimal. Because of this variability, they do not likely represent groundwater but more likely represent imperfectly measured boundary conditions.

PacifiCorp 53: Page 2-42, Paragraph 3, Line 2. The Draft TMDL states "The lower of the nitrogen or phosphorus 'limiting factors' is applied as a rate multiplier to limit maximum algal growth". There is no explanation of how the "limiting factors" are calculated, or how they relate to nutrient concentration. This must be provided to permit adequate evaluation of the validity of the "limiting factors".

Response: The document has been modified to include a reference to Appendix C which describes the water quality models used to calculate the limiting factors.

PacifiCorp 54: Page 2-42, Paragraph 3, Line 8. The Draft TMDL states "Springs with high natural phosphorus concentrations discharge into the Klamath River at this location" (i.e., below J.C. Boyle dam). In the absence of any data to the contrary, it seems reasonable to assume that the phosphorus concentration of the springs below J. C. Boyle dam of around 0.07 mg/L is representative of the natural groundwater of the area, and that this phosphorus concentration represents the natural baseline condition.

Response: Your logic is faulty because you ignore dilution and sinks of phosphorus. Additionally, the TMDL document presents evidence to the contrary.

PacifiCorp 55: Page 2-44, Table 2-8. "Loading capacity" and "current loading" for heat at Stateline differ by less than 1 percent. This difference is far less than the resolution of the models and should be considered negligible.

Response: We respectively disagree that the difference should be considered negligible.

PacifiCorp 56: Page 2-44, Paragraph 1, Lines 1-4. The Draft TMDL states: "A simplified loading capacity, current load and excess load was calculated from the flow and concentration for the year 2000 conditions at state line (Table 2-8). Since these pollutants are not conservative and the loading capacity varies longitudinally, the sum of the allocated loads may exceed the simplified loading capacity presented in Table 2- 8." Recognizing that the nutrient loading capacities in Table 2-8 are "simplified", it is still unclear why the loading capacities in Table 2-8 differ substantially from the sum of allocations in Tables 2-9 and 2-10. For example, the loading capacity listed in Table 2-8 for total P is 41 metric tons/year. By comparison, the sum of the allocations in Tables 2-9 and 2-10 for total P is about 165 lb/day, or about 27 metric tons/year. As another example, the loading capacity listed in Table 2-8 for total N is 520 metric tons/year. By comparison, the sum of the allocations in Tables 2-9 and 2-10 for total N is about 2,224 lb/day, or about 368 metric tons/year. The Draft TMDL needs to explain why the loading capacities in Table 2-8 are so much greater than the sum of allocations in Tables 2-9 and 2-10.

Response: Your calculation does not include the loading from Upper Klamath Lake under TMDL conditions, so your comparison is not accurate.

PacifiCorp 57: Page 2-44, Section 2.7.3. PacifiCorp does not agree that a load allocation is simply the amount of a pollutant that nonpoint sources may contribute without violating water quality standards. A

load allocation is an "attribution" of nonpoint and natural background source loadings based on DEQ's "best estimate" or prediction of the actual future loading from these sources. *See* 40 C.F.R. § 130.2(g). Nonpoint source load allocations generally should equal current loadings unless "nonpoint source pollution controls make more stringent load allocations practicable." *Id.*, § 130.2(i). A load allocation may not be arbitrarily set at whatever amount is needed to balance the TMDL equation; DEQ must have a reasonable basis for believing that the load allocation will actually be achieved within a reasonable time.

Response: Oregon's TMDL rule, 340-042-0040(h), states: "Load Allocations. This element determines the portions of the receiving water's loading capacity that are allocated to existing nonpoint sources of pollution or to background sources". The load allocations in the Draft TMDL are consistent this rule.

PacifiCorp 58: Page 2-45, Table 2-9. In Table 2-9, the Draft TMDL indicates that TMDL allocations would require about a 90 percent reduction in total P and BOD5, and about an 85 percent reduction in total N from Lost River Diversion and Klamath Straits Drain sources. These very large percent reductions indicate that the Draft TMDL's nutrient reduction goals are unrealistic and unachievable. The Draft TMDL's TP and TN concentration targets are so low, in fact, as to be substantially less than naturally-occurring groundwater concentrations that discharge to the Klamath River. The Draft TMDL must address in a realistic manner how these very large reductions of nutrient loads would be achieved. To PacifiCorp's knowledge, there have been no documented cases in which nutrient load reductions on such a large scale have been achieved elsewhere, or even determined to be feasible and achievable for planning and implementation purposes, particularly where nutrient sources are overwhelmingly nonpoint source-dominated, as in the case of the Klamath Basin.

Response: This TMDL meets the requirements of Oregon's TMDL rule and the Clean Water Act. Designated management agencies and sources will develop plans to reduce pollutants in their discharges and to meet their allocations.

PacifiCorp 59: Page 2-50, Figure 2-38. As mentioned above for Table 2-9, Figure 2-38 indicates that the Draft TMDL allocations seek about a 90 percent reduction in total P. As mentioned for Table 2-9, the Draft TMDL must address in a realistic manner how this very large reduction of total P loads would be realistically and feasibly achieved. If the proposed TMDL is unachievable, then either (1) the water quality criteria or "targets" on which the TMDL is based are unnecessary to protect beneficial uses, or (2) the beneficial uses are not attainable. In the former circumstance, the appropriate courses before establishing the TMDL are either to reconsider the water quality "targets" that interpret the water quality criteria or to adopt and obtain EPA approval of revised water quality criteria. In the latter circumstance, the appropriate course before establishing the TMDL is to conduct a UAA to specify the attainable beneficial uses.

Response: See response to "PacifiCorp 58". You do not present evidence that the TMDL is 'unachievable'. Site-specific criteria and UAA development are discussed in response to comment "PacifiCorp 4".

PacifiCorp 60: Page 2-50, Figure 2-38. This figure also suffers from the same defect as the others of its type in the TMDL – the sources and sinks do not balance, and there are large unaccounted for losses of phosphorus. Most notably, in the allocation scenario 16,061 kg of annual P load, equal to half the total load coming from Upper Klamath Lake, is not accounted for in the figure (i.e., 44,276 kg in [from Upper Klamath Lake and other sources] - 28,215 kg out [to Keno reach] = 16,061 kg lost). Such a significant loss of P should be noted and explained.

Response: The apparent difference in loading depicted in the vector diagram is due to loss through the in-stream process such as decay and settling as well as withdrawal.

PacifiCorp 61: Page 2-51, Last paragraph. The Draft TMDL states "Dams differ from the others [sic] sources described above. Rather than adding nutrients to the system, they alter the hydraulics which leads to a contribution to the impairments". The Draft TMDL should clarify that dam-altered hydraulics do not necessarily contribute to impairments, but can also improve conditions and lessen impairments.

Response: Already acknowledged in the Source Assessment, Section 2.6.5.

PacifiCorp 62: Page 2-57, Third paragraph, Lines 6-7. The Draft TMDL introduces "temperature offsets" as the surrogate measure for the amount of heat load attributed to the dams that needs to be offset (i.e., the amount of cooling of the river") to meet the instream temperature target. The Draft TMDL states that "the temperature offset (Toffset, °C) is derived from the predicted impact of the dams to the river with all other source allocations in place (Tdam impact, °C)" minus the 0.06°C "human use allowance" for the dams (HUAdam). Table 2-15 (page 2-59) of the Draft TMDL lists the temperature offsets for Keno reservoir (measured at the Keno dam "outfall") and J.C. Boyle reservoir (measured at Stateline).

Related to the temperature offsets for Keno reservoir reported in the Draft TMDL, PacifiCorp believes the Draft TMDL model has an important defect that affects Keno dam "outfall" temperature predictions. Model inspection by Watercourse Engineering has determined that questionable temperature simulation output was produced in the last segment of the model's computational grid for Keno reservoir. Predicted temperatures from this last segment were found to diverge sharply between model scenarios. This issue is discussed in greater detail in Attachment A of this document. Before the Draft TMDL's model results for this location are used to set allocations, this issue should be resolved.

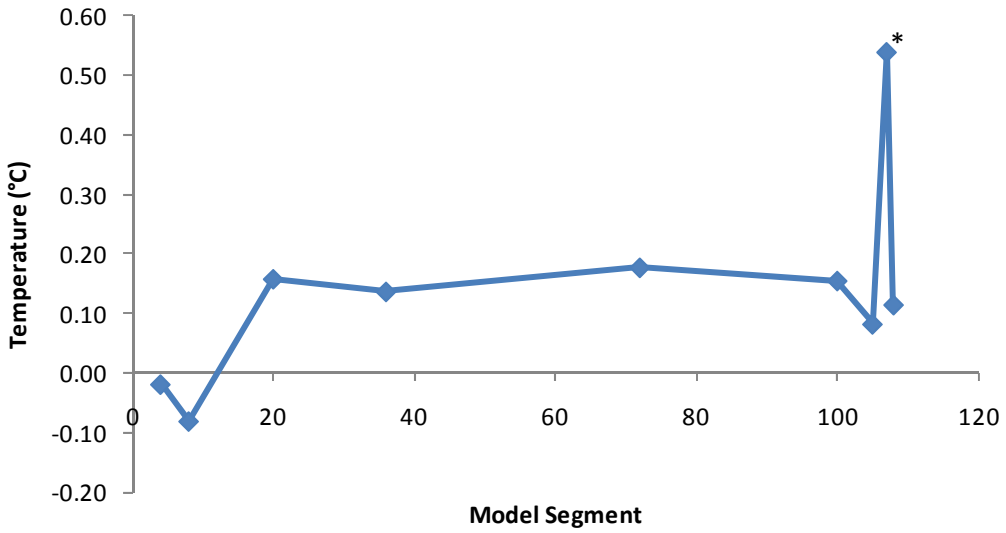
Response: DEQ examined your Attachment A and tested your hypothesis that the type of outlet designated in the model (i.e. weir or structure, point or line) caused sharply divergent results. DEQ compared what temperature allocations to Keno Dam would have been using a variety of outlet types to the Draft TMDL (see table below). Our analysis shows that the maximum change to allocations is 0.024 °C because of the Keno Dam representation. Therefore, DEQ concludes that the outlet structure type does not cause the temperature to 'diverge sharply between model scenarios'.

Table: Sensitivity of Keno Dam allocations to different representations of Keno Dam and Keno reef.

	Allocations without dam, Keno Reef representation	Allocations with dam, Keno Dam representation	Maximum change to allocations(°C)
Draft TMDL	Weir	Structure, layers 4 – 7, point	--
Test 1	Weir	Structure, layers 4 – 7, line (27 m)	-0.007
Test 2	Weir	Structure, layers 4 – 7, line (118 m)	-0.005
Test 3	Structure, layer 3, line (118 m)	Structure, layers 4 – 7, point	0.024
Test 4	Structure, layer 3, point	Structure, layers 4 – 7, point	0.024

DEQ calculated the predicted impact of Keno Dam at different locations within Keno impoundment (see figure below). In the draft TMDL, the segment just upstream of Keno Dam was used to compute the change in temperature caused by Keno Dam and hence the Keno Dam allocation (segment 107, indicated with an '*' in the figure below). The calculated impact at segment 107 appears to be anomalous and not representative of the temperature impact at other locations. Attachment A of the PacifiCorp comments states: "… the last segment should not be used in the allocation calculation, but rather the outflow from the dam that represents actual river release temperatures." DEQ decided that the suggested change to the compliance location is appropriate given that the allocations are meant to be protective of the 'cold water' reach downstream of Keno Dam and the outfall is a better representation of the impact at other locations in the impoundment. Allocations derived from results at the outfall of Keno Dam (as opposed to the segment just upstream of dam) do not appear to be affected by the issue raised in the comment (see figure below). The change in compliance location to the outlet of Keno Dam results in changes to Figure 2-44 and Table 2-12. The change does not impact downstream predictions.

Figure: Average of the monthly temperature changes caused by Keno Dam at various model segments. The mouth of Link River is at segment 0, Keno Dam is located at segment 107 and the outlet of Keno Dam is represented at segment 108.



While answering inquiries about the temperature allocations during the public comment period, DEQ discovered an error in the code used to analyze model result and develop temperature allocations for the dams. The error has been corrected. This change along with the change in the Keno dam compliance location have resulted in changes to Table 2-12, Figure 2-43, Figure 2-44, Figure 2-45 and Table 2-15. The correction resulted in greater temperature offset allocated to Keno Dam and JC Boyle Dam. However, the change of compliance location for Keno Dam decreased the temperature offset for Keno Dam. The correction of this error does not influence downstream predictions.
This comment raises the issue of the human use allowance and how it is allocated. One portion of the human use allowance is explicitly set aside as reserve capacity in the draft TMDL. A more nuanced approach is presented in the final TMDL which acknowledges the potential for the dissipation of heat from allocated sources increasing the reserve capacity for areas downstream of Keno Dam.

PacifiCorp 63: Page 2-57, Third paragraph, Lines 6-7, continued. The Draft TMDL indicates that the temperature offsets at Stateline are based on the difference between two modeled scenarios: (1) the Oregon Allocation Scenario (TOD2RN); and (2) the Oregon With-Dams TMDL Scenario (T4BSRN). The TOD2RN model scenario involved running the model with the following key assumptions: (1) no dams in place (except for Link dam); (2) upstream boundary conditions that assume full compliance with the Upper Klamath Lake TMDL; (3) existing flow quantities from the Lost River and Klamath Straits Drain flows but with the same temperature as the Upper Klamath Lake boundary condition; and (4) assigning natural or TMDL conditions for tributaries (which vary by tributary). The T4BSRN model scenario involved running the model with all dams in place. Otherwise, water quality inputs were based on the TOD2RN model scenario as described above. The Draft TMDL indicates that the objective of the T4BSRN model scenario simulation was to provide a means of estimating the effects of the dams and appropriate allocations. Model scenarios were performed using conditions for the year 2000 only.

PacifiCorp believes the Draft TMDL modeling to derive temperature offsets is incorrect in two fundamental ways. First, the calculated temperature offset at Stateline does not account for potential compliance at Keno dam. For example, if the temperature offsets at Keno dam are met, then the offset at Stateline would be lower. Second, temperature offsets at Stateline were based on incorrect applications of solar radiation in the modeling performed for the Draft TMDL. The Draft TMDL model runs included a major adjustment whereby modeled river reaches received only 80 percent of the available daily solar radiation, while the modeled J.C. Boyle reservoir reach received 100 percent of the available daily solar radiation.

As such, the TOD2RN model scenario, which does not include J.C. Boyle reservoir, is biased low and enlarges the difference between the TOD2RN and T4BSRN model runs (and, therefore, the corresponding computed temperature offsets). This solar radiation issue is discussed in greater detail in Attachment B of this document. Before the Draft TMDL's model results are used to derive temperature offsets, this issue should be corrected.

To assess the biases resulting from these two faults, PacifiCorp had Watercourse Engineering perform additional model simulation runs using the TMDL models to estimate Stateline offsets if: (1) temperature offsets at Keno dam are met; and (2) modeled river reaches receive 100 percent of the available daily solar radiation – the same percentage as the modeled J.C. Boyle reservoir reach receives. **Table 1** summarizes the temperature offsets from the Draft TMDL at Stateline and temperature reductions based on additional model simulations in comparison to the Draft TMDL's Stateline temperature offsets. The temperature reductions derived from the additional model simulations lower the offsets in the Draft TMDL, including some which would lead to negative offsets. Negative offsets indicate that the presence of J.C. Boyle reservoir results in water temperatures that are slightly cooler, not warmer, than hypothetical "without-dam" temperatures (based on the 7-day average of the daily maximum temperature or "7DADM"). In these instances, the instream temperature target is met under current conditions, and assignment of a temperature offset is not necessary.

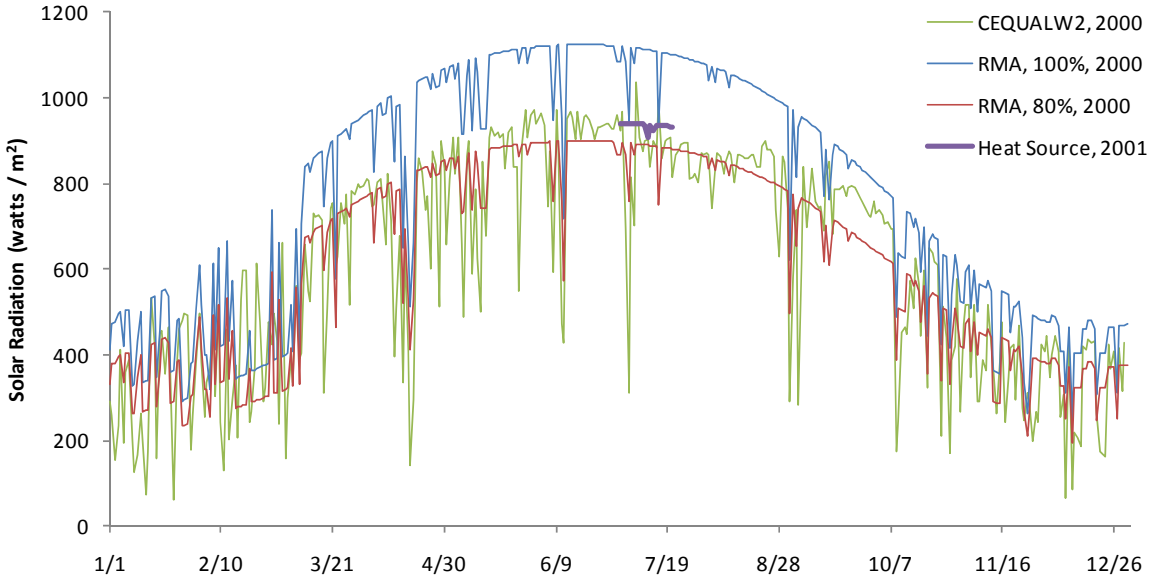
[Table 1 not included here]

Response: Your two issues are discussed below separately:

1. Temperature offset at stateline not accounting for potential compliance at Keno. We chose to combine the analysis of Keno and JC Boyle dams because they have the same owner and believe it is a valid allocation methodology. Separating the allocations would require assumptions about reservoir operations under a different hydrologic regime, adding uncertainty to the allocation.

2. Temperature offsets at Stateline were based on incorrect applications of solar radiation. Thank you for the analysis and the information provided in Attachment B. However, contrary to your suppositions, the solar radiation DEQ used in the different scenarios is in much closer agreement than the scenario you proposed (i.e. using 100% of the RMA predicted solar radiation) (Figure below). Additionally, DEQ's solar radiation inputs are in closer agreement with predictions from Heat Source at the mouth of Spencer Creek which was presented in Chapter 4 of the draft TMDL. Given the history of using CEQUALW2 and Heat Source for temperature TMDLs in Oregon, DEQ has more confidence in their solar radiation predictions than RMA without adjustments. Therefore, it appears that is your analysis which is biased rather than the draft TMDL. The comparison of measured temperatures to model results shows the model is appropriately calibrated and can be used to derive allocations (see Appendix C of the TMDL).

Figure. Daily maximum solar radiation predictions at JC Boyle reservoir using CEQUALW2 (with dam TMDL scenarios), RMA 80% (no dam TMDL scenarios), RMA 100% (proposed PacifiCorp) and Heat Source (Spencer Creek at mouth).



PacifiCorp 64: Page 2-57, Last paragraph, Line 2. The Draft TMDL states "Both Keno Dam and JC Boyle Dam increase the river temperature during the summer (Figure 2-44 and Figure 2-45)". It is incorrect for the Draft TMDL to conclude that Keno dam and J.C. Boyle dam increase water temperatures during the summer. As explained in the previous comment, the model results showing predicted 7DADM water temperatures for "with-dams" and "without-dams" scenarios are incorrect. For example, Figures 2-44 and 2-45 show that the 7DADM temperatures are slightly higher under the "with-dams" scenario, which obviously is the basis for the Draft TMDL's incorrect conclusion that "Keno Dam and JC Boyle Dam increase the river temperature during the summer". However, because the reservoirs' water volumes have a moderating effect on diurnal water temperature fluctuations, the model results should show that the 7DADM temperatures are slightly higher under the "without-dams" scenario. PacifiCorp's water temperature modeling conducted in support of the FERC relicensing process demonstrated this reservoir-related moderating influence, consistently showing that the 7DADM temperatures during summer at Project dam locations are lower under "with-dams" scenarios (see PacifiCorp 2004). As explained in the previous comment, the Draft TMDL's incorrect conclusion on this matter would be changed, and more in line with PacifiCorp's previous water temperature modeling, if the 80% versus 100% difference in solar radiation between river and reservoir reaches in the Draft TMDL model was corrected.

Response: Please see response to "PacifiCorp 62" regarding the "80% versus 100%". It would appear that PacifiCorp modeling for the FERC relicensing might be biased if it uses the same assumptions as your above comment. The draft TMDL discusses the impact of reservoirs on river temperature, especially downstream of the dam and presents clear evidence of the warming that is caused by the reservoirs.

PacifiCorp 65: Page 2-59, Paragraph 2, Lines 5-10. The Draft TMDL states:
"Achieving these instream targets does not determine compliance with allocations but is an example of one set of conditions which achieved water standards. The instream water quality targets are dependent on conditions from Upper Klamath Lake. As described previously, a range of conditions is expected from Upper Klamath Lake after achieving the TMDL targets. These targets likely represent the best conditions that could be expected in the Klamath River. Given the natural variability of the system, there will be some years when these targets will not be achieved but sources could be in compliance with their allocations

and water quality standards will be achieved. The significant change in concentration at river mile 220 is due to the springs discharging into the Klamath River at naturally high phosphorus concentrations."

By these statements, the Draft TMDL makes the important points that: (1) upstream Upper Klamath Lake conditions are the key drivers of water quality conditions in the Klamath River and hold the ultimate solution for Klamath River TMDL compliance; (2) there will be years when compliance with water quality standards will not be achieved even with TMDL allocations compliance; and (3) natural groundwater inflow to the Klamath of phosphorus is already naturally high in phosphorus. These statements suggest DEQ recognizes that the Draft TMDL is not achievable. As previously discussed in these comments, if the proposed TMDL is unachievable, then either (1) the water quality criteria or "targets" on which the TMDL is based are unnecessary to protect beneficial uses, or (2) the beneficial uses are not attainable. In the former circumstance, the appropriate courses before establishing the TMDL are either to reconsider the water quality "targets" that interpret the water quality criteria or to adopt and obtain EPA approval of revised water quality criteria. In the latter circumstance, the appropriate course before establishing the TMDL is to conduct a UAA to specify the attainable beneficial uses.

Response: You are incorrect that "water quality standards will not be achieved even with TMDL allocations compliance". For this TMDL, the water quality standard is based on a natural condition which is predicted to vary from year to year. Our analysis shows allocations will achieve that natural condition criteria, and thus, water quality standards. See previous responses to comments.

PacifiCorp 66: Page 2-60, Figure 2-46, Top plot of the figure. This plot indicates that total phosphorus "compliant conditions" would need to be substantially below current conditions (i.e., 87% less as shown in Table 2-8), especially at Stateline (RM 207) after the large natural springs of around 220 cfs enter the river (in the J.C. Boyle bypass reach). The Draft TMDL should justify and document how the concentration of total phosphorus in the river could be less than 0.027 mg/L after a significant influx of natural groundwater at a concentration of 0.07 mg/L.

Response: Dilution.

PacifiCorp 67: Page 2-60, Figure 2-46, Middle plot of the figure. This plot indicates that orthophosphate (PO4) "compliant conditions" would be set at 20 percent or less of total phosphorus. However, in more than 1500 samples collected from the Klamath River in the last 10 years, PO4 has averaged nearly 80 percent of total phosphorus. Therefore, it is unrealistic and impractical for the Draft TMDL to set PO4 to 20 percent or less of total phosphorus.

Response: This figure reflects model predictions of a restored river and was not "set" at a certain percent.

PacifiCorp 68: Page 2-61, Section 2.8.1 *Uncertainty Analysis*. The uncertainties highlighted in this section should be quantified with an uncertainty analysis. Instead, there is simply a blanket statement about uncertainty analysis. The Environmental Fluid Dynamics Code (EFDC) is discussed herein, but not included in Oregon river reaches.

Response: The uncertainty analysis is appropriate, similar to other TMDL analyses and meets TMDL requirements. The reference to EFDC is appropriate given the joint effort with the North Coast Regional Water Quality Control Board.

PacifiCorp 69: Page 2-62, First paragraph, Lines 10-12, under section *Model Input Uncertainty*. The Draft TMDL states: "Given the dominance of Upper Klamath Lake outlet conditions on the Klamath River in Oregon and the uncertainty associated with this boundary condition, DEQ concludes that this is the largest source of uncertainty in regard to the current model representation". As stated above in previous comments, the Draft TMDL makes the important points that upstream Upper Klamath Lake conditions are the key drivers of water quality conditions in the Klamath River and hold substantial uncertainty for Klamath River TMDL compliance. If the proposed TMDL is unachievable, then either (1) the water quality criteria or "targets" on which the TMDL is based are unnecessary to protect beneficial uses, or (2) the

beneficial uses are not attainable. In the former circumstance, the appropriate courses before establishing the TMDL are either to reconsider the water quality "targets" that interpret the water quality criteria or to adopt and obtain EPA approval of revised water quality criteria. In the latter circumstance, the appropriate course before establishing the TMDL is to conduct a UAA to specify the attainable beneficial uses.

Response: Uncertainty was appropriately discussed and used to inform the margin of safety. See also response to "PacifiCorp 59" and "PacifiCorp 4".

PacifiCorp 70: Page 2-63 and 2-64, Section 2.8.2 *Conservative Assumptions*. The "conservative assumptions" discussed in this section emphasize the fact that Klamath River water quality dynamics are complex, and vary considerably in space and time. Even though the numerical model included a wide range of parameters, constants, and coefficients, the model does not include all relevant processes. For example, the model has the following limitations affecting uncertainty:

- The model includes only a single algae group for J.C. Boyle reservoir,
- The model includes only a simple sediment model in both the river and reservoirs,
- The model includes incorrect partitioning of organic matter at Link dam,
- The two-group algae model for Keno reservoir is completely untested and parameter values have no basis,
- A 20 percent global reduction in solar radiation has been applied to all riverine reaches even though this proposed reduction only was applicable to a single location above Copco reservoir.
- The available data for modeling are limited in winter throughout the system, and
- Only a single year is modeled for the analysis (the validation period using 2002 data does not appear to have been used to assess improved model performance due to the many late changes in the code – rather the modeling appendix seems to simply have been updated with new figures and no interpretation of the most recent runs is included).

Response: All water quality models have limitations and uncertainty. The TMDL is based on the best available data, methodology and tools. Previous responses and TMDL documentation address the above bullets and are not reproduced here because the comment neither points out errors to the TMDL nor suggests changes to the document.

Specific Comments: Chapter 4. Draft Upper Klamath River and Lost River Subbasins Tributary Temperature TMDL

PacifiCorp 71: Page 4-8, Table 4-2. The Table identifies "flow modification that affects natural thermal regimes" as a "pollutant" under OAR 340-042-0040(4)(b). Pollutants under the TMDL program are limited to substances or heat added to waterbodies. *See* OAR 340-042-0030(8); 33 U.S.C. § 1362(6). A "flow modification" is not a pollutant because it does not itself add any pollutant, including heat or solar radiation, to a waterbody.

Response: The table has been updated to include the following verbiage: "and other factors contributing to impairment".

PacifiCorp 72: Page 4-9, under section *Salmonid Stream Temperature Requirements*. In this section, the Draft TMDL briefly describes water temperature ranges and thresholds generally related to effects on cold water fish (i.e., salmonids). For example, in Table 4-3, the Draft TMDL lists a "sub-lethal limit" of 20ºC to 23 ºC with a "Time to Death" of "Weeks to Months" (which is incorrectly translated as 64º to 74ºF.). DEQ needs to provide important additional information or clarifications to the information presented in this section, including:

1. Clarify if and how the specified "Temperature Ranges" apply to actual field conditions (rather than a controlled laboratory research setting) where water temperatures fluctuate throughout the day from diurnal changes in solar radiation, and from day-to-day or week to- week due to changes in weather and seasonal meteorological conditions. For example, research indicates that tolerance limits for trout for the maximum daily mean

temperature and maximum daily maximum temperature varies as a function of daily temperature range and length of exposure (e.g., Wehrly et al. 2007).

2. Clarify what temperature metric is being referred to in the specified "Temperature Ranges", and if and how that metric applies to the 7-day average of the maximum daily temperature (7DADM) that the Oregon temperature standard is based on.

3. Clarify if and how the specified "Temperature Ranges" should differ if applied to redband trout (as introduced in Section 1.3.8.2 of the Draft TMDL), a species that research indicates has a higher thermal tolerance than other salmonids (e.g., Cassinelli and Moffitt 2010, Rodnick et al. 2004).

4. Describe why this section on temperature requirements for cold water fish is provided in this chapter, but not in Chapter 2, which contains the Klamath River temperature TMDL.

Response: The section "Salmonid Stream Temperature Requirements" is background information and was not repeated in Chapter 2. This background information does not impact load allocations. For comprehensive literature reviews about modes of thermally induced fish mortality, please see *Scientific Issues Relating to Temperature Criteria for Salmon, Trout, and Char Native to the Pacific Northwest: Technical Synthesis (Water Temperature Criteria Technical Workgroup, 2001), Summary of Technical Literature Examining the Physiological Effects of Temperature on Salmonids: Issue Paper 5 (McCullough, D., Spalding, S., Sturdevant, D., Hicks, M. 2001), 1992 – 1994 Water Quality Standards Review: Temperature Final Issue Paper (Department of Environmental Quality, 1995)*. EPA's Issue Paper 5 states "Although these multiple effects [from actual field conditions] constitute the realism that ecologists are interested in, the best chance of adequately understanding these effects is to study them in controlled laboratory tests and then compare predictions from laboratory experience with field data." (p 20). DEQ's Final Issue Paper states "However, it is our belief that until more information becomes available, it is inappropriate at this time to try to develop stock-specific temperature standards." (p 2-4). The mathematical conversion was corrected.

PacifiCorp 73: Page 4-25, Paragraph 1. The Draft TMDL indicates that the Heat Source Model was used to simulate temperatures for the Draft TMDL's analysis of Jenny Creek (along with Spencer Creek and Miller Creek). Based on information presented in Appendix A of the Draft TMDL and the Heat Source Model spreadsheet, PacifiCorp notes the following issues with Heat Source Model assumptions:

- The Draft TMDL indicates that stream velocities and depths calculated by Heat Source for the "natural" flow conditions were based on measured channel dimensions and substrate composition. Please specify the source of the measured channel dimensions and substrate composition for Jenny Creek.

  Response: The text has been modified so DEQ model scenarios consistently refer to "natural" flow conditions as "system potential flow" conditions. The text continues to refer to OWRD's estimates of natural flow as "natural". For the "system potential flow" model scenario, channel dimensions and substrate composition were not changed from the "current calibrated conditions" model scenario. Text has been clarified.

- The Draft TMDL indicates that "the uncertainty related to allocations is accounted for in the Margin of Safety". However, Heat Source Model uncertainty is not quantified or discussed for these simulations.

  Response: Text has been added to Appendix A to refer the reader to Chapter 4.4.10 "Margins of Safety".

- The Draft TMDL indicates that channel geometry and dimensions in the Heat Source Model were determined through model calibration. Channel geometry is not a normal calibration parameter.

Accurate channel geometry is crucial for simulated temperature under different flow conditions, and should be based on empirical data and information.

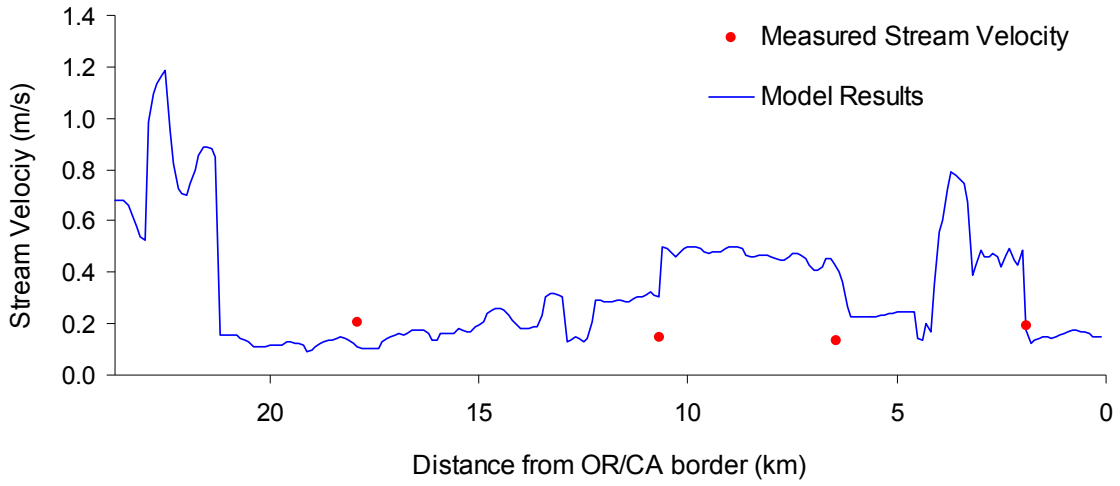
Response: Empirical data were used where available.

- The Draft TMDL indicates that "Manning's n" values were iteratively altered so that Heat Source Model temperatures approximately reproduced measured temperatures. However, the model's assumed Manning's N values of 0.1 to 0.5 are inconsistent with field values reported in the literature. It appears that the Heat Source Model's Manning's n values were altered to make up for the model's lack of hydraulic capabilities, wherein travel times can only be attained through erroneously high roughness values. It also appears that the Manning's n values were altered to modify depth and create a uniform width-to-depth ratio, which is constant for over 90 percent of the stream at a ratio of approximately 8. Such constant ratios are not typical of streams like Jenny Creek with variable longitudinal velocity regimes.

  Response: Heat Source consistently requires Manning's n values greater than reported in the literature to reproduce wetted width, wetted depth and velocity. We regard the Manning's n value more as an effective roughness coefficient which also accounts for other energy losses such as channel geometry and complex flow structures. The width-to-depth ratios are the average values from Level I Rosgen stream types as described in *Analytical Methods for Dynamic Open Channel Heat and Mass Transfer: Methodology for Heat Source Model Version 7.0* (Boyd and Kasper 2003). Depth values were calculated from measured active channel widths and average width-to-depth values.

- The Heat Source Model's simulated velocity results are not presented in the Draft TMDL. Modeled velocities show longitudinal variation that is based only on manufactured or "calibrated" cross sections and may not realistically represent actual physical conditions.

  Response: The graph below showing the longitudinal profile of stream velocity with sampled data was added to Appendix A as Figure A15.



PacifiCorp 74: Page 4-28, Paragraph 2, Lines 3-5. The Draft TMDL states "The impact from the Fall Creek Hydroelectric Project can be quantified and may not produce a cumulative impact to Jenny and Spring Creeks greater than 0.1ºC above the applicable criteria". PacifiCorp's only activity with respect to Jenny Creek and Spring Creek is to divert water from Spring Creek (which flows into Jenny Creek) to PacifiCorp's Fall Creek Project in California. This activity may not be regulated under a TMDL because it

does not add any thermal or other load to Spring or Jenny Creek. No heat is added to the creeks, and the diversion does not increase solar radiation to the creeks.
Although the diversion may affect the temperatures of the creeks (*e.g.*, by reducing flow and volume), this is not a thermal load to which a TMDL may be addressed. *See* 33 U.S.C. § 1313(d)(1)(D); 40 C.F.R. 130.2(e)(defining "load" or "loading" as "[a]n amount of matter or thermal energy that is introduced into a receiving water"); OAR 340-042-0040(4)(d), (e), (h).

Response: DEQ does not regulate water withdrawals as part of TMDLs. DEQ does take into account the effect that these diversions have on water quality. As part of determining the Natural Thermal Potential of a given waterbody, we commonly mathematically add the diverted water back into the river to estimate the relative effect having less water in the stream has on water temperature.

Thermal load allocations have been issued in TMDL orders from DEQ to designated management agencies whose activities cause a violation of a water quality standard. Though some of these activities involve withdrawing water from a waterbody, the allocations do not state or assume that the DMA must cease withdrawing water, or any other activity in order to meet the allocation, and the water quality standard. The allocation is a portion of the allowable pollutant load for the entire waterbody that the DMA is allowed for their operations. How they make their operations consistent with the allocation is to be established later through the planning process provided through an associated Water Quality Management Plan issued along with each TMDL order.

PacifiCorp 75: Page 4-28, Paragraph 2, Lines 3-5, continued. The Draft TMDL should recognize that water from Spring Creek that is diverted to Fall Creek for use in the Fall Creek Hydroelectric development contributes to water availability for the City of Yreka's water supply. An assessment should be performed to determine if ceasing diversions from Spring Creek in to Fall Creek would adversely impact the City of Yreka's water supply.

Response: This TMDL is not required to provide a hydrologic assessment for the City of Yreka.

PacifiCorp 76: Page 4-28, Paragraph 2, Lines 3-5, continued. The Draft TMDL identifies a 0.1ºC temperature allowance for the Fall Creek Project's diversion from Spring Creek when Spring Creek or Jenny Creek exceeds the 20ºC criterion.

Response: As specified in Chapter 4.4.7.1, the impact from the Fall Creek Hydroelectric Project must not produce a cumulative thermal impact to Jenny or Spring Creeks greater than 0.1*C above the applicable temperature criteria.

PacifiCorp 77: Page 4-28, Paragraph 2, Lines 3-5, continued. Because Spring Creek is spring-fed, it does not exceed the criterion, regardless whether the project is diverting water from it.

Response: The data have not been provided to evaluate this statement.

PacifiCorp 78: Page 4-28, Paragraph 2, Lines 3-5, continued. Jenny Creek does exceed the criterion, but only within a period of a few weeks during the late summer. Year-round data for Jenny Creek immediately below the mouth of Spring Creek is not available, but temperature data at Jenny Creek above Iron Gate reservoir (in California) is available. This site differs from Jenny Creek in the vicinity of the PacifiCorp diversion in that it has a lower elevation, different flow conditions, varying channel form, and different topographic and riparian shading. Nonetheless, the data clearly indicates that water temperatures exceed the 20ºC criteria only seasonally, generally in July and August, as shown by the 7-day average of the daily maximum water temperatures (Figure 10 [not included here]).

Response: Figure 4-6 shows Jenny Creek below Oregon Gulch exceeding the 20*C biobased criterion from late May to early September of 2001. Nonetheless, the Fall Creek Hydroelectric Project is named as a DMA and has responsibilities to fulfill as part of the TMDL. The temperature TMDLs in this chapter apply year round.

Specific Comments: Chapter 5. Draft Upper Klamath and Lost River Subbasins Water Quality Management Plan

PacifiCorp 79: Page 5-3, Paragraph 1; Page 5-18, Last Paragraph. The Draft TMDL states: "TMDL Implementation Plans are source-specific plans developed and implemented by Designated Management Agencies (DMAs) and designated nonpoint sources. A DMA is "a federal, state, or local governmental agency that has legal authority of a sector or source contributing pollutants, and is identified as such by the Department of Environmental Quality in a TMDL" (Oregon Administrative Rules [OAR] 340-042- 0030(2)). PacifiCorp, a non governmental entity, is a designated source responsible for a source-specific implementation plan. The TMDL Implementation Plans, due 18 months after DEQ issues the TMDL, are expected to fully describe the efforts of (DMAs to achieve their applicable TMDL allocations." PacifiCorp will submit a TMDL Implementation Plan to DEQ in accordance with Section 6.3.2 of the Klamath Hydroelectric Settlement Agreement (KHSA). The TMDL implementation plan provisions of the KHSA govern this issue in lieu of OAR chapter 340, division 042, which is preempted by the Federal Power Act.

Response: PacifiCorp is a designated source and is required to submit a TMDL implementation plan. The text was revised to clarify this designation. Consistent with the Clean Water Act, state law, and the Klamath Hydroelectric Settlement Agreement, DEQ expects PacifiCorp to submit its TMDL implementation plan within 60 days after DEQ's approval of the Klamath TMDL.

PacifiCorp 80: Page 5-4, Fourth bullet on page. The Draft TMDL states that DEQ, the North Coast Regional Water Quality Control Board (Regional Board), and Environmental Protection Agency (EPA) Regions 9 and 10 have developed a Memorandum of Agreement that establishes a framework for joint implementation of the Klamath River and Lost River TMDLs. The fourth bullet on page 5-4 describes one of the MOA "commitments" to "Explore engineered treatment options such as treatment wetlands, algae harvesting, and package wastewater treatment systems to reduce nutrient loads to the Klamath River and encourage implementation of these options where feasible". This is the only statement in the Draft TMDL that refers to such water quality treatment options and technologies. PacifiCorp recognizes that the Draft TMDL may not be the appropriate process or document for providing detailed assessment of implementation options and technologies. However, the Draft TMDL needs to provide additional details on the types and examples of treatment options (including treatment wetlands, algae harvesting, and package wastewater treatment systems) that are envisioned by this bulleted statement. These additional details are essential in providing the reader of the Draft TMDL with a context for what DEQ would consider as realistic and feasible methods for the very large reductions in nutrients and organic matter that the TMDL will require. Page 5-17, Last sentence on the page. The Draft TMDL states "DEQ encourages USBR to pursue innovative changes to project operations including reduction of discharge to the Klamath River from Lost River Diversion Channel (LRDC) to address their combined pollutant load reductions for Klamath Straits Drain and LRDC". The Draft TMDL needs to provide additional details on the types and examples of "innovative changes to project operations" that are envisioned by this statement. These additional details are essential in providing the reader of the Draft TMDL with a context for what DEQ would consider as "innovative changes to project operations" that would be realistic and feasible for the very large load reductions from Klamath Straits Drain and LRDC that the TMDL will require.

Response: The Department expects the DMAs and designated sources to submit detailed description of actions to address their respective allocations. The WQMP follows DEQ policy is not prescriptive and does not present an economic analysis of implementation strategies. Consideration of economic constraints maybe considered by the DMAs and designated sources when preparing their implementation plans.

PacifiCorp 81: Page 5-27, Paragraph 5, Lines 1-4. The Draft TMDL states: "DEQ and California Regional Water Board staff in coordination with US EPA, and PacifiCorp, have begun developing a Klamath River basin water quality improvement accounting and tracking program . This program will provide a record of

individual actions and, perhaps, the basis for a market that facilitates a higher level of activity and collaboration than could be achieved by a regulatory approach alone."

Response: No response necessary.

Specific Comments: Appendices, Appendix C: Klamath River Model for TMDL Development

PacifiCorp 82: Appendix C, Page 8, Section 2.2.2. Given the data provided, the value of this "two-state algae transformation" modification is questionable. As communicated to the CA TMDL development team by Watercourse Engineering, the concept that low dissolved oxygen can have an impact on algae physiology is of scientific interest, but is unsupported by laboratory or field research. Watercourse incorporated a simple version of this concept and abandoned this modification until further sufficient research could be completed to determine if such an approach is not only correct, but if a two-state representation was appropriate. The assumption and application of an experimental anoxia related algae mortality model has little support in a technical analysis for regulation such as this TMDL. The model must first be tested, reviewed, and found acceptable. As presented in the TMDL, results indicate that this untested modification does not improve the simulation of algae concentrations. A very limited number of data (3) seem to be the basis for this two- algae modification (please see discussion of Figure 2-1, below), and the data do not really support the scheme. The calibration plots for Miller Island and Hwy 66 in 2000, Figures E-6 and E-16, respectively show the two-algae model may "improve" results, but it still does not nearly match measured data at Keno Bridge in 2000. These plots suggest that just about any function that reduces algae concentrations from Miller Island to Hwy 66 would work just as well. Furthermore, it doesn't appear as if this "phenomenon," which refers to the sharp reduction in algae concentrations between Miller Island and Keno Bridge in 2000, exists in the 2002 "validation" data. In 2002, between the same two sites, there is no large drop in chlorophyll *a* concentrations, and the healthy-unhealthy hypothesis does not fit. At the very least, the TMDL should discuss the 2002 data that were used in "validation". At the same time, model calibration results and monitoring data indicate that the model failed to pick up the reduction in algae from South Side Bypass Bridge to Miller Island in 2002 (Appendix C, Figure E-31 and E- 51). Peak chlorophyll *a* concentrations went from approximately 110 mg/L to 60 mg/L in the measured data, but the simulated peaks were at around 200 mg/L at both locations.

Response: The concept of anoxia-related algae mortality was initially communicated to the TMDL development team by PacifiCorp's consultant Watercourse Engineering. Previously, Dr. Michael Deas had extensive communications with algae experts across the world about possible impacts of low DO on algae mortality. Dr. Deas indicated that although there was no direct evidence from laboratory research, it is likely that low DO can have a negative impact on algae physiology. Dr. Deas mentioned that his group tried to modify the algae mortality and growth rate in association with DO concentration, however, the effort was not successful because the simple DO-algae parameter relationship they implemented could not address the exposure time of algae to low DO (which is essentially a Langrangian process).

To overcome this technical limitation, the TMDL development team formulated a two-state algae transformation algorithm to approximate the Langrangian process within the Eulerian CE-QUAL-W2 system. With this new algorithm, the model was able to significantly improve the spatial representation of chlorophyll-a concentrations from upstream to downstream stations in Lake Ewauna over the previous model. The model was tested for both 2000 and 2002 against extensive data, and it was able to successfully reproduce the observed patterns for both years (without parameter adjustment). This suggested that the algorithm reasonably represents the observed phenomenon. Should a more detailed, local scientific investigation be conducted and yield different conclusions, the model could be updated.

The comment suggesting that no large drop in chlorophyll a concentrations occurred in 2002 is incorrect. The Klamath River Model for TMDL Development Report Appendix E presents model calibration results (and monitoring data) for 2002 and clearly demonstrates a reduction in chlorophyll a concentrations between Lake Ewauna – South Side Bypass Bridge and Miller Island. Indeed the highest measured

concentrations are reduced approximately 50% over this short distance. These data further bolster the approach implemented by the TMDL development team.

PacifiCorp 83: Appendix C, Page 8, Paragraph 3, last line. Many things can affect algal growth, and thus it is difficult to accept the statement in the Oregon Draft TMDL that "available data show no other explanation for the observed phenomenon." The "observed phenomenon" is not explained.

Response: The observed phenomenon refers to the sudden decrease in algae over a short distance and within a short period of time (i.e., what is described two paragraphs prior to the statement referred to by the commenter). Also refer to response comment PacifiCorp 82.

PacifiCorp 84: Appendix C, Page 9, Figure 2-1. There are three chlorophyll *a* concentrations above 50 g/L at Miller Island, as shown in this figure. Are these three data points representative of chlorophyll *a* at those times and in that location? These three data appear to be the basis of the entire healthy-unhealthy algae hypothesis and implementation. The eleven (11) other concentrations reported at Miller Island are all below 50 µg/L – similar in magnitude to chlorophyll *a* concentrations at Hwy 66. How does this low dissolved oxygen argument explain these data? The "two-state algae transformation" model used in the TMDL is unsupported and should be removed from the analysis until it can be independently tested, reviewed, and accepted as a viable approach.

Response: Refer to responses comments PacifiCorp 82 and PacifiCorp 83. Also, the high chlorophyll-a concentrations called into question by the commenter (observed at Miller Island) coincide with high concentrations in Upper Klamath Lake near Link Dam. Thus, they are assumed to be real. No other information is available to indicate otherwise. As the response to comment PacifiCorp 82 notes, the observed phenomenon also occurs in 2002.

Also, on the contrary, chlorophyll a concentrations are not uniformly lower at Hwy 66 than at Miller Island. This is clear from the plots in Appendix E (E-6 and E-16). There are multiple occasions where concentrations are nearly the same or higher at Hwy 66 than at Miller Island. The commenter also noted that chlorophyll a was low at Hwy 66 during May while DO was high but failed to mention that chlorophyll a was also low at Miller Island during the same period (due mainly to the upstream boundary condition). Thus, the implication that the data contradict the phenomenon or approach is unjustified. The TMDL development team calibrated and corroborated the model for separate years and reasonably reproduced observed concentrations with the model. A sensitivity analysis was also conducted during the calibration process that compared results of the two-algae state transformation algorithm to the existing model algorithm. The results indicated that the existing algorithm is incapable of reproducing the observed spatial variability.

PacifiCorp 85: Appendix C, Page 10, Equation 3. This equation is not a "Monod-type function" in the rigorous sense.

Response: This equation is not referred to as a Monod-type function on Page 10.

PacifiCorp 86: Appendix C, Page 11, Last paragraph. "A Monod-type continuous SOD and OM decay formulation was thus incorporated into the CE-QUAL-W2 code to represent a smoother transition of SOD and OM decay effects when DO is low." (Emphasis added) "Smoother" is a vague and unquantifiable term. The modification to make the model results "smoother" does not necessarily improve the model.

Response: The modification implemented is a more reasonable approximation of natural processes and thus improves the model. With the current model (prior to the modification), unrealistic results are produced where the "cut-off" is set for SOD. For example, the model may simulate that SOD is present when DO is 0.1 mg/L, however SOD is absent when DO is 0.099 mg/L. This is an oversimplification of reality and not substantiated by data. As such, the TMDL development team chose to improve representation in the model.

The modification does not have a significant impact on the model results, however it was deemed more appropriate to represent the process using a smooth transition rather than an abrupt change. Since sediment oxygen demand is essentially a diffusive process which relies on the DO gradient at the water-sediment interface, it is more reasonable to represent it as a smooth transitional process with regard to DO rather than an abrupt on-and-off process.

PacifiCorp 87: Appendix C, Page 12, Section 2.2.4. Watercourse ran into some problems using the pH modifications. The numerical technique is not robust and can lead to errors under certain simulation conditions.

Response: The pH modifications never caused a problem in the numerous scenario analyses conducted during TMDL development.

PacifiCorp 88: Appendix C, Page 12, Paragraph 3, Equation (Ke). In this formula, it is unclear if the OM term refers to particulate or dissolved or both (i.e., total). The form of OM will affect light extinction differently, and so an equation involving particulate OM may not apply to a system consisting of mostly dissolved OM, and vice versa.

Response: The RMA-11 model represents only one lumped OM constituent (in the code modified by Watercourse Engineering). Therefore it represents both particulate and dissolved, and labile as well as refractory.

PacifiCorp 89: Appendix C, Page 13, Paragraph 2, Lines 13-19. The Oregon Draft TMDL needs to clarify that the numbers given here are just an example and not values fixed for all simulations.

Response: The numbers provided were those used in the original PacifiCorp model. For the TMDL model, dynamic partitioning was used to refine the representation. Therefore the numbers were not fixed for all simulations.

PacifiCorp 90: Appendix C, Page 13, Paragraph 2, Line 19. "… values demonstrate that the fraction of dissolved OM increases with downstream distance, while the fraction of particulate OM decreases (because of the effect of settling)."(Emphasis added) Both settling and decomposition affect the OM fractions.

Response: Correct. This is why dynamic partitioning was used instead of static partitioning.

PacifiCorp 91: Appendix C, Page 21, Paragraph 4, Lines 6-8. "Considering the significant inter-year variability in water quality in Upper Klamath Lake, it is preferable to use data collected during the modeling year rather than other years to represent the external forces at boundaries." Sometimes, "it is preferable to use data collected during the modeling year", but only if the site is representative of boundary conditions.

Response: Comment noted.

PacifiCorp 92: Appendix C, Page 21 to 22, Paragraphs 1-4 of Section 2.3.3.1. Phosphorus data used to formulate the Link Dam boundary conditions appear to come from Pelican Island, Fremont Bridge, and Miller Island, but the documentation is unclear which site is used during any particular period. Given that Miller Island is several miles downstream of Link Dam, this point is important in interpreting TMDL assumptions and appropriateness of data used in the analysis.

Response: Application of data from multiple locations was deemed the most appropriate way to construct a reasonable boundary condition for Upper Klamath Lake. Conditions at Upper Klamath Lake are highly dynamic and are very important to accurately simulate conditions downstream. Therefore, a lot of attention was given to developing the most accurate and representative dataset for the calibration period. Data were insufficient at any one location to characterize conditions.

PacifiCorp 93: Appendix C, Page 22, Paragraph 2. Boundary condition PO4 concentration is used as a calibration parameter, i.e., this concentration is modified to fit downstream observations. This is not standard practice and can invalidate the calibration process. Appendix C,

Response: On the contrary, it is not rare to indirectly derive boundary condition data from observed data (when there is a strong relationship between the data). This has been documented in peer-reviewed literature (e.g., Zou et al, 2007: An adaptive neural network embedded genetic algorithm approach for inverse water quality modeling, Water Resources Research, Vol. 43, W08427, doi: 10.1029/2006WR005158).

PacifiCorp 94: Page 22, Paragraph 3. The PO4 boundary condition is from Miller Island. But PO4 and TP used in the OM boundary condition are from Pelican Marina. This is inconsistent and poor modeling practice.

Response: Refer to response for comment PacifiCorp 92. Additionally, through model sensitivity analysis conducted during model calibration, it was found that the Miller Island PO4 data were a better approximation of the upstream boundary condition than the data at Pelican Marina. OM data from Pelican Marina, however, were deemed sufficient and appropriate. This combination of data sources may seem unconventional, however, since data were not available at the actual boundary condition location, all potential data were considered and evaluated to create the most appropriate dataset.

PacifiCorp 95: Appendix C, Page 22, Paragraph 4. Boundary condition total inorganic carbon (TIC) and alkalinity concentrations are used as calibration parameter to match pH in Lake Ewauna. This is not standard practice and can invalidate the calibration process.

Response: The alkalinity boundary condition was configured based on a composite dataset. Only TIC was derived through the calibration process. Refer to response to comment PacifiCorp 93.

PacifiCorp 96: Appendix C, Page 22, Paragraph 4. In 2002, Miller Island data were not used to estimate PO4 (as was done in 2000). Again, we question this method. The Oregon Draft TMDL needs to clarify why PO4 concentrations from Upper Klamath Lake are good to use in 2002, but not appropriate in 2000.

Response: The boundary conditions were developed on a case by case basis (i.e., separately for 2000 and 2002) and were subject to data availability for each year. All potential data were considered and evaluated to create the most appropriate dataset. Refer to response to comment PacifiCorp 94.

PacifiCorp 97: Appendix C, Page 36, Bullet Point 1, Line 1. The Oregon Draft TMDL states that "…OM in the boundary conditions is lumped (and thus not partitioned between labile and refractory components) due to lack of sufficient data for accurate OM partitioning." In fact, the assumption here is that ALL OM in the boundary condition is labile. Available data suggest that the majority of OM in the boundary condition is not labile, but refractory (see Sullivan et al 2008, Sullivan et al 2009). This incorrect assumption has large consequences for predicted water quality downstream and into the estuary.

Response: It is important to first clarify that allocating OM to labile and refractory portions in a model is a simplified representation of reality. In the Klamath model, OM for the boundary was only assigned to the labile portion, meaning that all OM was represented using labile parameterization. This was done because unless the majority of OM decay relatively quickly (resulting in significant deoxygenation), the DO in Lake Ewauna would never be as low as it has been observed in the historical record (particularly near the water/air interface). Therefore, using best professional judgment, the labile parameterization was used in W2 to represent the total OM from the boundary condition. In the model, an average decay rate was used to reflect the characteristics of the OM. Because an average value was used, it can be taken to mean that a combination of both extremely labile OM and refractory OM are considered. The decay rate of the OM decreases in a downstream manner since the more labile OM fraction is lost faster than the less labile fraction.

At the time the model was developed, detailed organic matter data were not available. However, although the 2007 and 2008 data provide insight into recent organic matter characteristics, they cannot be directly applied to models for 2000 and 2002. First, the data are 5 to 8 years more recent than the modeled period. Conditions in Lake Ewauna change significantly from one year to the next. Even the 2007 and 2008 data demonstrate significant variability over only a one year period.

PacifiCorp 98: Appendix C, Page 36, Bullet 5, Line 3-6. We agree that the model is not good at predicting actual water quality concentration, but that it "can be used to represent the overall water quality trends in response to external loading and internal stream dynamics" as the Oregon Draft TMDL states. This being the case, the Oregon Draft TMDL needs to clarify the model's limitations for accurately setting target concentrations and load allocations. This inability to predict values is not well incorporated in the Oregon Draft TMDL discussion. Quantifying uncertainty, particularly in a regulatory setting environment, is important. Incorporation of that uncertainty into load allocations is not effectively completed in the Draft TMDL.

Response: We believe this comment misinterprets the statements in this Appendix. Model uncertainty was discussed in Section of 2.8.1 of the Draft TMDL.

PacifiCorp 99: Appendix C, Page 37, Paragraph 1 of Section 2.4.3, Lines 3-4. We agree that uncertainty is inherent in the model (especially with a limited observed data set) and that the model should only be relied upon to reproduce "general trends." To be useful in setting regulatory limits, the TMDL must quantify uncertainty with respect to the targets and allocations.

Response: We believe this comment misinterprets the statements in this Appendix. Model uncertainty was discussed in Section of 2.8.1 of the Draft TMDL.

PacifiCorp 100: Appendix C, Page 44, Section 3.3. Some calibrated parameters were changed during "validation." The Oregon Draft TMDL needs to confirm that calibrated values were unchanged for all TMDL scenarios. Further, the model used in the California TMDL underwent several last minute modifications, with multiple model parameters modified. Neither in the California or Oregon TMDL was there any discussion of "recalibrating" the model with these latest changes. Rather, the model parameters were changed, Appendix C was updated, but no discussion of these changes and their potential impacts were presented. Thus, the model has not formally been calibrated as parameters and coefficients have been changed without exploration of implications or sensitivity.

Response: The 2000 and 2002 model parameters are all the same except that in the 2002 model the SOD in Lake Ewauna is changed from 3.0 gO2/m2/day to 2.0 gO2/m2/day to reflect potential interyear variability as suggested by the data in Lake Ewauna.

PacifiCorp 101: Appendix C, Page 44, Last paragraph, Line 1-2. In calibration, algae and OM parameters changed from reservoir to reservoir. We question the validity of changing these values in light of the lack of data to support the changes. The Oregon Draft TMDL needs to provide more justification for the actual changes made (e.g., "algae growth rates were reduced in J.C. Boyle because…"). This is especially important because only one year of data was used in calibration and one year in validation (and during validation, certain parameters were changed, which can invalidate the validation process).

Response: Many characteristics, such as algal composition, can change significantly from one reservoir to the next, particularly in a complex system like the Klamath. As such, it is appropriate and defensible to change corresponding model parameters by waterbody during calibration.

PacifiCorp 102: Appendix C, Page 45, Paragraph 2, Line 2-5. Lumping labile and refractory OM together and using an "average decay rate" does not accurately represent the separate decay rates of refractory and labile OM. Further, when an average value is used, the combination of both extreme labile and extreme refractory OM concentrations and their respective effects on the system are actually ignored.

Response: Theoretically, a higher degree of OM representation would result in more accurate predictions. Unfortunately, insufficient data are available to accurately perform this partitioning. It should also be noted that the RMA-11 model simulates OM as a lumped parameter (with no partitioning even between dissolved and particulate phases).

PacifiCorp 103: Appendix C, Page 45, Table 3-3. The Oregon Draft TMDL does not mention the fact that SOD parameters also change from reach-to-reach. The Oregon Draft TMDL needs to explain the rationale for changing these parameters reach-to-reach.

Response: You are incorrect; Table 3-3 does report variable SOD parameters.

PacifiCorp 104: Appendix C, Page 47, Table 3-5. The Oregon Draft TMDL Table 3-5 implies that parameter values remain constant reach-to-reach and for each scenario. Values of some important parameters do not remain constant. Also, some parameters are not listed in this table. For example, "bed algae carrying capacity" is a term added to the RMA-11 model. In earlier versions of the TMDL model, this important parameter was not kept constant. The Oregon Draft TMDL needs to include all important parameters and confirm that they remain constant reach-to-reach and for each scenario.

Response: It is unclear what 'important' parameters you reference. This comment appears to be directed at 'earlier versions' of the TMDL model and it is not clear whether it is relevant.

PacifiCorp 105: Appendix C, Page 49, Paragraph 2, Line 1. Contrary to TMDL assertions, the model does not appear to "reproduce the supersaturation of DO during early summer well." Simulated dissolved oxygen is always 4-6 mg/L low in comparison to observed values in May.

Response: You misquote the draft TMDL. The correct quote is: "The model reproduces the supersaturation of DO in June well, as well as the extended anoxic period in July." [Underline added for emphasis]

PacifiCorp 106: Appendix C, Page 49, Paragraph 3, Lines 6-10. There is SOD in W2. It is not clear that a fully dynamic interaction between bed and water column is necessary. Similar results might be obtained by specifying seasonal SOD.

Response: The comment is noted.

PacifiCorp 107: Appendix C, Page 52, Paragraph 2, Last sentence. At Lake Ewauna, "the model's over prediction of chlorophyll a …is likely caused by inaccurate boundary conditions from UKL", then why would this over prediction of chlorophyll a not show up in all upstream reaches? The Oregon Draft TMDL suggests that the model simulates chlorophyll a "very well' in the Lake Ewauna to Keno Reach (page 49, paragraph 4, line 1), which is upstream of Keno Dam. Or, is the Oregon Draft TMDL suggesting that inaccuracies in boundary nutrients led to poor chlorophyll *a* simulation in all downstream reaches? This needs to be clarified, and the uncertainty quantified.

Response: You misquote the draft TMDL. The correct quote is: "The model's overprediction of chlorophyll *a* in Figure H-17 is likely caused by the overprediction of chlorophyll *a* in Lake Ewauna during the early summer, which propagate to this location in the system."

PacifiCorp 108: Appendix C, Page 53, Paragraph 1, Line 3. The Oregon Draft TMDL states that the model "predicts concentrations within the range of observed data". This is misleading. Model results for NH4 and NO3 are not within any meaningful observed range.

Response: The TMDL development team does not agree with the commenter's statement regarding NH4 and NO3 not being within any meaningful observed range. Not only are the magnitudes of the model's

predictions similar to the observations, but with a few exceptions for NO3, the temporal and vertical trends are similar as well.

PacifiCorp 109: Appendix C, Page 53, Paragraph 3. The Oregon Draft TMDL states that calibrating a model to observed data "indicates that water quality dynamics … are reasonably represented." Calibrating at this level (one year of data) is simply a curve fitting exercise and doesn't indicate anything about the model's ability to represent the dynamic nature of surface water quality. Also, "reasonably represented" does not translate to any quantitative approach.

Response: The model results are compared to two years worth of data. It is not clear what is meant by the comment that the calibration is "simply a curve fitting exercise". The calibration process does include, and must include, attempts to "fit" the model prediction "curves" (x-y plots) to measurement "curves" (x-y plots). This is why the term "calibration" is used – the model parameters are "calibrated" to produce the best fit of model predictions to measurements. This is standard practice in model development.

PacifiCorp 110: Appendix C, Page 55, Paragraph 1, Line 7-8. Uncertainty in lab data is shown in estuary calibration figures. This was only completed for the estuary. The Oregon Draft TMDL needs to include error bars in the presentation of lab uncertainty throughout this TMDL. This information (error bars) is presented for the 2000 data (Miller Island, Klamath Straits Drain, and Keno; see appendix D) in Watercourse (2003).

Response: This information was readily available for the estuary monitoring data but not for all other datasets. As such, it was only included for the estuary data.

PacifiCorp 111: Appendix D, Page 1, Last paragraph. The 1995 median condition represents the median conditions from the Upper Klamath Lake TMDL only if the two "extreme" years are ignored. A high percentage (~30%) of data were therefore excluded from this analysis with no reasonable basis for exclusion. Also, there is no discussion about the variability around this median – which is critical to meeting water quality targets. For all years where conditions exceed the median conditions (50 percent by definition), there is a likelihood for non-compliance. The frequency of acceptable non-compliance is not defined or explored.

Response: See response to comments "PacifiCorp 45" and "PacifiCorp 46".

PacifiCorp 112: Appendix D, Page 2, Bullet 1, Last Sub-Bullet. The Draft TMDL states "… it was assumed that the majority of OM would likely exist as dissolved phase, therefore, the OM was partitioned such that 90% is dissolved and 10% is particulate (typical reported ratio for lakes as reported in Thurman 1985)." The existing conditions scenario has a different partitioning where 80% of the OM was assumed to be in particulate form and 20% is dissolved (Appendix C, Page 19, Paragraph 2). No explanation is given for why there is such a discrepancy. Further, FSOD is inconsistent between these two simulations. This casts uncertainty over simulation results – certain parameters were changed prior to model application.

Response: The partitioning of organic matter in the existing conditions scenario was based on data available at the time of model development and in the TMDL scenario was based on literature values. This approach assumes that the portioning of organic matter will change as Upper Klamath Lake is restored. Sediment Oxygen Demand (i.e. parameter FSOD) is discussed on page 4, bullet 1.

PacifiCorp 113: Appendix D, Page 2, Bullet 2, Lines 2-3. "All the point sources and derived accretion/depletion flows for flow balance in the existing model were removed. Over the course of the year, the accretion/depletion flow levels average to near zero, so they likely do not represent an ungaged groundwater input. On shorter time scales, the accretion flows can be significant enough to alter the instream concentrations depending on assumptions about their concentrations. Out of concern that the accretion flows might influence allocations to point and discrete nonpoint sources, they were removed in the scenarios." By removing the accretion/depletion terms, the flow balance is no longer closed over short (e.g., daily) time periods. Also, this statement assumes that there would be no seasonal variation in

groundwater inputs. Further, with extensive land uses (e.g., wildlife areas, irrigated agriculture) adjacent to Keno Reservoir that exhibit highly seasonal water demands, these assumptions appear to misrepresent potentially important elements of local land use activities. Finally, the paragraph is not clear as to which model these assumptions apply.

Response: Your comments point out some of the difficulty in developing scenarios. If we included the accretion / depletion flows, we would have had to assumed 'natural background' concentrations and therefore, trading one source of uncertainty for another. The assumptions are appropriate and based on the best available information. These assumptions apply to the Natural Conditions Baseline and allocation scenarios.

PacifiCorp 114: Appendix D, Page 9 and onward. For a quantitative model to support a rigorous TMDL regulatory process, there is much qualitative discussion regarding results. The Oregon draft TMDL could easily be written to describe how much less, or how significant, or the level something is diminished, etc. This qualitative language varies in meaning for each reader (and each author) and is ill-defined for a technical TMDL: What is slightly higher? Higher than what? What is "smooth?" This language pervades the TMDL technical documents. While the general interpretation is appreciated, there is little quantitative basis for this discussion – information that could readily be pulled from model results to indicate levels of concentration, magnitude of differences between the scenarios, and temporal changes at each location

Response: We believe the model discussion and TMDL is appropriate in its use of qualitative and quantitative descriptors. There are many examples of quantitative descriptors in the Source Assessment and Allocation Section of Chapter 2.

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PacifiCorp 115: Appendix D, Page 9, Bullet points. Throughout these descriptions there are indications of violations of Oregon standards:

- "The 30-day minimum mean DO criterion of 6.5 mg/L is slightly violated at downstream locations…"
- "the Oregon 30-day DO criterion of 8.0 mg/L is violated at all locations…"
- "As for the 7-day DO criterion of 6.5 mg/L, it is only slightly violated at the upstream locations."
- "The simulated pH generally meets the Oregon criterion…"

It is not clear what constitutes an acceptable frequency or percentage of exceedance. In addition, time of year, location and the magnitude of deviation above or below a standard need to be considered when evaluating these exceedances, but the Oregon Draft TMDL has ignored these important considerations. For example, on page 17, the Oregon Draft TMDL states: "The predicted violations were deemed acceptable by RWQCB staff in the context of overall uncertainty." While there is some general discussion of uncertainty in Chapter 2, no quantification of violations or uncertainty was made. Furthermore, though the opinion of California RWQCB staff could be valuable, what does DEQ have to say about these violations?

Response: DEQ quantifies and discusses the very minor excursions in Section 2.7.2.2.

PacifiCorp 116: Appendix D, Page 13, Bullet 1. "The most sensitive location point source loading for pH compliance was just downstream of South Suburban WWTP. The most sensitive location for DO compliance was just downstream of Klamath Falls WWTP. It is suspected that the bathymetry of historic Lake Ewauna creates this sensitive location for dissolved oxygen because of deep, slow moving water." Some kind of sensitivity analysis would have to be performed in order to conclude that certain locations are more sensitive than others, but no details of sensitivity analyses were given anywhere in the Oregon Draft TMDL. Further, this language suggests that the WWTPs had a role in local water quality, *and* that data were available to test the model against such sensitivity. The WWTPs may or may not have played a dominant role in local water quality. River miles should be used to denote sensitivity in relation to constituents, unless specific actions (e.g., point discharges) are identified as playing a direct role. Throughout this page the use of "sensitive" is confusing.

Response: DEQ believes the model and TMDL documentation appropriately balances qualitative and quantitative descriptions. The word 'sensitive' means 'responsive to stimuli'. The conclusions were based on iterative runs used to develop waste load allocations and examining results at various locations in the Keno impoundment.

PacifiCorp 117: Appendix D, Page 13, Bullet 2. "The most sensitive time period for point source loading was mid-September when flows from Link River were greatly reduced (170 cfs as opposed to a median 736 cfs). However, this flow is still greater than the 7Q10 of 94 cfs. This is also the period in which there was earlier than usual flow into the Klamath River from Lost River Diversion Channel." The way sensitivity is apparently being used herein suggests that sensitivity would vary from year to year. Since the Oregon Draft TMDL is based solely on one model year, i.e., 2000, there could potentially be other years where the sensitivity would deviate from 2000, in which case applicability of the Oregon Draft TMDL would be questionable in other years.

Response: The TMDL uses a margin of safety to account for this type of uncertainty.

PacifiCorp 118: Appendix D, Page 13, Bullet 3, Line 1. "Once point source allocations were determined, the discrete nonpoint sources (KSD and LRDC) were analyzed…". It is unclear why the point source and nonpoint source allocations were looked at in sequence. Changes in one could affect the other.

Response: We were concerned that points of maximum impact were at different geographic locations and believed that evaluating source types in sequence would allow for full utilization of the loading capacity.

PacifiCorp 119: Appendix D, Page 21, Bullet 1. Several points:
• "outlet draws water from both the surface and the bottom" –the outlet draws from the full depth, not just the bottom and top.
• "This might be caused by the longer retention time in J.C. Boyle Reservoir that causes a loss of PO4 and NO3 from algal uptake while the benthic source is insufficient to compensate for this loss." It is unclear what "longer" is referring to as a comparison. This sentence indicates that the Oregon Draft TMDL recognizes retention as an important mechanism in reducing nutrient levels in J.C. Boyle Reservoir.
• "NH4, however, appears to be slightly higher during the summer when J.C. Boyle Dam is present. This might be due to the benthic source." – J.C. Boyle does not experience persistent anoxia, so benthic sources of NH4 should be modest. Could this be coming from upstream either as NH4 or as organic matter (which would be a source of NH4 upon decay)?

Response: Your bullet 1: We believe the wording in the TMDL is appropriate.
Your bullet 2: Longer compared to a 'no-dam' scenario
Your bullet 3: The only change to this scenario is dams are added back in. So the only upstream source would be related to Keno Dam.

PacifiCorp 120: Appendix D, Page 21, Bullet 2, Lines 8-9. "The springs' concentrations are not significantly different from the upstream incoming concentration." This is incorrect according to the Oregon Draft TMDL model files that indicated that the springs' concentration for PO4 is 0.066 mg/L throughout the year, whereas the PO4 coming out of J.C. Boyle dam just upstream of the springs has an average of 0.004 mg/L, and a peak of 0.009 mg/L (see Figure 10 below). This is an important statement to clarify because upstream reaches experience nutrient limitation (as stated in the last sentence of this bullet point), and the springs prove to be an important nutrient contribution in downstream reaches.

[Figure 10 not included here]

Response: The sentence you quote refers to ammonia (not phosphorus) concentrations which are discussed in the previous sentence. In context, we believe the meaning of the sentence is clear.

Comments by Bureau of Land Management

BLM 1: 1.2.6, paragraph 2. The DMAs in the Upper Klamath and Lost River subbasins include: U.S. Forest Service, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service…" Add the U.S. Bureau of Land Management to the DMAs listed.

Response: The text will be revised to reflect the comment.

BLM 2: 1.2.7, paragraph 5. "ODEQ also recognizes that despite the best and most sincere efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDLs and/or their associated surrogates. Such events could be, but are not limited to, floods, fire, insect infestations, and drought."

Since there is general consensus that climate change (increases in air temperature) is upon us, and that changes can occur over the term of the TMDL, it seems that climate change is more predictable than some of those listed. The document in general is silent on the effect of climate change on stream temperature. Suggest climate change be given more acknowledgement by including it in this list.

Response: Climate change is a global phenomenon and will influence factors addressed or used in this TMDL (water temperature, flow, vegetation, fish distribution, etc). TMDLs are developed based on the use of historical data and current conditions to meet current water quality standards. We develop allocations to meet these water quality standards. Water quality standards are reviewed periodically and are revised when appropriate. In addition, TMDLs are revisited and revised based on new information and conditions. If or when climate change affects water quality we expect to address those changes when we revisit TMDLs or revise water quality standards.

BLM 3: 1.3.3, paragraph 1."Spatial distributions of land ownership in the Lost River and Upper Klamath Subbasins are displayed in Figure1-7 and Figure 1-8, respectively."

Subbasin is displayed in Figure 1-7. The text has them reversed.

Response: The text was revised to reflect the comment.

BLM 4: 4.1, paragraph 4. "The temperature TMDLs in this chapter address year round impairments to all perennial and intermittent streams and rivers within Oregon in the Upper Klamath River and Lost River subbasins, with the exception of the Klamath and Lost Rivers." The reference to "intermittent" and "year round impairment" is conflicting. On some intermittent streams there may be no flowing water or causal link to down-channel temperature increases. BLM requests further definition or description on intermittent channels this TMDL applies to. Including all intermittent streams in the TMDL is including extensive channel networks with no causal linkage.

Response: The words "year round impairments to" were deleted. Perennial and intermittent streams that cause or contribute to temperature standard exceedances must be addressed. How DMAs make their operations consistent with a load allocation is to be established through their planning process and development of TMDL implementation plans as required in the TMDL rule (Division 42).

BLM 5: 4.1, paragraph 5. "All other streams in the Upper Klamath River and Lost River subbasins were assigned generalized load allocations based on system potential vegetation and effective shade curves." What assumptions were built in to effective shade determination for intermittent streams? Disclose what stream network was used to determine the appropriate effective shade targets.

Response: Effective shade curves are assigned to streams based on their geographic placement and dominant natural vegetation community, regardless of stream map. In this TMDL, the effective shade curves are assigned based on Ecoregion.

BLM 6: 4.1, paragraph 8. "All the tributaries within the scope of this chapter's TMDLs are designated as "Redband or Lahontan Cutthroat Trout" fish use." This seems to suggest that intermittent streams with Redband or Lahontan cutthroat trout presence would be applicable for coverage under this TMDL. If appropriate, use this location in document to further define "intermittent".

Response: All intermittent streams within the geographic scope regardless of fish presence are covered under this TMDL. Clarified sentence to read "All the tributaries within the geographic scope of this chapter's TMDLs are designated by the temperature water quality standard as "Redband or Lahontan Cutthroat Trout" fish use."

BLM 7: 4.1, Table 4-2 " All perennial and intermittent streams within the Upper Klamath River and Lost River subbasins…" This statement defines water bodies covered by the Temperature TMDL. Based on current verbal descriptions, ODEQ has indicated that only those streams that present a "loading" linkage are applicable for a temperature TMDL. This loading linkage could be through residual pools, hyporheic connection to the flowing channels or actual flow during a "standard" applicable season (e.g. trout presence during flow).

This statement defines water bodies covered by the Temperature TMDL. Based on current verbal descriptions, ODEQ has indicated that only those streams that present a "loading" linkage are applicable for a temperature TMDL. This loading linkage could be through residual pools, hyporheic connection to the flowing channels or actual flow during a "standard" applicable season (e.g. trout presence during flow). Unless ODEQ defines this, BLM will be responsible to meet surrogates on channels with no causal linkage, which are not applicable water bodies. All intermittent streams should not be included in the Temperature TMDL as there are some intermittent flowing channels that do not provide any heat loading. ODEQ should be explicit on which intermittent streams are included in the Temperature TMDL through definition either in the text or in the definitions provided in Chapter 1.

The BLM recognizes these are more easily defined than mapped at this time. This is why it is important to define the water body appropriate for application of targets.

Response: DEQ's current position includes the protection of streams designated as non-fish bearing because of potential downstream impacts. Intermittent streams whether or not they are fish bearing can have significant impacts on downstream water quality and restoring beneficial uses. How DMAs make their operations consistent with the load allocation is to be established later through their planning process provided through an associated Water Quality Management Plane issue along with each TMDL order (Division 42).

BLM 8, 4.3.3, paragraph 1. "Additionally, hydroelectric projects and multiple points of diversion in the Upper Klamath River and Lost River subbasins have altered stream flow levels. Low summertime flows decrease the thermal assimilative capacity of streams. Pollutant (solar radiation) loading causes larger temperature increases in stream segments where flows are reduced by human uses. These TMDLs focus mainly on the impact of riparian vegetation on stream temperature."

BLM 8: 4.7, paragraph 2."Heat contributions of water management districts, reservoir and dam operations, and hydroelectric projects should be calculated as a change in stream temperature."

BLM 8: 4.7.1, paragraph 3. "The water management districts within the scope of this TMDL are allocated a portion of the nonpoint source human use allowance. Because of the complexity and size of the irrigation system, it was not possible to quantify the thermal impact of each district's irrigation withdrawals, delivery and return into the Klamath River and Lost River tributaries."

Other nonpoint source DMAs have fairly restrictive effective shade targets, but some of the most significant nonpoint source warming is occurring through water withdrawals. Yet it seems due to the complexity of accounting they are not included in the targets?

The water withdrawals should be considered in the "surrogate targets" discussion.

The ODEQ needs to address why water withdrawals are not included in the determination of targets. These are human activities that can be controlled. Section 4.4.3.3 underscores the need. At least consider those irrigation ditches with return flow to streams with shade targets.

The statement from section 4.7 indicates that there is no accountability for these "changes".

It is hard to understand parity and equity in the subbasins between DMAs and the significance of their contribution to the problem when significant contributors are not part of the solution.

Response: Cumulatively, all the nonpoint sources may not impact the temperature of the river or stream greater than the portion of human use allowance assigned in Table 4-8. This TMDL chose to express the nonpoint source load allocation as effective shade, which is a surrogate measure, where appropriate. DEQ does not believe it is appropriate to express the load allocation for water management districts, reservoir and dam operations, and hydroelectric projects in terms of percent effective shade, but rather as the impact on (i.e. change in) temperature. Although we did not quantify the current impact on temperature for every nonpoint source, they are required to fulfill the TMDL.
The TMDL does not mandate or imply that a DMA or designated source must alter water diversions in order to meet this TMDL and the water quality standard. How a DMA or designated source makes its operations consistent with the allocation is to be established later through the planning process provided through sector-specific TMDL Implementation Plans developed following TMDL issuance (**Chapter 5**).

BLM 9: 4.4.3.1, paragraph 2. "Vegetation buffer is sufficiently wide to maximize solar attenuation (Note: Buffer widths required to meet the system potential target will vary given potential vegetation, topography, stream width, and aspect.), Vegetation buffer width accommodates channel migrations."

Why is a discussion of "buffers" in a portion of the text describing system potential? This is more appropriate in the WQMP for associated DMAs.

Response: The bullet points describe our understanding and assumptions regarding system potential vegetation. The width of the system potential vegetation zone is a relevant component.

BLM 10: 4.4.3.1 paragraph 2. "In addition, system potential effective shade does not account for potential major disturbances resulting from floods, drought, fires, insect damage, disease or other factors that could impact riparian areas." Some of the natural disturbance regime information has been quantified for watersheds. For example, in Spencer Creek (Spencer Creek Watershed Analysis USDI and USDA 1994), a pre-settlement fire was noted and the percentage of the landscape impacted by stand-replacing fire is documented. The shade target should reflect a portion of landscape at less than system potential to account for a natural disturbance regime

Response: The process of quantifying the impact of natural disturbance of the riparian area on stream temperature is complex, arduous and uncertain. Furthermore, since natural disturbance is a random event and variable with space and time, it is not clear how the information gathered from an analysis would inform allocations. The impact of natural disturbance was quantified in the Umpqua Basin TMDL (DEQ 2006, http://www.deq.state.or.us/wq/TMDLs/umpqua.htm). It was found that "in 99.8% of the modeled reaches, the difference between predicted natural thermal potential with and without natural disturbance was less than the uncertainty of the model (0.5°C)." In addition, not considering natural disturbance in the estimate of NTP is a conservative assumption that is used in the Margin of Safety. Given the above information, DEQ decided not to quantify the impact of natural disturbance on NTP.

BLM 11: 4.4.3.1, Tale 4-5. Average Shade deficit. If the deficit is simply the potential minus existing, there appears to be errors in the math use to get the deficit. Spencer Creek should be 30% and Barnes Valley Creek should be -6, and Antelope should be -5.

Response: The sentence in 4.4.3.1 (3) has been clarified to “The average shade deficit is the average of the differences between current and potential shade at each model node.”

BLM 12: 4.4.3.1, Table 4-5. Average percent system potential effective shade for Jenny Creek is 65%. The average percent system potential shade for Jenny Creek seems too high. Would it be possible for the BLM to obtain the Jenny Creek values for average percent effective shade (current and system potential) by reach with associated spatial data?

Response: Please see Appendix A, Table A10 for comparison of current and potential vegetation types used in the Jenny Creek models. Chapter 4, Table 4-13 shows the current and potential effective shade by kilometer for each modeled stream. The associated spatial data are available by contacting DEQ.

BLM 13: 4.4.3.1, Table 4-6: Basic physical characteristics of remaining reservoirs with area greater than or equal to 1450 acre feet. This statement mixes measurement units. Change “area” to “volume”.

Response: The document has been changed according to the comment.

BLM 14: 4.4.3.3, paragraph 2. “Water quality modeling presented later in this chapter and in Appendix A show that the increased flow in Miller Creek during the critical season likely results in lower stream temperatures than would have occurred under a natural thermal potential scenario. Therefore, Gerber Reservoir does not appear to be causing or contributing to a temperature water quality impairment.” Diversion and summer releases substantially change the wetted width and riparian vegetation widths/composition. The modeling does not account for the modification on riparian vegetation or the geomorphic effects of this change when summer irrigation flows are diminished to near zero during rain events or water storage shortages.

Response: These factors were not accounted for due to technical limitations of the analytic tools and limited data.

BLM 15: 4.4.3.3, paragraph 4. "BLM reports that the Fall Creek Hydroelectric Project impacts to Spring Creek warm the waters of Jenny Creek by up to 3.1°C...." The Fall Creek Hydroelectric Project impacts to Spring Creek warm the waters of Jenny Creek by up to 3.0°C (not 3.1°C).

Response: The text was changed to reflect the comment.

BLM 16: 4.4.3.3, paragraph 5. "Assuming PacifiCorp withdraws 5 cfs from Spring Creek…." Based on observations at PacifiCorp's Spring Creek diversion, PacifiCorp diverts 100 percent of Spring Creek.

Response: During the model year, 2001, PacifiCorp was not diverting water from Spring Creek. DEQ does not have data reflecting current flow in Spring Creek.

BLM 17: 4.4.3.3, Table 4-7. Spencer Creek (7/21/01) 9.4 33.8 360. Using water rights is not generally and accurate way to determine withdrawals because it does not account for return flow or actual usage. For Spencer Creek, there may be a substantial loss between the spring source and the gage at the mouth due to seepage and ET (a losing reach). We assume that the method used is this case was simply to add the water right to the measured flow and assume that the entire water right was being used at the time of the measurement. The method description should be more explicit and express the level of uncertainty.

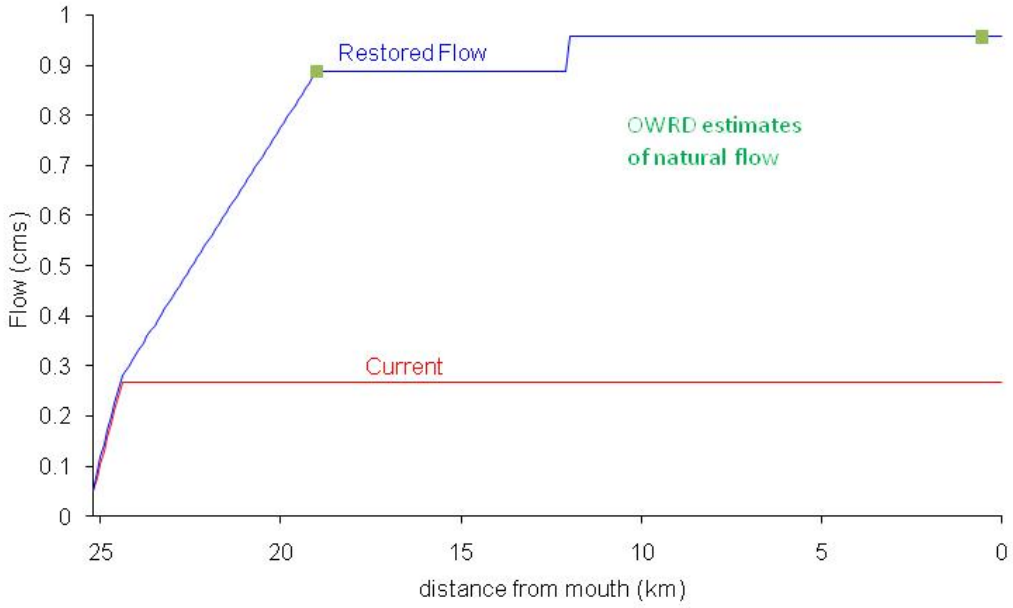
Response: To estimate potential flow, we used OWRD’s estimates of natural flow at two points on Spencer Creek. We did not quantify the water rights in the watershed. For more information about the methods, please see Appendix A-51 “System Potential Flow”.

Text in paragraph one of 4.4.3.4 has been clarified to “The influence of river flow is generally inversely related to the daily maximum stream temperature with higher flows moderating the diel swing of

temperatures. Less water from the tributaries generally decreases the ability of the stream to assimilate heat load and result in warmer stream temperatures (**Figure 4-11, Table 4-7, and Appendix A** for more detail). The method of estimating potential stream flows varied between streams but was generally based on water balances from OWRD estimates of natural flow."

Table 4-7 caption has been modified to "Modeled 7-DADM temperature differences between current and potential flow for two streams."

Figure A33 (below) was modified to include the OWRD estimates.



BLM 18: 5.3.1 Table 5-1. The period for Grizzly, Hoxie, Jenny, Johnson, Keene, Mill, and South Fork Keene creeks is "Year around". The period should be summer for Grizzly, Hoxie, Jenny, Johnson, Keen; Mill, and South Fork Keene creeks (see Tables 1-2 and 4-4).

Response: The text was revised to reflect the comment.

BLM 19: 5.3.2, paragraph1. "The WQMP combines a description of all DMA plans that are in place or will be developed to address the load and waste load allocations in the TMDL." As noted below (comment #19), existing BLM interim water quality restoration plans (WQRPs) have not been described nor assessed in terms of meeting implementation plan requirements.

Response: The text was revised to reflect the comment.

BLM 20: 5.3.4, Table 5-3. The timeline for "Development and Submittal of NPS Implementation Plans" indicates this will occur in 2010. Since the DMAs have 18 months after the ODEQ issues the TMDL to complete TMDL implementation plans, the timeline for submittal of implementation plans should extend through 2011.

Response: The text was revised to reflect the comment.

BLM 21: 5.3.6, table 5-4. Table 5-4 contains a reference to “BLM managed lands” in the “Area of Jurisdiction” column. This needs some clarification as provided for the USFS. Suggest replacing “BLM managed lands” with “BLM Medford and Lakeview Districts”.

Response: The text was revised to reflect the comment.

BLM 22: 5.3.7, Non Federal Forest Lands. “The Forest Practices Act (FPA) applies broadly to state forest lands and also provides for watershed- specific protection rules. Watershed-specific protection rules are a mechanism for subbasin-specific TMDL implementation in non-Federal forest land where water quality impairment is attributable to current forest practices. Legacy issues are addressed through management planning with ODF as a participant.” The BLM is concerned with equity in responsibility for DMA implementation plans among the forest sector management agencies. The BLM has similar broad plans in terms of the Northwest Forest Plan and Resource Management Plans which provide best management practices and guidance in terms of water quality. These plans should be recognized in the same context as used here for ODF.

BLM manages lands in watersheds with state and private ownership and would find information as described in the “watershed- specific protection rules” and “legacy issues” important to disclose in the WQMP. ODEQ should list any of these that exist in the TMDL area.

Response: The text was revised to reflect the comment.

BLM 23; 5.3.7, Federal Lands: “The U.S. Forest Service and BLM have developed a protocol to be used to guide the development of WQRPs (USFS 1999).” The protocol referenced is outdated in terms of the content of a WQRP. The OAR and ODEQ guidance has superseded this multi-state protocol. The sentence referencing the protocol should be deleted.

Response: The text was revised to reflect the comment.

BLM 24: 5.3.2.1, paragraph 1. The WQMP combines a description of all DMA plans that are in place or will be developed to address the load and wasteload allocations in the TMDL."

As noted below (comment #21), existing BLM water quality restoration plans (WQRPs) have not been described nor assessed in terms of meeting implementation plan requirements.

Response: The Department appreciates BLMs commitment to preparing a draft TMDL implementation plan prior to release of the Draft TMD/WQMP document, prior to the response to comment document and prior to approval of the TMDL/WQMP by US EPA. DEQ will submit comments to BLM’s draft implementation plan in a timely manner following US EPA approval of the Upper Klamath and Lost River Subbasins TMDL/WQMP.

BLM 25: 5.3.4, table 5-3. The timeline for "Development and Submittal of NPS Implementation Plans" indicates this will occur in 2010.

Since the DMAs have 18 months after the ODEQ issues the TMDL to complete TMDL implementation plans, the timeline for submittal of implementation plans should extend through 2011.

Response: The text was revised to reflect the comment.

BLM 26: 4.3.6, Table 5-4. Table contains a reference to "BLM managed lands" in the "Area of Jurisdiction" column. This needs some clarification as provided for the USFS. Suggest replacing "BLM managed lands" with "BLM Medford and Lakeview Districts".

Response: the text was revised to reflect the comment.

BLM 27: 5.3.7, Non Federal Forest Lands. The Forest Practices Act (FPA) applies broadly to state forest lands and also provides for watershed- specific protection rules. Watershed-specific protection rules are a mechanism for subbasin- specific TMDL implementation in non- Federal forest land where water quality impairment is attributable to current forest practices. Legacy issues are addressed through management planning with ODF as a participant."

Plan and Resource Management Plans which provide best management practices and guidance in terms of water quality. These plans should be recognized in the same context as used here for ODF (see comment #20). BLM manages lands in watersheds with state and private ownership and would find information as described in the "watershed- specific protection rules" and "legacy issues" important to disclose in the WQMP. ODEQ should list any of these that exist in the TMDL area.

Response: Comment noted.

BLM 28: 5.3.7, Federal Lands. "The U.S. Forest Service and BLM have developed a protocol to be used to guide the development of WQRPs (USFS 1999)."

The protocol referenced is outdated in terms of the content of a WQRP. The OAR and ODEQ guidance has superseded this multi-state protocol. The sentence referencing the protocol should be deleted.

Response: The text was revised to reflect the comment.

BLM 29: 5.3.7, Federal Lands. No reference to existing BLM management plans.

Add the following: All management activities on BLM Medford District-managed lands follow the 1995 Medford District Record of Decision and Resource Management Plan which incorporates the Aquatic Conservation Strategy (ACS) and standards and guidelines from the Northwest Forest Plan, The ACS outlines a comprehensive framework for protecting and restoring aquatic and riparian systems. The ACS contains four components: riparian reserves, key watersheds, watershed analysis, and watershed restoration. The ACS contains nine objectives that guide maintenance and restoration of watershed processes and water quality. Standards and guidelines associated with the ACS are designed to meet or attain ACS objectives and prohibit and regulate activities that retard or prevent ACS objective attainment, The Resource Management Plan also includes specific best management practices (BMPs) to protect water quality.
Response: The text was revised to reflect the comment.

BLM 30: 5.3.7, Federal Lands Current Status. "WQRP's for BLM and USFS managed lands in the Upper Klamath and Lost River Subbasins have not yet been developed." The BLM Medford District submitted a WQRP for the Jenny Creek Watershed to the ODEQ in May 2008. ODEQ has not provided comments or a letter of approval for the 2008 Jenny Creek Watershed WQRP.
This section should address the federal WQRPs that have been submitted and whether they are approved or approved conditionally. The BLM has invested a significant amount of workload and funding to complete WQRPs. To accomplish this before the TMDL is complete, illustrates a desire to go over and above legal requirements in order to meet the intent of the Clean Water Act. feedback in the WQMP is the logical/legal method of approval/determination of needs. ODEQ's approval of these plans is documentation of this effort and a clear direction on the WQRP status.

Response: The text was revised to reflect the comment.

BLM 31, 5.3.7, Federal Lands. No reference to existing BLM management plans. Add the following: All management activities on BLM Klamath Falls Resource Area -managed lands follow the Klamath Falls Resource Area 1995 *Record of Decision and Resource Management Plan* which incorporates the Aquatic Conservation Strategy (ACS) and standards and guidelines from the Northwest Forest Plan. The ACS outlines a comprehensive framework for protecting and restoring aquatic and riparian systems. The ACS contains four components: riparian reserves, key watersheds, watershed analysis, and watershed

restoration. The ACS contains nine objectives that guide maintenance and restoration of watershed processes and water quality. Standards and guidelines associated with the ACS are designed to meet or attain ACS objectives and prohibit and regulate activities that retard or prevent ACS objective attainment. The Resource Management Plan also includes specific best management practices (BMPs) to protect water quality.

Response: The text was revised to reflect the comment.

BLM 32: 5.3.7, Federal Lands, Current Status. "WQRP's for BLM and USFS managed lands in the Upper Klamath and Lost River Subbasins have not yet been developed." The BLM Lakeview District submitted an interim WQRP for the Willow Valley and Gerber Reservoir watersheds. This section should recognize BLM efforts to address WQRPs.
Response: The text was revised to reflect the comment.

BLM 33: 5.3.7, Federal lands, DEQ expectations. "DEQ expects development of WQRPs within 18 months from the adoption of the TMDL."

This section should list the specific areas that are not covered by WQRPs submitted to date. If a WQRP has been approved conditionally, this section should outline ODEQ's expectations in order for the WQRP to meet approval (e.g. OAR or guidance that are specifically not being addressed).

Response: Comment noted.

BLM 34: 5.3.8, paragraph 2. "DEQ review and approval of TMDL implementation plans is called for in OAR 340- 042. Following Implementation Plan submittal, DEQ will work closely with DMAs to ensure a successful and timely review/approval process. In accordance with MOUs, once a USFS or BLM WQRP is received by DEQ, DEQ will provide a letter of approval within 60 days with any appropriate requirements for revision."

The Jenny Creek Watershed WQRPs was submitted in May 2008 and no requirements for revision or approval have been received by BLM.

Response: Comments to the Jenny Creek Watershed WQRP will be submitted to BLM following approval of the TMDL and WQMP by US EPA .

BLM 35: 5.3.7, Hydroelectric Facilities. "PacifiCorp is designated as a source responsible for developing a source- specific implementation plan to address the dissolved oxygen and temperature allocations associated with JC Boyle and Keno Dams."

Is PacifiCorp required to develop a source-specific implementation plan for their Fall Creek facility?

Response: The Fall Creek Hydroelectric Project is in California and is owned by PacifiCorp. It is regulated by DEQ, under the 401 Hydroelectric Certifications program. The Fall Creek Hydroelectric Project is allocated a portion of the nonpoint source human use allowance. The impact from the Fall Creek Hydroelectric Project can be quantified and may not produce a cumulative impact to Jenny and Spring Creeks greater than 0.1ºC above the applicable criteria. PacifiCorp will prepare a TMDL implementation plan to address this allocation.

BLM 36: 5.3.7, Water Management Districts. "Irrigation and drainage districts are the DMAs responsible for developing implementation plans to address load allocations associated with non-federal water delivery and drainage systems in the Klamath Irrigation Project. Current Status - Source-specific implementation not yet developed. DEQ Expectations- DEQ recommends development of a unified implementation plan for all water management districts within 18 months from the adoption of the TMDL." As previous comment (#7) indicated, water withdrawals should be considered a significant source of loading.

Response: The TMDL does not mandate or imply that a DMA or designated source must alter water diversions in order to meet this TMDL and the water quality standard. How a DMA or designated source makes its operations consistent with the allocation is to be established later through the planning process provided through sector-specific TMDL Implementation Plans developed following TMDL issuance (**Chapter 5**).

BLM 37: 5.3.9, paragraph 2. "As discussed previously, the BLM and USFS are DMAs for federal lands in the Lost River Subbasin…" Include the Upper Klamath Subbasin in this sentence.

Response: The text was revised to reflect the comment.

BLM 38: 5.3.10, paragraph 3. "Monitoring riparian vegetation communities and shade to assess progress towards achieving system potential targets established in the TMDL". Suggest identifying the monitoring parameter (effective shade) associated with the target. Recommend changing sentence to: Monitoring riparian vegetation communities and shade to assess progress towards achieving effective shade targets established in the TMDL

Suggest inserting language that allows for new information regarding shade targets, natural disturbances, and potential vegetation heights and densities to be incorporated into WQRMPs as that information may change and improve over time. Shade targets may need to be adjusted over time after the TMDL is finalized.

Response: Text was revised to include "effective shade as targets as a monitoring parameter and refer to Section of the WQMP regarding adjustment of shade targets as part of the adaptive management process".

BLM 39: 5.3.14, Federal Land Managers. No reference to authority for federal land management. Recommend adding the following authority for the BLM:

Federal Land Policy and Management Act of 1976; 43 U.S.C. 1701 et seq. The act states that public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values.

Response: The text was revised to reflect the comment.

BLM 40: Table A-17. Vegetation height for shrub and grasses floodplain community with a height of 12.2 meters seems very high.

Response: This potential vegetation community is predicted to have a mix of 75% willows & alders at an average height of 6.1 m and 25% cottonwoods at an average height of 30.5 m. The weighted average is 12.2 m.

BLM 41: A-51, paragraph1. "The OWRD estimate of flow at the mouth of Spencer Creek necessitated adding a tributary representing Miller Creek to balance the increase in flow. These estimates were incorporated into the model as "Restored Flow" (Figure A33)." "Miller Creek" should read "Miners Creek". It is unclear why was Miners Creek was added to the restored flow but not the current flow. See comment #12 regarding use of maximum water right to estimate withdrawal rate.

Response: Text has been changed from Miller to Miners. There were very little flow data available in the Spencer Creek watershed. In order to reduce assumptions, the model was simple. Under the "current" flow scenario, the flow from Miners Creek and all tributaries were zero. Under the "restored" flow scenario, the flow from Miners Creek is assumed to be restored to 2.4 cfs. The flow was added to Miners Creek only, as a simplifying assumption, based on Miners Creek's position near the middle of the watershed and a larger tributary. The flow to Miners Creek was calculated to balance the flow between

two points from OWRD's estimates of natural flow. For information about OWRD's assumptions of consumptive use while estimating natural flow, please see *Determining Surface Water Availability in Oregon: Open File Report SW 02-002 (OWRD, 2002*).

BLM 42: 5.3.7, Federal Lands. "WQRP's for BLM and USFS managed lands in the Upper Klamath and Lost River Subbasins have not yet been developed."

The BLM Medford District submitted a WQRP for the Jenny Creek Watershed to the ODEQ in May 2008. ODEQ has not provided comments or a letter of approval for the 2008 Jenny Creek Watershed WQRP. This section should address the federal WQRPs that have been submitted and whether they are approved or approved conditionally. The BLM has invested a significant amount of workload and funding to complete WQRPs. To accomplish this before the TMDL is complete, illustrates a desire to go over and above legal requirements in order to meet the intent of the Clean Water Act. Feedback in the WQMP is the logical/legal method of approval/determination of needs. ODEQ's approval of these plans is documentation of this effort and a clear direction on the WQRP status.

Response: The Department appreciates BLMs commitment to preparing a draft TMDL implementation plan prior to release of the Draft TMD/WQMP document, the response to comment document and approval of the TMDL/WQMP by US EPA. DEQ will submit comments to BLM's draft implementation plan in a timely manner following US EPA approval of the Upper Klamath and Lost River Subbasins TMDL/WQMP.

BLM 43: 5.3.7, Federal Lands. "DEQ expects development of WQRPs within 18 months from the adoption of the TMDL." This section should list the specific areas that are not covered by WQRPs submitted to date. If a WQRP has been approved conditionally, this section should outline ODEQ's expectations in order for the WQRP to meet approval (e.g. OAR or guidance that are specifically not being addressed).

Response: The text will be revised to reflect the comment.

BLM 44: 5.3.8, paragraph 2. "DEQ review and approval of TMDL implementation plans is called for in OAR 340-042. Following Implementation Plan submittal, DEQ will work closely with DMAs to ensure a successful and timely review/approval process. In accordance with MOUs, once a USFS or BLM WQRP is received by DEQ, DEQ will provide a letter of approval within 60 days with any appropriate requirements for revision."

The Jenny Creek Watershed WQRPs was submitted in May 2008 and no requirements for revision or approval have been received by the BLM.

Response: The Department appreciates BLMs commitment to preparing a draft TMDL implementation plan outside the TMDL approval schedule and prior to:

- release of the Draft TMDL,
- public comment period,
- response to comment document, and
- approval of the TMDL by EPA.

DEQ will submit comments to BLM's draft implementation plan in a timely manner, following EPA approval of the Upper Klamath and Lost River Subbasins TMDL/WQMP.

Comments by US EPA Region 10 office

General Comments

EPA 1: Overall, we found the TMDLs to be very well articulated. They provided many clear, inventive, and concise data figures to illustrate the TMDL concepts and goals. Given the complexity of the TMDLs, the use of appendices for presentation of the information are also very helpful.

Response: Comment noted.

EPA 2: This TMDL did an excellent job in incorporating the data into the document to support the allocation approach, particularly in describing both projected scenarios (dams and dam removal).

Response: Comment noted.

Water Quality Modeling for the draft Klamath and Lost TMDLs

EPA 3: The scientific foundation for the Klamath and Lost River TMDLs is a system of linked water quality models developed by Tetra Tech, Inc., under an EPA contract. The development of water quality models is a complex undertaking in any circumstance, but the Klamath River system presents a particularly difficult challenge to modelers. Challenges include the scale of the system, variety of water systems (e.g. alternating reservoirs, free-flowing river reaches, and an estuary), variable flow management, highly variable input water quality conditions (e.g. hyper-eutrophic Upper Klamath Lake, irrigation return flows, and runoff from forested and agricultural lands), and multiple pollutant parameters. By requiring a margin of safety in each TMDL, the Clean Water Act explicitly recognizes the inherent uncertainty in water quality analyses.

Response: Comment noted.

EPA 4: The Klamath River models have been subjected to a substantial level of peer review. The model was developed and run by Tetra Tech, Inc., but each phase of the work was carefully reviewed by program and technical staff from four agencies -ODEQ, California North Coast Water Board, EPA Region 9, and EPA Region 10. In addition to this inter-agency review, the models were reviewed by numerous outside experts. In 2005, peer reviews of the Klamath River TMDL models were completed by Dr. Scott Wells (Portland State University), Brown & Caldwell (for City of Klamath Falls, Oregon), and the Bureau of Reclamation. Between 2005 and 2007 the TMDL development team had informal consultation with Watercourse Engineering, Inc. (consultant to PacifiCorp). The State of California later submitted its technical report to review by four external scientific peer reviewers in accordance with its regulations. Finally, under contract from the Bureau of Reclamation, the U.S. Geological Survey reviewed the Klamath model during the public comment period for the Klamath TMDL in California. Over time, the agencies have made substantive corrections and improvements to the model in response to peer review comments.

Response: Comment noted.

EPA 5: While uncertainties in model predictions cannot be eliminated, EPA believes the review process has built a strong scientific foundation for these draft TMDLs.

Response: Comment noted.

Specific Comments

EPA 6: Page 1-16: Typos:"...drainages originates in with" and "straitss"

Response: Text was revised to reflect the comment.

EPA 7: Page 1-23: Klamath Falls permit: Recommend clarifying the permittee for the discharge from the Cogeneration plant to the river and that there is a single outfall for all discharges (Klamath Falls).

Response: Text was revised to reflect the comment.

EPA 8: Page 1-23: Recommend adding the expectation in the TMDL for additional treatment: At the end of each summary on point sources, include a line that TMDL is expected to (or not expected to) lead to upgrades in treatment plants.

Response: Text was revised to reflect the comment.

EPA 9: Page 3-23, Uncertainty in Process Rep: Please spell out OM.

Response: Text was revised to reflect the comment.

EPA 10: Page 1-23: South Suburban: Define "discharge box." Note that S. Suburban discharge is monitored for compliance prior to entering the ditch and commingling with drainage ditch flow (assuming that's true).

Response: Text was revised to reflect the comment.

EPA 11: Page 2-6, Typo: In Reserve Capacity section: "....approach related DO ... "

Response: Text was revised to reflect the comment.

EPA 12: Page 2-9, Plot 2-9: Add "numeric criteria" to legend.

Response: The final figure has been clarified.

EPA 13: Page 2-22, Flow Plot: Excellent plot comparing modeling year flows to entire flow record range.

Response: Comment noted

EPA 14: Page 2-23, Figure 2-16: Stormwater is actually a point source...but only large municipalities are required to have permits. One option is to add an "other" classification for unpermitted stormwater.

Response: “Stormwater” in this case is broader than the urban context but also includes storm runoff from agricultural and forest lands.

EPA 15: Page 2-23, Algae: Growth, respiration, and decomposition .. .lead to problems.

Response: DEQ is uncertain about the meaning of this comment.

EPA 16: Page 2-24, 3rd Paragraph: Paragraph should begin "Additionally" not "Alternatively."

Response: The document has been corrected.

EPA 17: Page 2-24, Overview: Excellent overview of water quality dynamics.

Response: Comment noted.

EPA 18: Page 2-36: SOD modeling: SOD modeling is mentioned in passing. Suggest noting here that such modeling is not commonly conducted, was not conducted here, and that common approaches to address SOD are used.

Response: SOD modeling was included in the water quality model and its representation is documented in Appendix C.

EPA 19: Page 2-45: Table 2-10: The text on previous page indicates that design flow is used for WLA's, but this table lists average flow.

Response: The document has been corrected.

EPA 20: Page 2-67: Reference: EPA guidance on modeling is final now.

Response: Text was revised to reflect the comment.

Comments by North Coast Regional Water Quality Control Board

Executive Summary

NCRWQCB 1: Staff believe it is important to note the level of collaboration that was involved between ODEQ, NCRWQCB, and EPA Regions 9 and 10 and suggest the following language be inserted at the bottom of page ii just above the last paragraph on that page: ODEQ and California's North Coast Regional Water Quality Control Board have worked cooperatively to develop TMDLs for the water quality impaired waterbodies in the Klamath Basin, including the Lost River and the Klamath Straits Drain, and the Klamath River from Link River to the Pacific Ocean. In particular, Oregon and California have formed a technical team in conjunction with USEPA and its contractor Tetra Tech, Inc. to develop a uniform water quality model of the basin and conduct joint analyses to ensure compatible TMDLs. However, the states will establish independently the TMDLs for those portions of the basin within their respective jurisdiction.

Suggested revision to the third sentence in first full paragraph on page iii: "NCRWQCB has prepared a draft TMDL document for dissolved oxygen, nutrient, microcystin, and temperature 303(d) listed waterbodies in the Klamath River hydrologic areas downstream of the Oregon-California Stateline.

Response: Text was revised to reflect the comment.

NCRWQCB 2: We wish to clarify a misperception by some Oregon stakeholders to the NCRWQCB on the CA Klamath River TMDL stating that TMDL allocations in OR were developed to meet CA water quality objectives. To address this confusion and to further clarify and acknowledge the collaboration between our agencies, we recommend adding a discussion explaining that the analyses that satisfied Oregon's water quality standards also ensured that CA's WQS were met at stateline and no further reductions were needed to meet downstream standards. Thus the load allocations at stateline identified under OR compliance scenarios formed the upstream boundary condition for CA's compliance scenarios. ODEQ could use language similar to the following (Excerpted from CA's Chapter 6 (Section 6.2.3): "These Oregon-issued TMDLs will be based on Oregon's water quality standards. Because these TMDLs (and their anticipated load and wasteload allocations) are being developed by Oregon as part of a comprehensive multistate analysis of pollutant loadings to the Klamath River, they are also being designed to meet California water quality standards at stateline. It is appropriate for the Regional Water Board to account for these anticipated upstream load reductions in Oregon when developing the TMDLs for the segments of the Klamath River that are downstream in California."

Response: Text was revised to reflect the comment.

NCRWQCB 3: We believe that some discussion of the emerging Klamath Basin Water Quality Tracking and Accounting (TAP) framework should be included in the Executive Summary. TAP is an important joint TMDL implementation tool which will ensure that funds invested to reduce pollutant loading can be applied to the largest and most easily controlled sources. Addressing the highest priority sources with available funding will result in the most effective and efficient pollutant reduction strategies. A more

detailed discussion of the role of pollutant reduction offsets should also be included in Chapter 5 as a key element of the Water Quality Management Plan.

Response: A description of the TAP framework is provided in Section . 5.4.1 Water Quality Credit Trading Opportunities.

Chapter 2

NCRWQCB 4: We suggest the following revision to first sentence of second paragraph of section 2.1 Introduction: "Using available information, a hydraulic and water quality model was developed to: 1) analyze the available data; 2) simulate water quality dynamics in the system, and 3) predict conditions that attain applicable water quality criteria for Oregon and applicable California water quality objectives at the Oregon–California Stateline."

Response: The text was revised to reflect the comment.

NCRWQCB 5: First sentence in 6th paragraph in section 2.5: consider adding a footnote that explains that the validation/corroboration for 2002 was only done for Oregon reach of river.

Response: The text was revised to reflect the comment.

NCRWQCB 6: First paragraph of section 2.7: we believe it is appropriate and necessary to add the text that is consistent with the discussion included in the third bullet in the Executive Summary recommendations above. It is important that ODEQ describe here that the standards attainment analysis applied to CA objectives at Stateline as well as to OR criteria. The suggested text is based text that was jointly developed by OR and CA counsel and management; it is appropriate and necessary to include it.

Response: The text was revised to reflect the comment.

NCRWQCB 7: Section 2.7.3 Allocations to address DO, pH, excess algae and ammonia toxicity impairments and Section 2.7.4 Allocations to address temperature impairment: We believe it is appropriate and necessary to add sentences stating that the respective LAs and WLAs result in meeting the applicable California water quality objectives at the Oregon–California Stateline as well as achieving OR criteria.

Response: Text revisions related to NCRWQCB 6 address meeting applicable California water quality standards.

Chapter 5

NCRWQCB 8: We suggest that ODEQ should incorporate text that describes and discusses the existing Implementation Memorandum of Agreement between ODEQ, CA NCRWQCB, and EPA Regions 9 and 10. This discussion should highlight our interagency commitment to coordinating our efforts to implement the TMDLs. This suggested text could be included as a new section before the existing section 5.4. Language from the CA NCRWQCB TMDL staff report in Section 6.2.3.3 could be easily adapted for this purpose.

Response: The requested information is provided in Section 5.1 Introduction.

NCRWQCB 9: We believe a section should be added that describes the Klamath Basin Water Quality Accounting and Tracking framework. This tool could help address concerns regarding the effective use of funds to most efficiently reduce pollutant loads in the upper part of the basin. The following language in Chapter 6 from the CA NCRWQCB Klamath River TMDL staff report could be easily adapted for this purpose.

Response: The requested information is provided in Section 5.4.1 Water Quality Credit Trading Opportunities.

Comments by Karuk Tribe, Quartz Valley Indian Reservation and the Yurok Tribe

Karuk - QVIR- Yurok 1: While we still have some concerns regarding the Klamath TMDL water quality model, expressed in many rounds of previous comments on California's Klamath TMDL, it is our opinion that on the whole the model is robust enough to serve its intended purposes in the TMDL (i.e. setting load allocations). It is abundantly clear that the current nutrient concentrations in the river are far higher than natural background and that substantial reductions are necessary to restore water quality.
We strongly support the nutrient reductions proposed in the Draft TMDL and WQMP; however, we have serious concerns that the proposed water quality management plan is unlikely to be effective for that purpose. A primary reason is that Oregon's laws and regulations regarding environmental protections are relatively weak compared to California's. For example, the strategy proposed to address the effects of private land forestry is to rely upon the implementation of Oregon's existing Forest Practices Act rules, which were found to be inadequate to protect coldwater fish resources by National Marine Fisheries Service (NMFS 1998) and an Independent Multidisciplinary Science Team (IMST 1999) convened by the State of Oregon.

Aspects of the water quality restoration plan look good on paper, such as requirements for Designated Management Agencies to develop implementation management plans, yet it remains to be seen how effective such efforts will actually be in practice. We encourage ODEQ to be proactive and aggressive in implementing the water quality management plan, and to move the process forward as quickly as possible.

Many efforts are already underway in the Upper Klamath Basin to improve water quality. We applaud such efforts; however, to our knowledge, these efforts have yet to result in measurable instream improvements. ODEQ and other regulatory agencies must not confuse activity and effort with real evidence of success. Restoration activities must be strategically planned and then implemented with enough scope and magnitude that they actually begin to result in measurable improvements to water quality and habitat complexity.

To restore water quality in the Klamath River, real and substantive changes in land and water management will be necessary.

We are cautiously optimistic about the proposed water quality improvement accounting and tracking program under development by ODEQ, California, U. S. EPA, and PacifiCorp. It offers promise for cost-effective water quality improvements, but only if properly implemented. One shortcoming of the program is its lack of specific mention of the role of Klamath River basin Tribes in the development of the program.

Treatment wetlands constructed for nutrient removal could play a pivotal role in reducing nutrient loads in the Klamath River and we offer some recommendations on wetland implementation, including a proposal to use the outflows from constructed wetlands to establish a network of thermal refugia around Keno Reservoir. We note, however, that engineered solutions such as treatment wetlands should complement, not serve as a substitute for more direct source reduction and restoration of habitat complexity.

The comments below are organized into two sections. First, the 'General Comments on Important Issues' section addresses major topics. The 'Specific Comments on Minor Issues' uses the same chapter/section numbering system as the *Draft TMDL and WQMP*. The topics addressed in the General Comments on Important Issues section are:

- Restoration of Habitat Complexity and Ecosystem Function

- Non-Point Source Nutrient Reductions: Activity Does Not Necessarily Result in Success –

Importance of Thermal Refugia

- Using Easements or Land Acquisition to Expand Riparian Wetlands along Keno Reservoir – Water Quality Improvement Accounting and Tracking Program

- Constructed Wetlands

- Effects of Hydropower Peaking/Bypass Operations on Downstream Water Quality – Private Land Forestry

- Data sharing

Response: Comment noted.

General Comments

Karuk - QVIR - Yurok 2: Restoration of Habitat Complexity and Ecosystem Function
As noted in comments regarding California's Klamath TMDL provided by the Quartz Valley Indian Community (QVIC 2007) and the Yurok Tribe (2009), the Lost River, Klamath River, and Lower Klamath Lake ecosystems have been profoundly diminished and degraded over the past century. A major component of the water quality problems of these areas is not simply nutrient pollution, but also channelization, diking, and simplification -- the loss of connection between stream channels and wetlands. This lack of habitat complexity reduces the ability of wetlands and riparian vegetation to serve as nutrient sinks. Additionally, it reduces the quality of aquatic habitat available for fish including the coldwater species that are the beneficial uses that the TMDL seeks to restore.

If TMDL implementation in the Klamath River, Lost River, and Lower Klamath Lake is to succeed the continuing trend of habitat degradation and channel simplification must be reversed. Reductions in nutrient inputs, alone, will not be sufficient to restore ecosystem function.

We encourage ODEQ to lay out a more bold restoration vision in the *Draft TMDL and WQMP*, even if the agency lacks the authority to guarantee its outcomes.

Response: Oregon DEQ's TMDL implementation strategy described in Chapter 5 Water Quality Management Plan follows the State's TMDL implementation policy and Oregon's TMDL rule OAR-340-042.

Karuk - QVIR - Yurok 3: Non-Point Source Nutrient Reductions: Mere Activity Does Not Necessarily Result in Success
Reducing the impacts of agricultural activities on private lands offers perhaps the most important opportunity for the improvement of water quality in the entire Klamath Basin, and thus is a critically important issue for TMDL implementation.

The *Draft TMDL and WQMP* proposes that the water quality effects of agricultural activities on private lands be addressed through the development of Agricultural Water Quality Management Area Plans (AgWQMAPs) to be implemented by Local Area Advisory Committees (LACs). AgWQMAPs for the Klamath Headwaters and Lost River have been in place since 2004 and 2002, respectively. The LACs have issued status reports summarizing their activities implementing the AgWQMAPs. It is clear that positive activities such as riparian fencing and the development of conservation plans are occurring and we encourage these efforts; however, we note that evidence of activity is not evidence of success, or even measurable progress. Restoration activities must be strategically planned, then implemented with enough scope and magnitude that they actually begin to result in measurable improvements to water quality and habitat complexity.

We have not studied the Oregon projects in detail but restoration efforts in other areas have often focused on activities that are easy to implement, but which fail to address the core stressors to aquatic habitat. For example, in the Shasta and Scott river valleys of California, much commendable effort has gone into activities such as riparian planting, riparian fencing, and screening agricultural diversions. These activities have resulted in some minor improvements; however, comparatively little effort has gone into reducing surface water diversions and groundwater pumping (pumping has actually increased). In some cases, inappropriate projects such as agricultural wells were funded with "restoration" or "water conservation" money, actually causing further impairment of instream flows. Thus, fish populations in those valleys have continued to decline as these rivers and their tributary streams have become progressively more and more de-watered.
We encourage ODEQ to do whatever it can to ensure that grant funds (and other incentives) intended to improve water quality go in fact to the highest-priority projects that will result in the most water quality and habitat benefits, rather than be spent in a random scattergun approach.

Response: Comment noted.

Karuk - QVIR - Yurok 4: Yurok Importance of Thermal Refugia
Given the poor water quality conditions that exist during the summer and early fall periods in the Klamath River, access to water quality refugia are extremely important to juvenile and adult salmonids. The mouths of tributaries, in particular, provide critical thermal refugia in many rivers (U.S. EPA 2003), including the Klamath (Belchik 1997, 2004; Sutton 2004). The *Draft TMDL and WQMP* provides very little discussion of this important topic, and we request that appropriate information on the subject be added to the Draft TMDL and WQMP. In the wetlands section below we propose the use of constructed wetlands to create a network of thermal refugia around Keno Reservoir.

Response: DEQ recognizes the importance of thermal refugia and expects increased thermal refugia will be an ancillary benefit to implementation of the temperature allocations. Channel complexity, restored tributary temperatures and wetlands would likely lead to increased thermal refugia.

Karuk - QVIR - Yurok 5: Effects of Hydropower Peaking/Bypass Operations on Downstream Water Quality
The *Draft TMDL and WQMP* contains no discussion of how peaking/bypass operations between J.C. Boyle Reservoir and Copco Reservoir affect nutrient concentrations. These effects are summarized briefly in the following paragraphs. Additional details are contained in comments by the Hoopa Valley Tribe (2006), Karuk Tribe (2006), Quartz Valley Indian Reservation (QVIR 2007), Resighini Rancheria (2006), and Yurok Tribe (2006) on the Federal Energy Regulatory Commission's Draft Environmental Impact Statement for the Klamath Hydroelectric Project.

As PacifiCorp (2005) itself has acknowledged, peaking operations decrease the nutrient removal capacity of the Klamath River by inhibiting growth of attached algae. The mechanisms include: 1) increasing water depth and turbidity during the day, thereby reducing the amount of light that can penetrate the murky water and reach the river's bottom to promote the production of nutrient-removing periphyton, 2) creating daily cycles of wetting and drying along the channel margin, and 3) daily scouring of streambed. Additionally, peaking decreases water transit time (higher flows move faster), allowing less time for biological activity. This impairment of nutrient-removal capacity results in increased nutrient concentration downstream.

Bypass operation below J.C. Boyle and Copco Dams allow the diverted water to avoid a turbulent journey down the river that would help break down organic matter and phytoplankton. Nitrogen and phosphorus are more easily removed in downstream reaches when in inorganic form (ammonia and nitrate for nitrogen; orthophosphorus for phosphorus) than when bound up in organic matter. The longer it takes for the organic matter to become mineralized into inorganic nutrients, the further downstream those nutrients will travel before being removed from the water column. Thus, the bypass operations delay the natural improvements in water quality that occur as the Klamath River flows downstream from Keno Dam.

We request that the final *TMDL and WQMP* include an analysis of the effects of hydropower peaking and bypass operations on nutrient concentration and form. Additionally, the final *TMDL and WQMP* should include requirements to eliminate these impacts.

Response: The Klamath River TMDLs target natural conditions which include consideration of natural condition baseline for nutrients. Given the broad scope of this TMDL, DEQ did not investigate the specific impact of the processes detailed above. However, some of these processes would have been represented in the water quality model and the comparison between the natural condition baseline and the with dams allocations scenarios. The implementation of TMDL will address specific operational change.

Karuk - QVIR - Yurok 6: Private Land Forestry

The water quality effects of timber harvest and roads on private lands are an important issue generally in the Klamath River Basin, but play a particularly critical role in the impairment of coldwater tributaries. For example, Spencer Creek is a Klamath River tributary that currently drains into J.C. Boyle reservoir. It contains low-gradient stream habitat that is rare in tributaries of the Middle/Upper Klamath Basin. Following the likely removal of J.C. Boyle, Copco, and Iron Gate dams, a restored Spencer Creek could provide excellent habitat for coho salmon. The *Draft TMDL and WQMP* Plan found that current riparian shade is 60% lower than the estimated maximum potential, current water temperatures at the mouth of Spencer Creek are 10 ºC warmer than its natural thermal potential (Figure 4), and that a substantial portion of this water warming is due to the lack of vegetative shade. Examination of aerial photographs of the Spencer Creek watershed and the surrounding areas shows more bare ground than trees, with the forest confined to narrow strips (Figure 5), a powerful illustration of the poor condition of private timber lands in the Oregon portion of the Klamath River Basin.

The *Draft TMDL and WQMP* relies on the Oregon Department of Forestry's ongoing implementation of Oregon's Forest Practices Act (FPA) to ensure that private land forestry activities do not result in water quality impairment. Unfortunately, these regulations have long been recognized as inadequate for the protection salmonid habitat and water quality. For example, the Independent Multidisciplinary Science Team (IMST 1999) was convened by the State of Oregon to assess whether the FPA rules were sufficiently protective to restore wild salmonids in Oregon. The IMST found that the existing rules were not adequate on several bases, including water quality issues such as sedimentation resulting from landslides and roads. We are not aware of any significant improvements to the Oregon FPA rules to address the shortcomings identified by the IMST. The National Marine Fisheries Service has also recognized the shortcomings of the FPA rules and has made recommendations to the State of Oregon (NMFS 1998), but these recommendations have not yet been implemented. *We realized that ODEQ's authority to resolve the situation is limited due to existing laws, regulation, and politics; however, we feel compelled to note the approach outline in the* Draft TMDL and WQMP *to address the water quality impacts of forestry on private lands is unlikely to succeed.*

Response: Comment noted.

Figure 4. Predicted 7-day average maximum temperatures for Spencer Creek in different four modeled scenarios for July 2-21, 2001. Figure A32 from the *Draft TMDL and WQMP.*

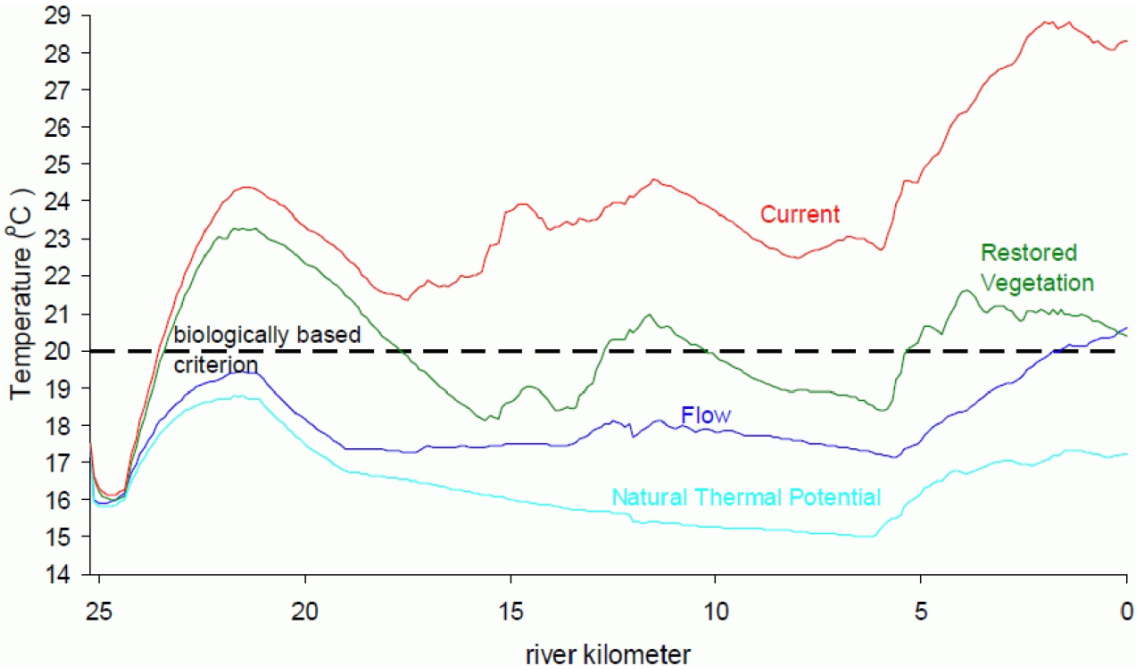
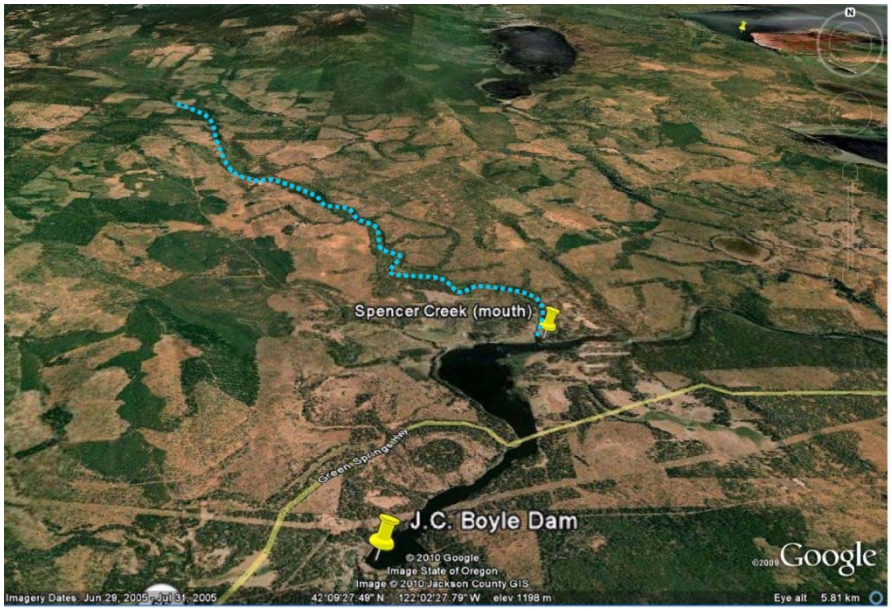


Figure 5. Oblique aerial photograph of Oregon forests, looking north from J. C. Boyle Reservoir. The dotted blue line shows approximate path of lower Spencer Creek. Image from Google Earth.



Karuk – QVIR - Yurok 7: Data sharing
There is little discussion in the *Draft TMDL and WQMP* regarding sharing of the monitoring data to be collected by the Designated Monitoring Agencies and other entities. Experience shows that both public and private entities sometimes withhold data that discloses conditions that do not reflect well on management. ODEQ should require that all monitoring data and photographs collected as part of TMDL implementation be made publicly accessible on the Internet.

Response: Comment noted. Data reported to DEQ is required by the source-specific implementation plans (**Chapter 5**) and is public information that will be available when finalized.

Karuk - QVIR - Yurok 8: Water Quality Improvement Accounting and Tracking Program
We are very supportive of the general concept of water quality improvement accounting and tracking program under development by ODEQ, California, U.S. EPA, and PacifiCorp. It offers promise for cost-effective water quality improvements, but only if properly implemented. There are important details that are not yet addressed which need further development.

There must be strong evidence and a high likelihood that any pollution trading allowed will have at least as positive an effect on water quality, at the site of the discharge, as pollution control done in a "normal" way – that is, pollution reduced at the source, rather than at an alternate site. Given that pollution trading could result in substantial economic benefit to the entities responsible for pollution discharges, because pollution trading could be much cheaper than on-site compliance, the burden of proof should be on such entities to demonstrate that pollution trading will be effective. Also, due to the uncertainties surrounding their effectiveness, the predicted outcomes of pollution trading should contain some safety factor (i.e. >200% of the effectiveness of on-site compliance, perhaps larger if the uncertainties are particularly large) to assure that the water pollution reduction goals are met. One shortcoming of the proposed program is the lack of specific mention of the role of the Klamath River basin Tribes in the development of the program. This should be rectified.

We offer detailed ideas about construction of treatment wetlands used for bio-filtration below, but also wish to state clearly that natural riparian wetland systems in the Keno Reservoir and the Lost River need to be restored, and that the size and bio-filtration capacity of Tule Lake and Lower Klamath Lake need to be increased. We do not look at constructed wetlands as a substitute for these wetland restoration measures, but they could be used in conjunction with natural wetland restoration. Both efforts are needed because of the extremely high nutrient loading from Upper Klamath Lake and the Lost River to the Klamath River. Riparian wetland and lake expansion are also needed to recover ESA-listed sucker species (NRC 2004), which are designated beneficial uses of the Klamath River under the Clean Water Act.

Response: DEQ appreciates the concern for successful implementation of the Klamath Accounting and Tracking Program. DEQ anticipates that California North Coast Regional Water Quality Control Board will include the Karuk Tribe, the Quartz Valley Indian Reservation and the Yurok Tribe in the Klamath TAP outreach process.

QVIR - Yurok 9: Using Easements or Land Acquisition to Expand Riparian Wetlands along Keno Reservoir
The Klamath River in what is now the Keno Reservoir reach was once surrounded by thousands of acres of wetlands (Figure 1) that supplied natural water filtration, water storage, and hyporheic connections that promoted river cooling. The Klamath River in Keno Reservoir is now almost completely channelized and confined. Channelized rivers have lower rates of nutrient attenuation (Bernot and Dodds 2005, Yurok Tribe 2007). A functional riparian buffer needs to be restored adjacent to the river in addition to constructed wetlands (see below). As noted in Yurok (2007) and Karuk (2007) comments on the Lost River TMDL, marsh buffers could promote mildly acidic conditions, potentially retarding the growth of the bluegreen algal species *Aphanizomenon flos-aquae* that washes out of Upper Klamath Lake and can further proliferate and add to nutrient enrichment in Keno Reservoir. Figure 2 shows the Keno Reservoir

reach with remnants of natural marsh areas, but mostly agricultural development with no riparian buffer strip.

Several flat benches exist below Lake Ewauna that could be used to set up pilot-scale and, then, larger constructed wetlands. Remnant intact marshes and wetlands extend northward from the Straits Drain to Miller Island, where wetlands are fragmented, but where a large contiguous riparian wetland area could potentially be restored. If the terrace north of Gore Island and across from the Straits Drain were reclaimed as wetlands, sinuous multiple channels of the Klamath River could be reconfigured. This would slow river flow transit time and assist in nutrient removal.

Reconnecting floodplains to riparian marshes can also increase water storage capacity and foster surface water and groundwater connections (hyporheic zone) that can moderate water temperatures and provide refugia (ODEQ 2008). Such an area could also provide optimal sucker habitat.

Figure 1. Historic size of Lower Klamath Lake and associated wetlands are shown in the map below, with wetlands broken down by percentage of cover by bulrushes. Note extensive marsh areas surrounding the Klamath River at upper left. Map from USBR (2005).

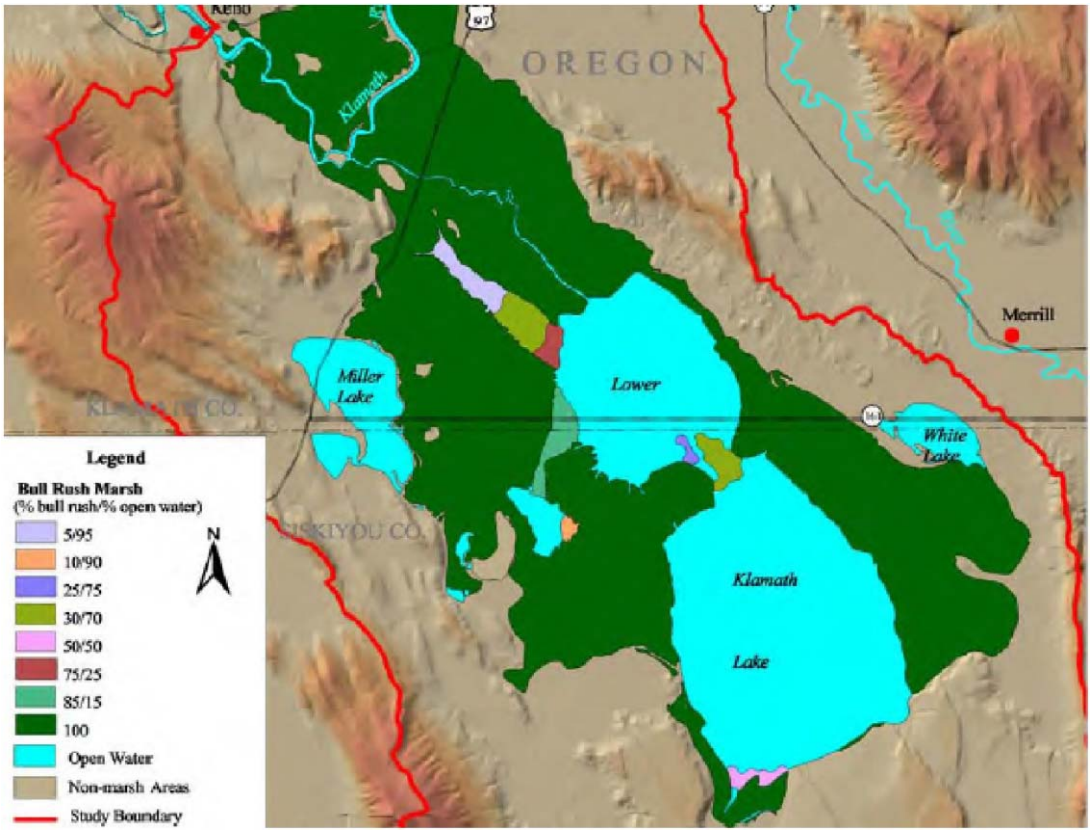
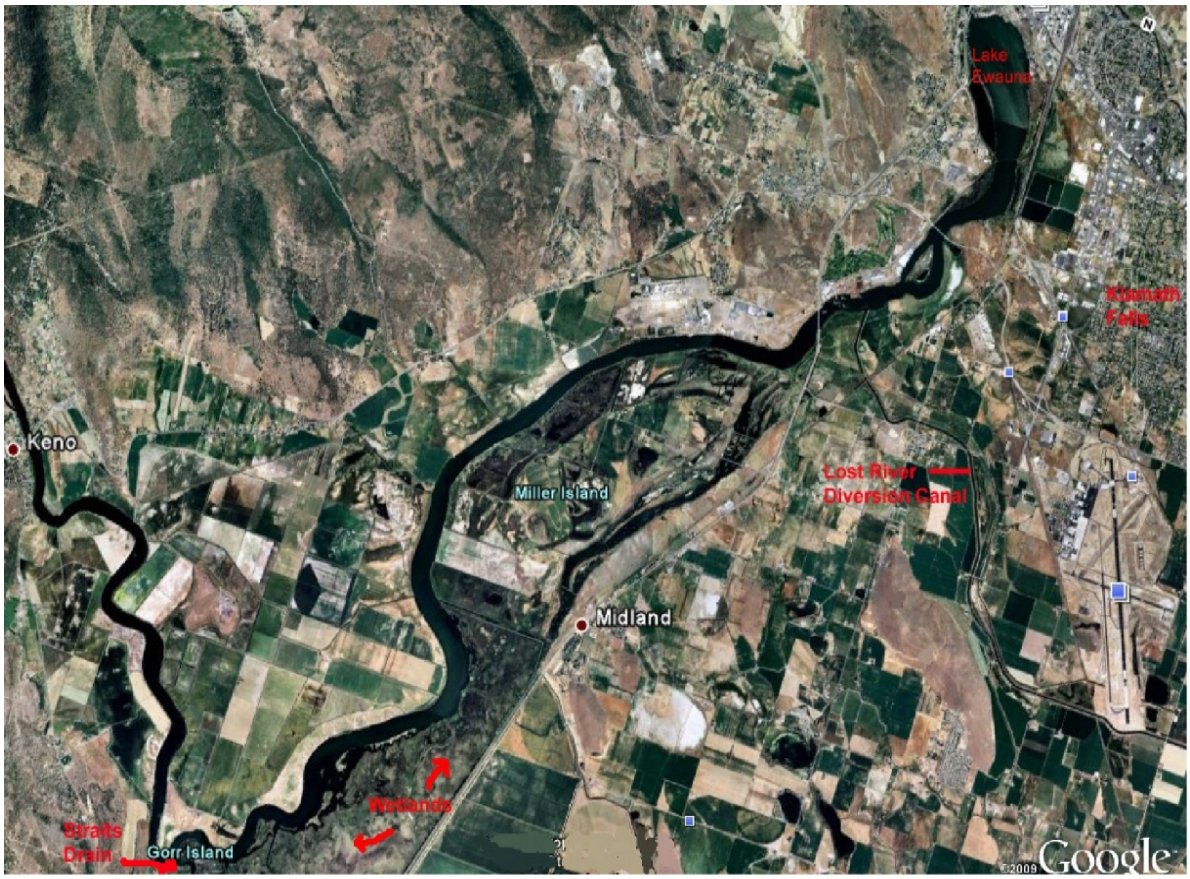


Figure 2. This image in the Klamath River in the Keno Reservoir reach is captured from Google Earth



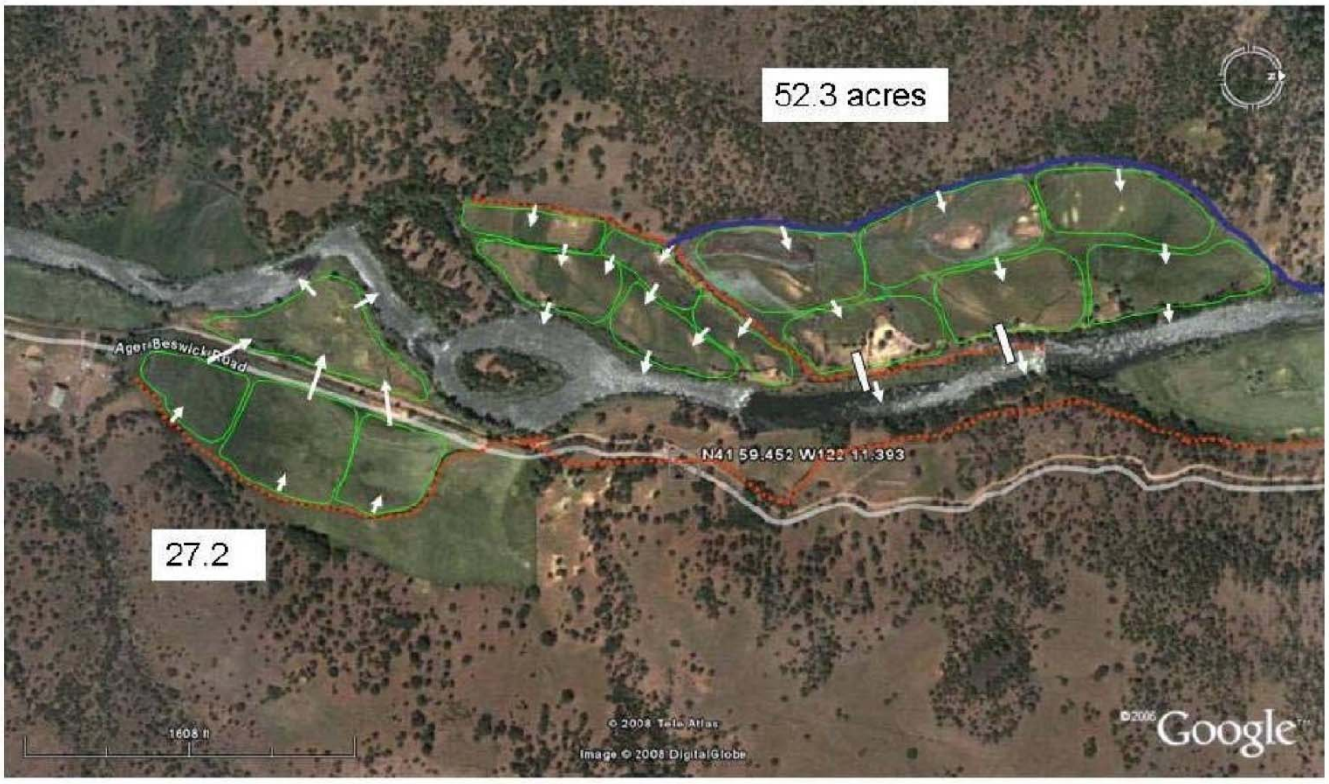
Response: Comment noted.

QVIR - Yurok 10: Constructed Wetlands:
Constructed wetlands are one of the primary nutrient reduction methods likely to be utilized in the proposed water quality improvement accounting and tracking program. In this section, we offer some suggestions on the placement, effects, usage, and design of such wetland systems. Although these comments below may be useful to ODEQ ongoing collaboration among all interested parties is encouraged to develop a comprehensive approach. Nevertheless, ODEQ should encourage constructed wetlands to reduce nutrients in the Klamath River by offering any services to allow implementation to occur in a timely manner.

Design Considerations for Constructed Wetlands:
The optimal wetland design characteristics (e.g. depth, area, volume, hydraulic residence time, and vegetation) for nutrient removal vary depending upon climate, the concentration of the various chemical forms of nutrients and organic matter in the inflowing water, the desired levels of reduction of such chemical constituents, and the volume of water requiring treatment. We will not attempt to address wetland design considerations in detail in these comments; however, there are many relevant studies available for the ODEQ staff to review (Kadlec and Knight 1996; Phipps and Crumpton 1994; U.S. EPA 1993, 1999, 2000; WHG and TP 2007) including several which are specific to the Klamath Basin (Deas and Vaughn 2006, Lyon et. al 2009, Lytle 2000, Mahugh et. al 2008).

Best Locations for Constructed Wetlands:
We recommend treatment wetlands with different types of characteristics depending upon their location along the Klamath River. These wetlands should be optimized to remove the specific forms of nutrients or organic matter that are abundant at a particular location.

Figure 3. A gently-sloping area on PacifiCorp's ranch upstream of Copco reservoir that is suitable for placement of constructed wetlands. Figure from Lyon et al. (2009), accompanied by the following caption: "Conceptual layout of surface flow wetlands at Site 013 on the Klamath River upstream of Copco reservoir. As much as possible, this makes use of the pre-existing gravity fed canals (in red) and when necessary, installs new channels (in blue)."



Previous and Ongoing Klamath River Studies Regarding Constructed Wetlands for Nutrient Removal:
The U.S. Bureau of Reclamation (USBR) and PacifiCorp have each conducted studies regarding the use of wetlands for nutrient removal in the Upper Klamath River Basin.
Lytle (2000) applied the Kadlec and Knight (1996) model to calculate the area of treatment wetlands required to treat the 70 to 133 cfs flows of the Klamath Straits Drain prior to its discharge into the Klamath River, concluding that an area of between 1,633 and 3,114 acres could achieve "a 61%reduction in total P concentration (0.41 to 0.16 mg/L) and a 90% reduction in total nitrogen including NH3-N [ammonia]. "Deas and Vaughn (2006) did literature research and calculations to investigate the potential of wetlands to remove particulate organic matter between Link Dam and Keno Dam. Their estimated scale for significantly reducing nutrients was 1,400 acres. A 5,000-acre marsh was thought sufficient to filter the entire upper Klamath River flow. However, they recommended that a pilot scale project be constructed to test effectiveness before large scale construction is considered. Mahugh et al. (2008) inventoried potential sites around Keno Reservoir for possible placement of pilot and full-scale treatment wetlands, and modeled potential effectiveness of such wetlands, and that team has submitted a proposal to USBR to construct a pilot project, but we are unclear whether the project has been funded. Lyon et. al (2009) conducted a similar study, but in addition to Keno Reservoir, also included areas between Keno and Iron Gate Dams see figure 3.

Opportunities for Constructed Wetland to Serve as Water Quality Refugia:
During the summer season, Lake Ewauna and Keno Reservoir have the worst water quality in the entire mainstem Klamath River. Due to the extreme oxygen demand imposed by the organic matter in the water and sediments, the entire water column of the reservoir can be nearly devoid of dissolved oxygen for weeks at a time, and fish kills are common (FERC 2007). Also, due to its location, Keno Reservoir lacks the cool oxygen-rich refugia provided in downstream reaches by mountain tributaries.

If properly designed and located, the outflows from treatment wetlands could serve as critical thermal refugia along those Klamath River reaches that now lack refugia in summer, such as Keno Reservoir. In treatment wetlands with complete canopies of emergent vegetation (e.g. cattail and bullrush), the plants and thatch (accumulated dead plant material) intercept the incoming solar radiation and prevent it from warming the water below. Given sufficient hydrologic residence time (which will vary according to factors such as inflow temperature - it was ~5 days in the Tres Rios wetland in Arizona described by Kadlec 2005), temperatures in fully vegetated wetlands in arid climates reach a "balance temperature" which is typically several degrees lower than mean air temperature due to evaporative cooling (Kadlec 2005). Thus, wetland outflow temperatures can be substantially lower than wetland incoming temperatures as has been demonstrated in municipal wastewater treatment systems in Tres Rios (Kadlec 2005), the Imperial Valley (Kadlec 2005), Sacramento (Kadlec 2005, Nolte and Associates 1998), Gustine/Los Banos (Gearheart, pers. comm.) and Arcata (Gearheart, pers. comm.).

One important conclusion that can be drawn from this science is that anywhere that mean air temperatures are less than or equal to mean water temperatures in the river, and there is relatively flat land available for wetlands to be constructed, outflows from constructed wetlands have the potential to provide thermal refugia. This potential is greatest in higher elevation areas, such as above J.C. Boyle reservoir. Since none of the local reports investigating the potential for treatment wetlands in the Klamath (Deas and Vaughn 2006, Lyon et. al 2009, Lytle 2000, Mahugh et. al 2008) predicted wetland outflow temperatures, we did some "back-of-the-envelope" calculations using air and water temperature data from 2007-2008 to provide a rough assessment of what constructed wetland temperatures outflows might be in the Upper Klamath Basin, and how they compare to current river water temperatures (Table 1).

The results are striking, suggesting strong potential for wetlands to provide thermal refugia. During months where high temperatures are a potential concern (May-October), mean monthly air temperatures at Klamath Falls Airport are ~3.4°C cooler than mean monthly water temperatures at Keno Dam. Assuming that treatment wetland outflow temperatures are several degrees cooler than air temperature in arid climates such as the Upper Klamath (see discussion above), that would suggest that treatment wetland outflow temperatures could be on the order of ~5.4°C cooler than Keno Dam water temperatures (Table 1). This temperature differential is great enough to have potential to provide significant thermal refugia. We emphasize here that these are preliminary results and that more in-depth calculations (e.g. applying the equations supplied by Kadlec 2005) should be used to refine these estimates, as these initial estimates may only be within +/- approximately 3°C of reality.

Table 1. Comparison of 2007-2008 monthly mean air temperatures (from the Klamath Falls Airport: http://www.wunderground.com/history/airport/KLMT), estimated constructed wetland outflow temperatures (estimated from air temperatures), and Keno Dam water temperatures (from USGS: http://or.water.usgs.gov/proj/keno reach/monitors.html).
Temperature C˚

Month	Air	Estimated Wetland (Air minus 2)	Keno Dam Water	Difference of Estimated Wetland & Keno Dam
May	12.0	10.0	15.8	-5.8
Jun	15.1	13.1	19.0	-5.9
Jul	20.3	18.3	22.9	-4.6
Aug	18.7	16.7	22.1	-5.4

Sep	14.4	12.4	18.0	-5.6
Oct	7.5	5.5	10.8	-5.3
Mean	14.7	12.7	18.1	-5.4

If a sufficient percentage of mainstem river flow was routed through wetlands, it could potentially be possible to go beyond creating localized refugia and even reduce mainstem river temperatures overall (though residence time in Keno Reservoir may confound this possibility). As noted above, a combination of constructed wetlands and reconnection of natural riparian wetlands through purchase or acquisition of easements is likely optimal because it also supplies potential sucker habitat.

Due to the decomposition of organic matter within treatment wetlands, dissolved oxygen in wetland outflows are typically low (though not zero) and may therefore require re-aeration prior to discharge back to the river if the outflow were intended to serve as water quality refugia. Aeration could be accomplished either through a weir structure (if there is enough gravity fall) or mechanical re-aeration. If wetlands discharged into a high gradient river reach (such as near site of J.C. Boyle Dam), re-aeration may not be required prior to discharge (low D.O. may be tolerable because water would quickly re-aerate as water flowed downstream).

Response: Comments regarding the potential for constructed wetlands to improve water quality and fish habitat are noted. The WQMP presented in Chapter 5 is not prescriptive but DMAs are encouraged to develop strategies to achieve their respective load allocations.

Specific Comments on Minor Issues

Chapter 1: Draft Upper Klamath and Lost River Subbasins TMDL Introduction

Karuk - QVIR - Yurok 11: 1.2.4 Tribal Trust Responsibilities
We are glad to see the statement that “The Department must consider federal tribal trust responsibilities in the Klamath River basin since TMDLs are subject to the approval of the USEPA.” (p. 1-8).

Response: Comment noted

Chapter 2: Draft Klamath River Dissolved Oxygen, Chlorophyll, pH, Ammonia Toxicity, and Temperature TMDL

Karuk - QVIR - Yurok 12: 2.3.1 Dissolved Oxygen, pH and Ammonia Toxicity
Figures 2.4 to 2.8 show D.O., pH, and ammonia toxicity. They are not very comprehensive (show only a very small amount of the total available data), but are sufficient to serve their intended purposes of documenting water quality impairment and longitudinal trends.

Response: Comment noted.

Karuk - QVIR - Yurok 13: 2.4 Seasonal Variation
On page 2-19, it is noted that “The following plots present data from 1995 to 2003 as reported by Tetra Tech 2006”. This citation is erroneous; it should be TetraTech (2004).

Response: The document has been revised.

Karuk - QVIR - Yurok 14: 2.5 Water Quality Modeling Overview
On page 2-22, it is noted that “Indeed, the entire TMDL modeling process has been a case study for collaboration at both technical and policy levels, with participation of two federal agencies, two state agencies, and private consultants over a five year period.” It should be noted that several Klamath River basin Tribes were also involved in the process and merit mention here.

Response: DEQ appreciates the involvement by several of Klamath basin Tribes, however the referenced passage was referring to s specific group that coordinated closely.

Karuk - QVIR - Yurok 15: 2.6.1 Pollutant Identification
Discussions of BOD on page 2-24 and 2-25 may provide more detail and equations than is necessary.

Response: Comment noted.

QVIR - Yurok 16: 2.6.1 Pollutant Identification
On page 2-26, it is noted that "Shade from riparian vegetation was not explicitly considered in the Klamath River analysis for the following reasons..." It is our understanding that topographic shade (i.e. from ridges, but not vegetation such as trees) was included in the water quality model and thus may merit mention here.

Response: The TMDL focuses on shade influenced by human activities. Topographic shade, though important is not affected by management options.

Karuk - QVIR - Yurok 17: 2.6.2 Upstream Condition - Upper Klamath Lake
On page 2-27, is stated that: "Despite restoration efforts, regular sampling of phosphorus concentrations in Upper Klamath Lake has not revealed a statistically significant temporal trend (data from personal communication with Jacob Kann of Aquatic Ecosystem 2009). The trend analysis used the nonparametric Seasonal Kendall method to test for montonic [sic] trends in the water quality data using the program WQHydro (Aroner 2009)."

This is passage is confusing and appears to unintentionally mislead readers. It should be re-worded for clarity. First, it should be noted that while there has been restoration effort, much of the most significant projects around the lake, such as levee breaches in the Williamson River Delta have only occurred within the past few years and thus have not yet become fully functional ecosystems (i.e. wetland vegetation is still developing). It may be that positive effects will become apparent in future years and it would be pre-mature to dismiss these efforts as ineffectual in the Draft TMDL and WQMP. Second, the data were collected by the Klamath Tribes and it would be more appropriate to cite the Tribe as the source of the data rather than Dr. Kann. Third, the passage appears to suggest that the Dr. Kann did the statistical analysis when, in fact, the analysis was conducted by ODEQ. This should be made more clear. Fourth, a few more details about the trend analysis should be included (i.e. what time-frame was used [annual, June-September?] and what were the p-values or other appropriate statistics?)

Response: Thank you for the suggestions. The document was revised to address your concerns.

Karuk - QVIR - Yurok 18: 2.6.4 USBR's Klamath Project: Lost River Diversion Channel and Klamath Straits Drain
Overall, this section provides an informative and well-illustrated summary of the effects of the Klamath Project on water quality (i.e. that on a mass-basis it is a nutrient sink but that it increases nutrient concentrations in the river, because it is more a water sink than it is a nutrient sink). A note should also be added providing the historical context of how agriculture has contributed to the degradation of water quality and aquatic habitat in the basin - something like: "In addition to diversions and discharges, agriculture has been the driving force in the historical changes in land and water use that have degraded water quality and aquatic habitat in the Klamath River and Lost River basins over the past century. These changes have included conversion of lakes and wetlands to farmland, construction of reservoirs, the channelization and straightening of stream channels into ditches."

Response: Comment noted.

QVIR - Yurok 19: On page 2-30 "Rykbost and Charlton 2001" is mis-cited as "Rybost and Charlton 2001

Response: The reference was corrected.

Karuk - QVIR - Yurok 20: On page 2-33, it is stated that "Briefly, the operation of Keno Dam appears to decrease dissolved oxygen by 0.1 mg/L in Keno impoundment and increase temperature by 0.7 °C at the

outfall." Also, Figure 2-43 ("Predicted 7-day average of the daily maximum temperature (°C) in Klamath River at Keno Dam") on page 2-57 is a graphical illustration of the same point. It was our impression that PacifiCorp's water quality modeling effort indicated a substantially larger effect on water temperatures. If this is true then the magnitude of the difference between the two model results should be discussed, as well as an explorations of the potential reasons why (is it related to a change in the reef elevation?).

Response: It is outside the scope of the TMDL analysis to compare the TMDL analysis with previous efforts to model the system.

Karuk - QVIR - Yurok 21: 2.6.11 Natural Sources
On page 2-33 and 2-34, it is stated that, "Specifically, there is a spring complex which contributes approximately 225 cfs (6.36 cms) just upstream of the JC Boyle powerhouse. Based on sampling from other springs in the basin and examining the nutrient mass balance in the river, we estimated an inorganic phosphorus concentration of 0.07 mg / L and nitrate-nitrite concentration of 0.25 mg N/L" Actually, it is our understanding that the values used in the TMDL water quality model for PO4 concentrations in the springs are 0.066 mg/L (close to, but not identical to 0.07) with a small amount of algae and OM, for a total P concentration of 0.0688 mg/L (IFR and PCFFA 2009).

Response: The numbers in the document were rounded. For reporting purposes, approximate significant figures were maintained throughout the analysis process.

Karuk - QVIR - Yurok 22: 2.6.13 Keno impoundment Source Evaluation
On page 2-37, it is stated that "In 2000, USBR's operations of Lost River Diversion channel was unique compared to other years, in that flows were diverted into the Klamath River during September (Jon Hicks, USBR, personal communication)." Based on information presented in Sullivan et al. (2009), this appears to have occurred in 2008 as well. The Lost River Diversion channel did discharge to the Klamath in September, because Sullivan et al. (2009) states that "The Lost River Diversion channel, which conveys water both to and from the Klamath River at different times of the year, was sampled only when flow was towards the Klamath River, which occurred in spring and fall." Appendix B of Sullivan et al. (2009) shows data collected on 9/16/2008 and 9/30/2008.

Response: Comment noted. The text will be revised to reflect the comment.

Karuk - QVIR - Yurok 23: 2.7.1 Natural Conditions Baseline
On page 2-41, it is stated that "The natural conditions baseline scenario simulated the Klamath River from Upper Klamath Lake to the Pacific Ocean in the absence of all dams, except for Link Dam, but represented the presence of the historic Keno Reef (a natural basalt outcrop that was removed prior to construction of the Keno dam). Keno Reef was represented using data provided by the Bureau of Reclamation." It would be useful to add a note regarding how the height of the reef compares to the current dam/reservoir elevation.

Response: The document will be updated with the requested information.

Karuk - QVIR - Yurok 24: 2.7.3 Allocations to address DO, pH, excess algae and ammonia toxicity impairments
The Table 2-10 ("Point Source Waste Load Allocations using flow-weighted averages") on page 2-46 does not list the percent reductions required. The percent reductions values should be added to provide context to the allocations and make them more understandable. It appears to be a reduction of approximately 90%, approximately the same reduction required for non-point source loading, but this should be explicitly stated.

Response: DEQ does not believe that percent reductions are useful metrics for presenting WLAs.

Karuk - QVIR - Yurok 25: 2.7.3.1 Point source and nonpoint source (except dams) nutrient allocations
Figure 2-38 shows an annual loading diagram for total phosphorus, but no similar diagram is presented for total nitrogen or organic matter. It might be helpful to include diagrams for these parameters as well.

Response: The graphs looked very similar, so they were not included. WSe chose to use a single graphic image that reflected patterns of all the parameters.

Karuk - QVIR - Yurok 26: 2.7.4.3 Thermal Load Allocations: Dams
Table 2-15 ("Keno impoundment and JC Boyle Reservoirs Load Allocations in terms of a the [sic] surrogate measure of temperature offset") on page 2-59 sets allocations of up to ~0.5 ºC of degree for Keno and Boyle reservoirs. How will these allocations be accomplished?

Response: The technical analysis presented in Chapter 2 does not include implementation strategies. DEQ expects the designated source (PacifiCorp) will develop an implementation plan to address the temperature allocation.

Karuk - QVIR - Yurok 27: 2.7.5 Instream Targets
Figure 2-46 and Figure 2-46 on page 2-60 are excellent graphics, clearly displaying summer longitudinal trends in temperature, chlorophyll, and nutrient concentration with the TMDL allocation scenarios.

Response: Comment noted.

Karuk - QVIR - Yurok 28: 2.8.1 Uncertainty Analysis: Model Input Uncertainty
A note should probably be added on page 2-62 that nutrient concentrations of the JCB Boyle springs have never actually been directly sampled, but were calculated based on mixing equations. Given the large volume of flow, this is a source of uncertainty. Someday, somebody should directly sample these springs.

Response: The text was revised to reflect the comment.

Chapter 3: Draft Lost River Dissolved Oxygen, Chlorophyll, pH, and Ammonia Toxicity TMDL

Karuk - QVIR - Yurok 29: 3.6.1.2 Nutrients
The statement on page 3-19 that "Available data indicate that a significant amount of nitrogen in the Lost River system is in particulate (organic) form." appears to be erroneous. Not all organic N is particulate, it can be dissolved. Recent USGS sampling found that the majority of the organic N in Keno Reservoir is dissolved (see Figure 3 in Sullivan et al. 2009) and this is likely to be similar in the Lost River given that Upper Klamath Lake contributes water to the system.

Response: The statement in the draft was based on the available data from the Lost River. It is unclear if the results from Keno impoundment are relevant because there is not a direct connection between Upper Klamath Lake and the Lost River.

Karuk - QVIR - Yurok 30: 3.6.1.2 Point Sources
On page 3-19, it is noted that "Klamath Irrigation District has a permit to use herbicide in their irrigation system and is not associated with the pollutants in this TMDL." It would be useful to mention in the text which pesticides are permitted, so that readers of the TMDL can assess any potential toxic effects on aquatic ecosystems in the Lost River.

Response: Comment noted.

Karuk - QVIR - Yurok 31: 3.7.1 Nutrient and CBOD Reduction Analysis
It is noted on page 3-31 that Oregon's water quality standards will be met in the Lost River with a 50% reduction in carbonaceous biochemical oxygen demand (CBOD) and dissolved inorganic nitrogen (DIN); however, Chapter 2 of the *Draft TMDL and WQMP* requires a 90% reduction in these parameters in the discharge of the Straits Drain (terminus of the Lost River system) to the Klamath River. This seems somewhat inconsistent, and thus should be discussed somewhere in the *Draft TMDL and WQMP* (perhaps it was, and we did not notice).

Response: The Klamath Straits Drain has allocations for both the Klamath River TMDL (phosphorus, nitrogen and biochemical oxygen demand) and allocations for the Lost River TMDL (dissolved inorganic nitrogen and carbonaceous biochemical oxygen demand). The text will be revised to reflect the comment.

Chapter 4: Draft Upper Klamath and Lost River Subbasins Tributary Temperature TMDL

Karuk - QVIR - Yurok 32: 4.1 Overview and Scope: Temperature Issues
Page 4-6 notes that "The potential causes of high water temperatures include urban and rural residential development near streams and rivers, irrigation water return flows, *past forest management within riparian areas*, agricultural land use within the riparian area, water withdrawals, and road construction and maintenance." (*emphasis added*). This appears to suggest the current timber harvest practices and rates do not contribute to high stream temperatures, and that only timber harvest in riparian areas matters. We disagree with both of those concepts. Some areas of the Klamath Basin have been so heavily logged that there is little forest remaining (Figure 5), and aerial photographs indicate that at least some of the harvest is recent (or the forest would have regenerated). Timber harvest outside riparian areas can cause landslides and other erosion that increases sediment levels in streams, increasing width-to-depth ratios, and resulting in stream warming.

Response: The text will be revised to reflect comment.

Karuk - QVIR - Yurok 33: 4.4.3.3 Hydromodification: Dams, Diversions, and Water Management Districts
On page 4-19, it is noted that, "USBR (2003) calculated that the Jenny Creek watershed contributed 24,230 acre-feet per water year to the Rogue River Basin Project. USBR also predicts that without the project, flows in Jenny Creek would be an average of 6 cfs greater in July and 4 cfs greater in August." We have never seen anyone quantify the effects of these diversions on Jenny Creek flows, so are very interested to review the USBR (2003) document. That document is not listed in the references of the *Draft TMDL and WQMP*. It should be added.

Response: The reference was added to the list of references.

Karuk - QVIR - Yurok 34: Page 4-20 of the Draft TMDL and WQMP notes that PacifiCorp's diversion of water from Spring Creek (a Jenny Creek tributary) into Fall Creek for the purposes of hydropower generation warms Spring Creek approximately 2 ºC and Jenny Creek approximately 2.6 ºC degrees at the Oregon/California border. Table 4.8 (page 4-24) notes that PacifiCorp's allocation for temperature increase in Jenny and Spring Creeks is only 0.1 ºC. We are unclear on what the on-the-ground implications of this allocation are. Does this mean that PacifiCorp must cease its diversion of Spring Creek water?

Response: PacifiCorp is required to develop an implementation plan that demonstrates actions to achieve the load allocation.

Karuk - QVIR - Yurok 35: 4.5.1 Excess Load
This section of the TMDL presents very informative model results comparing the current water temperatures of several streams to their "natural thermal potential" in a simulation with maximal vegetative shade and natural flow conditions (no dams, no irrigation or drinking water withdrawals, no point sources, and no water imported into the watershed). For example, as noted above, with the elimination of diversions and an increase in vegetative shade, water temperature at the mouth of Spencer Creek could be reduced by over 10 ºC (Figure 4) and be highly favorable to coho salmon. We appreciate ODEQ's efforts in performing these analyses, as the information should be quite useful in guiding efforts to restore thermal refugia following dam removal.

Response: Comment noted.

Chapter 5: Draft Upper Klamath and Lost River Subbasins Water Quality Management Plan

Karuk - QVIR - Yurok 36: 5.3.4 Timeline for Implementing Management Strategies

On Page 5-13, it is stated that "DEQ recognizes that there has been and continues to be much progress towards improving water quality in the Upper Klamath and Lost River Subbasins." We are not aware of any data showing that in-river water quality conditions in the Upper Klamath or Lost River are getting better. It is true that some efforts are being made, but factors such as climate change that are detrimental to water quality are also progressing. As we noted above, activity and effort is different than progress or actual improvement. This may seem to be an issue of minor semantics, but actually it is important to distinguish between the two; thus, we suggest that "progress" in the passage above be changed to "effort".

Response: Comment noted.

Karuk - QVIR - Yurok 37: 5.3.7 Identification of Sector-Specific Implementation Plans
The web link listed for the Klamath Headwaters and Lost River Subbasin AWQMAPs (http://www.oda.state.or.us/nrd/water quality/areapr.html) on page 5-17 is outdated. The current link is http://oregon.gov/ODA/NRD/water agplans.shtml

Response: Comment noted.

Karuk - QVIR - Yurok 38: 5.3.10 Monitoring and Evaluation
This section appears to focus solely on water temperature. Is there a reason why pH, dissolved oxygen, specific conductivity, phytoplankton, microcystins and nutrients are not measured? In addition, photo-monitoring is an easy and powerful tool for documenting and tracking both habitat conditions and projects. We recommend that ODEQ require and encourage photo monitoring as appropriate, and consider adding mention of photo monitoring to this section.

Response: Comment noted.

Comments from 201 Concerned Citizens

The following comments summarize similar comments received from 201 individuals.

I fully support you in setting the strongest possible standards for nutrients, temperature, dissolved oxygen and chlorophyll-a in Oregon's Klamath and Lost River TMDL. Stringent standards will benefit all residents of the Klamath River, as well as visitors who come to enjoy this place and future generations who will subsist off its resources.

I also support you in employing meaningful and effective tools to clean up the "dead" stretch of river above Keno Dam, and in requiring reductions in polluted discharges at Klamath Straits Drain.

I am also concerned about dense algae growth and oxygen shortages in the Oregon reaches of the Klamath--particularly in the lakes--and would like to see prompt action taken in the TMDLs to deal with this problem.

Please ensure that NPDES permits for dischargers such as Columbia Forest Products and local sewage facilities specifically incorporate the standards established in these pollution limits. Columbia has been allowed to illegally pollute the Klamath for too long. Please make sure all permits are brought up to date and all water quality impacts of the facility are fully regulated including log floats.

Most importantly, it is vital that the TMDL clearly delineate time schedules for compliance, parties accountable for compliance and consequences of non-compliance. Pollution limits without implementation and enforcement will not improve Klamath water quality.

Your time and attention on these important issues is appreciated.

Response: Comments noted. The text was revised to clarify the regulatory requirements for in-river log storage at the Columbia Forest Products facility.

Comments by Betty Anderson

I would like to comment on the proposed TMDL requirement for the Klamath River in Klamath County. I have lived at my home on the bank of the Klamath River at Keno for over 15 years now. My lot is almost 2 acres and includes about 200 ft of river frontage. I watch the river flow and quality almost daily as I also enjoy the multitude of birds that use the river as their home and highway. It depresses me to see the quality of the water decline from about July 1 until October. I observe the persistent increase of algae and weeds in the water, the slow and turgid flow and increased scum on the shore and rocks. It makes me very sad to think that today, in contrast to times past when children could safely swim and play in this river and salmon were common at the Keno reach, today I must tell my grandkids "sorry, you cannot swim in the river...it is not healthy." I have canoed the river many times, observing the trash, noxious weeds, thistles on the adjacent banks. I ardently wish that we can again turn the Klamath into a healthy, vibrant river. I whole heartedly support your proposed TMDL limitations on the river. I believe that the city and suburban sanitary facilities have for many years neglected to update and modernize their facilities. The property owners that use the facilities have refused to approve money for this improvement. It is time for them to pay up and stop polluting the river. Keep up the good work and save our Klamath River.

Response: Comments noted.

Comments by Klamath Irrigation District

The Klamath Irrigation District (KID) appreciates the opportunity to comment on the Draft TMDL. KID is submitting comments separately and jointly with Klamath Water Users Association.

In addition, KID wishes to point out that the draft document presents conflicting responsibility for irrigation districts in a federal reclamation project. On page 1-20, it appears KID is considered a water management district, thence a designated management agency (DMA). However, on pages 5-17, 5-18, it states that DMAs are associated with non-federal water and drainage systems. KID is a contractor to the United States and operates canals and drains owned by the United States. There are other entities, such as the Klamath County Drainage District, that also operate federally owned drainage systems in the Klamath Project. The canals and drains also collect drainage from non-project sources.

Response: The text was changed to reflect the comment.

Comments by Curt Mullis

CM 1:DEQ should more fully emphasize the flexibility we discussed in our meeting yesterday when evaluating and approving district WQMPs. The document should more clearly reflect that DEQ will accept plans that describe general progress towards improving water quality conditions that the districts can reasonably implement, as opposed to holding the districts to specific numbers reflecting precise improvements among the various allocation criteria.

Response: A designated management agency or designated sources is in compliance with the TMDL when following an approved TMDL implementation plan.

CM 2; Minor stuff- Section 5.3.13, p. 5-21- Add BOR under "Programs"; FSA is under USDA, not USDI. Section 5.4.2, p. 5-25- USFWS... should be Ecological Services Office. ERO is defunct. Probably should check with both FWS and BOR.

Response: The text was changed to reflect the comment.

Comments by Jim Wery

Water quality is increasingly becoming more important not only to local communities but nationwide.

The State of Oregon claims that it owns all the water within its boundaries. Water rights are really hard to come by and it is always on an individual basis but that's another story.

If I am required to pay more as a tax payer to treat waste water then so be it. However, if the state of Oregon owns all the water i.e. Klamath Lake, I feel that the state should be required to clean up Klamath Lake.

Why doesn't the DEQ mandate that this problem be addressed before forcing the city of Klamath Falls to clean up its wastewater. If the lake were cleaner, it seems like that would be a better place to start with this problem.

Fishermen don't fish the lake in the summer months because the fish caught in the lake taste terrible because of the polluted water. No one swims in the lake in the summer due to the algae. What a waste of a natural resource. The largest lake in Oregon and it is almost useless except for irrigation.

Clean the lake up first. It would promote better use of the lake. Imagine Klamath Lake clean! People would flock to this area to fish, water ski, boat etc. There would be restaurants and boating to enjoy the lake. Now it is a cesspool. The lake is only enjoyed from a distance.

The lake, if cleaner would benefit all. Wildlife would improve, our main industry, agriculture would still have water, fish would be healthier. People would be able to enjoy this body of water in many ways instead of its limited use now. In the summer time it stinks and you can see blue green algae blooms which we know are toxic. Seems to me if you have a cleaner lake then downstream the water would also be cleaner and a better habitat for our wildlife.

Clean up the lake first then address the downstream problems. The problem starts with the lake.

Shouldn't this problem be addressed by the state of Oregon?

The Department of Environmental Quality is a powerful department and should hold the state to the same standards as the individual communities

Response: The goal of implementing the Upper Klamath Lake Drainage TMDLs is to improve water quality in Upper Klamath Lake for support the designated beneficial uses. Entities responsible for implementing the TMDLs for UKL are identified in the Water Quality Management Plan for Upper Klamath Lake Drainage (DEQ, 2002). DEQ is a responsible for issuing the NPDES permits in the UKL Drainage and working collaboratively with the designated management agencies to implement the TMDLs that will improve water quality through time.

Comments by William Kennedy

WK-1, Lost River TMDL in Oregon: The TMDL for the Lost River in Oregon needs to underline and repeat that the data set used for this document is limited at best. There simply is not complete data on the water quality aspect of the Lost River.

Response: Comment noted.

WK-2, Temperature: The TMDL does not identify naturally occurring geothermal input into the Lost River. There are over a dozen locations where geothermal springs enter into this river. The TMDL does not describe the geographic landscape of the Lost River. This river is in the desert of Oregon where it naturally is exposed to high solar radiation. It has a gradient of less than one foot per mile. It is slow moving and shallow.

Response: The Lost River TMDL does not consider thermal inputs from geothermal sources. There is no temperature TMDL for the Lost River because it is not 303d listed for temperature.

WK-3, Temperature: The focus is on shade. Shade can have an effect on temperature but not to the degree that ambient temperature has. There are several studies on the impact of shade on stream temperature in eastern Oregon. (See Larson). Repair the literature review.

Response: Comment noted.

WK-4,Temperature: The draft TMDL for the Lost River also fails to acknowledge the beneficial impact that flood irrigated pasture has on water quality. Specifically, there is no reference to the important return flows that are cooler in temperature than the water, which was applied to the flood irrigated pasture.

Response: This impact was not quantified during TMDL development and the commenter does not provide this information. There was no temperature TMDL calculated for the mainstem Lost River.

WK-5, Designated Management Agencies: The TMDL for the Lost River refers to water management districts as being DMA's. There has not been any formal discussion with the water management districts as to their role in the implementation of the TMDL's. There is not an actual list of these districts except for being referred to in some graphs or figures.

Response: The text will be revised to reflect the comment. As part of the implementation process, DEQ will meet with individual water management districts to clarify expectations for TMDL implementation plans.

WK-6, Designated Management Agencies: There are several water management districts known as "improvement districts" that have no jurisdiction over water movement, they do not handle any water and they do not belong in the TMDL as DMA's. Poe Valley Improvement District is one such district.

Response: The text will be revised to reflect the comment.

WK-7, Designated Management Agencies: One DMA's that has been referred to in the draft TMDL is the Oregon Department of Agriculture. This DMA has played an important role in addressing water quality and non-point source water quality. It is important to note that by way of Oregon Department of Environmental Quality this DMA receives annual funding for its role as a DMA. None of the water management districts in this basin that have been designated as DMAs without consultation have been afforded any funding. The Oregon DEQ has handed an un-funded mandate to these districts.

Response: Comment noted.

WK-8, Designated Management Agencies: As we have all acknowledged, everyone is an advocate for clean water. What is drafted is a plan for improving water quality in the Lost River. What is ignored is the reality of what the naturally occurring background water quality and what is economically and physically possible to influence. The ODEQ needs to attend a 12-step program and study co-dependency.

Response: Comment noted.

WK-9: The Clean Water Act, which has prompted the TMDL for the Lost River and all water quality limited waters on the 303d list, is helping to drive new generations away from natural resource management. Your actions may be based on federal and state statues. You need to be aware that your actions and interpretations of the Clean Water Act may be the ultimate factor resulting in a nation dependent upon imported food and fiber.

Response: Comment noted.

Comments by Brian and Sally Woodward

I just want to express my opinion about the TMDL for Klamath Falls. I own a 12 space mobile home park for seniors. All are on fixed income and I keep the rent as low as possible but if sewer rates increase, it

will be financially devastating to these people. This is yet another example of environmental law gone crazy. All I am asking you is be an advocate for us- the public. Stand up for common sense and help our public officials. Find a solution besides killing our economy. For once, let's put humans in the equation and our impact of less than 1% of the river flow. If you will stand up for the public side of common sense, I would sure appreciate that. Thank you for your time.

Response: Comment noted.

Comments by: Thomas Mallams

The whole process seems to be ignoring proven historical data on the absence of clean water in the Klamath Lake & Klamath River. There needs to be a proven starting point of correct water quality standard from historical facts. Many of the standards are set at a level to support cold water fish on a year round basis. This NEVER existed in the Klamath Lake or Klamath River. Historical facts say that the water quality in both the Klamath Lake and Klamath River are actually better today than they were when the first white explorers came through this area.

Since the development of the Klamath Reclamation project, and irrigation development in the upper basin, there is a recorded increase of 30% in flows downstream (study done by Mark Van Camp, a hydrologist). Without the project all the water from Lost River would never reach the Klamath River. Before the project, Lost River ended up in Tule Lake and simply evaporated away there.

The dams on the Klamath River are being blamed for many of the water quality problems while not acknowledging the benefit of the dams. The dams keep water flowing in the late season where before the Klamath River often times "dried up." True, water quality in the reservoirs is not the best in the late season, but even the problems with the algae has been exaggerated way out of proportion, to the extent that one of the Tribes posted warning signs on the banks, warning people of "dangerous" algae blooms that were present. This is simply scare tactics, since there are no documented cases of serious problems with the algae. The occurrence of any serious problems is highly unlikely and would be very rare. With that attitude you would have to ban all people from the Klamath River for fear of drowning, since many have died or been injured from swimming in the river, where no one has died or been injured because of the algae.

Historically, it is said that there was 200,000 acres of wetlands, in the project area. After developing the project that number was reduced to 17,000 acres. Wet lands are supposed to filter the water. They apparently didn't function well since before the project was developed, the water quality is documented as being so poor the early explorers wouldn't even allow their horses and other livestock to water there.

A serious problem with expanding or putting wetlands back is what happens to all the organic matter produced in the wetland? That decomposing material and or the chemicals in the material often times still ends up in the Klamath Lake or Klamath River, when there is a high water event. Wet lands also consume a greater amount of water than any irrigated crop in our area. This is thru evaporation in the large warm shallow water in the wetlands and transpiration or loss of water through the plants in a wet land. In the last 20 years, over 98,000 acres of irrigated land has been taken out of production. Most has been put into wetlands and there has been no measured improvement in water quality or quantity, in our basin.

Agriculture is routinely blamed for much of the water quality problems in the Klamath Basin. Our entire basin has a volcanic origin. Many of our springs and creeks literally come out of the ground loaded with phosphorus, many times over allowable limits. This natural occurring phosphorus promotes algae growth in the shallow warm water in Klamath Lake and the algae then produces the nitrogen levels that continues the cycle of out of compliance water in both the Klamath Lake and the Klamath River. If we need to change what Mother Nature has given us, or we need to change what has been the historical conditions of the Klamath Lake and Klamath River, then be critical of Mother Nature, not agriculture!!

TMDL standards have been set according to what it takes to keep cold water fish alive. No scientific proof exists that proves cold water species ever existed above the dam locations on any consistent level in the years before the dams were built on the river. Any salmon that did make it past where the dams are now were beat to pieces and not edible. The Klamath Tribe historically got their salmon in trading with the downstream tribes. Often time their form of barter was slaves for fish. Another major conflict is that the Klamath Lake and the upper part of the Klamath River is habitat for the various warm water sucker species. That puts two opposing habitats being mandated in the same exact water bodies. There is so much written historical evidence from the earliest explorers to Tribal members themselves that seems to be ignored. Only one side is being recognized.

In conclusion, even if all agriculture was eliminated, the high probability is that with the natural occurring elements in our water, the entire water system would go back to the
Poor state before agriculture was advanced here. The end result would be – NO Farms, NO Jobs, NO food production and still POOR WATER QUALITY.

Please use some simple common sense.

Thank you,

Response: Comments noted.

Comments by Therese Cartwright

I want recognize and commend DEQ and all those present and talking this time around as well as to encourage further participation concerning the ongoing water shortages in Klamath Basin Watershed. Most realize that this is an ongoing process in nature and we must change how water is over allocated in this basin. I want to identify that I have been involved intimately in the ongoing water process in the Klamath Basin since 1999.

Water quality and the precious allocation of water flow in this basin are necessary for all life. I have great compassion and empathize with farmers, ranchers and irrigators. I am personally aware of the costs and what individual farmers/rancher and our community are going through including the cost to their financial livelihoods. Having participated in the BOR Chiloquin Dam Removal process in 2003/2004 I am aware of the accurate and vast collaborative efforts that went into removal of the Chiloquin Dam. None of the individuals, city, county, nor irrigators/farmers/ranchers present at your May 12, 2010 at 6:30pm meeting in the auditorium at Oregon Institute of Technology in Klamath Falls, OR, were present for the extensive period of time, scientific presentations and broad spectrum of interests that collaborated together in the removal of the Chiloquin Dam. Limited pure water inflows and the limited supply of aquifer water upstream are greatly affected by water draws downstream. With the history of severe putrification within the Klamath Basin BOR Project it is an immediate necessity to address and limit TMDL's and water expenditures for irrigators downstream. We are well past the time that all users need to deal with the reality of decreased TMDL's. In 2003 irrigators will only received 75% of normal deliveries and therefore for the first time in BOR history shared the burden of water over-allocation in the Basin. When irrigators draw too much our wells in Rocky Point get drawn dry.

The 2003 BOR figures disguises the profound unfairness of the current plan by relying on an apples-to-oranges comparison of wet and dry water year allocations, and neglects to factor in the 50,000 acre-foot water bank. As the BOR figures show, Project irrigators received or were paid for 103% of average water deliveries in a dry year.

In comparison, the refuges within the Project received only 53% of average deliveries in a dry year, or roughly a quarter of the amount necessary to sustain refuge habitats into the critical migration season. Klamath River flows take even deeper cuts, with flow ranges varying from 45% to 76% of dry year levels scientists have recommended to recover salmon populations (Hardy and Addley 2001). Upper Klamath Lake fares no better. The 2003 plan dried out all of the lake's bordering marshes-covering thousands of acres–from August through November. This extended period of low lake levels had a devastating impact

on the lake's ecosystems and water quality, disrupt the fall migration of waterfowl, and jeopardized the survival of the lake's endangered Lost River and short nosed suckers as well as many other residents and animals who depend upon this water source. The Bureau's plan failed to provide river flows and lake levels adequate to prevent harm to species on the brink of extinction. It also fell far short of the U.S. government's Tribal Trust responsibility to provide the water necessary to achieve and maintain the robust, harvestable fisheries promised the Klamath region's tribal nations over a century ago. Given the extreme disparity between the water allocations to Project irrigators in comparison to the allocations for all other interests in the Basin, two questions remain: *Where is the balance in the Draft DEQ Water Quality and BOR plan and what did the BOR's water bank pay for?*

Solutions suggested:

1. Continue to limit TMDL's. Begin strict monitoring and rigid costly fines for misuse of all water allocated off the Klamath Basin watershed for those of irrigators in northern and western part of the watershed as well as the southern.

2. Continued Federal, State and County financial assistance to increase the water storage of significance to keep water in the Klamath Basin Watershed and ecosystem, implement greater supplies of water banking, and then let it out in a strict prescribed way. (i.e. the 50,000+ acre feet drained in 2008/1009 by Jeld Wen/Running Y Resort et all & re-damned which was and could have continued as a great natural water storage off Geary Canal).

3. Continue dialogues, research, actions and cooperative land/storage purchases and collaboration with all Federal, State and County agencies including and not limited to the Klamath Tribes, all agencies within the Department of Agriculture including BOR and State, County agencies and regional irrigators as well as residents of the Klamath Basin to keep water within our ecosystem.

Thank you for the opportunity to address this complex and vitally important issue! There is no quick, inexpensive or easy fix for our current and ongoing neglect. Our wells here in Rocky Point are getting strained this early in the water year due to over usage downstream.

Response: Comments noted.

Oral Comments: Klamath Falls Public Hearing at Oregon Institute of Technology, May 13, 2010

Comments by Randy Shaw-Klamath County Planning Commission.

I want to make my comment specifically to just the community itself. I don't wish to get in to the agriculture end of this thing because I think both side have their own thoughts on all of this and so I would like to talk about specifically to the impasse and what we believe are the solutions to some of the issues and those I guess those theories have been developed through meetings between Klamath Fall City Planning Commission and Klamath County Planning Commission and through research done by some of the publications that have been put out by the DEQ and so forth. It appears to us that what may be required by the city, sewer requirements of The South Suburban Sanitation District as far as their thermal discharges into the river are actually inconsequential to the TMDL's .

It would actually be I think on the community to spend the type of money that would be required in order to clean the sewage to the level that is being talk of or spoke of and we feel pretty strongly that there are some alternatives that can be looked at here which would involve dredging of the lower part of Klamath Lake, from about the Buck Island area down to the mouth of Green River. And we would actually like to join with some of the other communities groups to develop some scientific knowledge on what the effect of that might be. It is our understanding that to remove the wave actions that are pretty prevalent on Klamath Lake at certain times of year, that this can cause the phosphorous levels to rise based on the disturbance of the bottom of the Lake. It is also our understanding that there is approximately eight feet or so of sediment that is collected on that lake since the installation of Link River Dam, and we feel that there are small (inaudible) that need to be looked at, we haven't really developed a plan that would make any commitments on how we might gather that information but we think that it is important that that is

included in the potential solutions for these TMDL's levels, especially in relation to the Klamath River itself, and actually I think we have a lot of work to do yet ahead of us and I just want to get this in to the record at this point because time is short for the submission of that. We really haven't had a opportunity to really look in to that possible advantages of something like that but we think that there are some real advantages not only to the TDML but to the community itself and certainly to citizens that live here as far as the cost of what may be required of them at the sewage end itself. You know I think that the thought in mind at this point is that we have a lot of work to do ahead of us but we do want to get on record at this point is that we think there are some alternatives to what is being talked about as far as conditions that are going to have to be met by the two sewage systems in this community. We want to continue our development of this idea or concept and we're certainly looking forward to working with other entities in the community and DEQ along with other agencies that maybe involved in helping to develop a plan that has some solutions that are not only good for the community but also good for the fish and everyone that lives in the area.

Response: Comments noted. DEQ will continue to work with the Designated Management Agencies (DMAs) and designated sources during implementation of the TMDLs.

Comments by Luther Horsley

I am a third generation farmer in the basin and president of Klamath Drainage District. I would like to preface my remarks by saying I am not arguing against clean water. I am a great proponent of sustainable communities of all species in the basin but I don't believe that your actions are going to enhance that. Our district has a water quality management plan in place already which if we could spend less time chasing our tail trying to fill out all your forms or comply with your regulations, we could actually do some hands on infrastructure improvements which we know will improve water quality much faster and a more beneficial rate than some of the proposals that you are promoting. By your our admissions at the last meeting, you said that in 50 years you didn't know if these TDML's would have any effect or what they would cost and we know what we can do to improve water quality in our district and I think we know a faster way to do it. I would also like to say, Steve just said that there is also a nitrate problem in the basin and as you know Klamath Basin is the apex of the Pacific flyway, we get millions of birds passing through here on their migrations. I would like to know if you took into account bird defecation that occurs.

Response: The TMDL analysis for Tule Lake and Lower Klamath Lake Refuges considered nutrient contributions from natural sources such as waterfowl.

Comments by William Adams-City Council, Klamath Falls

I appreciate the fact that DEQ is required by EPA to develop TDML's standards for the Klamath River but I also believe the government has a responsibility to its citizens to use common sense when setting rules and standards. Where's the common sense? The cost benefits ratio of these new TDML's standards is beyond my comprehension. The most recent cost analyst has the City of Klamath Falls spending 22 million dollars to meet these standards, that's one thousand dollars for every person in the city of Klamath Falls that's hooked up to the system, four thousand dollars for a family of four. If the improvements that were made would actually improve the river by some measurable degree there might be a reason to implement these standards. The City's treatment plant flows probably less than two to three percent of point sources that are in the river. I am willing to bet that 500 feet from our discharge there will be no measurable change in the water quality in the river. So what since does it make for us to spend this money? I can't in good conscience pass this cost on to our rate payers. Just say no.

Response: Comment noted

Comments by Trish Seiler – Klamath Falls City Council

Two of my colleagues on the council up here along with our Public Works Director and I know that the Public Works Director has a deeper understanding than I do in all of this but I really find this to incredibly frustrating. I don't believe in shooting the messenger, I understand you folks with DEQ have a job to do and like the previous commenter, I support clean air and water, but you have to know something. We're a

little fried. We have one year to devise a plan after we get your plan. I have heard numbers anywhere from 22 million to 180 million. It is hard for me to get my head around 180 million. Like my colleague Mr. Adams it's my understanding that between South Suburban Sanitary District and the City of Klamath Falls wastewater treatment plant we contribute less than 3% to the absolute discharge, less than 3% of the problem. There is no guaranty that throwing millions of dollars at this problem is going to fix it, I don't have much confidence there. I feel like we are throwing money down the river. The prospects for our constituents is unreasonable in these difficult economic times to have to go to our constituents and say to them you're going to have to pay, and have to pay and then pay some more. I work as a professional grant writer for the private sector. My comment on your limited grant program indicates to me that this is essentially an unfunded mandate. We can apply for all the grants we want. You take out one of those and its all taxpayer dollars. I would like to see how the application forms work, to make them available to me. So, as I said I see this as an unfunded mandate that will add to our community's already difficult economic situation. We need time to decide what option we are going to choose. We need time to work with the other stakeholders and our partners in resolving these problems and we need time to figure out how to pay for it. So I guess I am requesting that yes we will take the responsibility and put our own plan together working with the community, but if we have to implement this in a very short amount of time, we have to go our constituents and raise millions of dollars in a short amount of time it's going to be incredibly difficult. So if we have the option of phasing in all our solutions over time, over 3 to 5 years or whatever. It's not going to take the pain away because we still have to pay for it but it might help us devise a better plan, that's all I am saying. Thank You.

Response: DEQ will continue to work with the City of Klamath Falls during the TMDL implementation process.

Comments by Gail Whitsett

I am Gail Whitsett, Chief of Staff for Senator Doug Whitsett. I have a fair amount of testimony and I am going to read it because some of it is pretty complicated. I have a bachelor degree in geology from OSU, a masters degree in geology from Oregon State University with additional geologic work at Princeton University. My primary background is in sedimentation and stratigraphy specifically in reconstructing environmental deposition in paleoclimates. The following is my opinion. I object to the Upper Klamath Lake TMDL's is basically the upper Klamath River TMDL, based on the following. I first became aware of the Upper Klamath Lake TMDL in 2001 and tried to participate in the TMDL process for almost ten years now. Dr. Ken Rykbost PhD, an OSU employee and I sent comments on the earliest data sets to the draft TMDL which were not assimilated in the final TMDL of 2002. The Upper Klamath Lake TMDL is primarily flawed in two respects. The first is that the tribal hired scientist Jake Kann says the estimated background phosphorus in Upper Klamath Lake is total inflow volume times mean concentration of phosphorous, based on springs around Upper Klamath Lake. Anthropogenic phosphorus loads were estimated the different between the total inflow load and the estimated background load. This is an unsupportable assumption suggesting no loading from three things: first normal resident processing in Klamath Lake, wetlands and swamps adjacent to Upper Klamath Lake, flows from swamp and marshes along Sycan and Seven Mile rivers and inflow from springs along faults in Upper Klamath Lake beneath 2000 feet of phosphorus or sediment underlying the lake. Up to 15% of all the water in Upper Klamath Lake is estimated to be derived from springs underlying the lake which are directly emptying into the lake. The Oregon Department of Geology and Mineral Industry have had two geologists who worked in the Klamath Basin and one geochemist described the naturally occurring background of high phosphorus in certain volcanic bedrock assemblages surrounding Upper Klamath Lake. This form of environmental phosphorus is liberated during natural erosion of the geological material and has been accumulated in low lying areas of the Klamath Basin, including the Lost River sub-basin and Upper Klamath Lake for millions of years. Estimates of the depth of the graben that Upper Klamath Lake occupies is up to 6000 feet. The amount of phosphorus which lies under Klamath Lake in a large sediment interface is enough when re-suspended with a wind shear of 30 miles an hour over the lake surface which we often get, to keep the lake in a hyper-eutrophic state for 60 years. This is from an article researched by two OSU professors named Phinney and Peek, the two projected that waters from Upper Klamath Lake or any low lying area of Klamath County be cleansed of phosphorus is absolutely impossible. We are now being asked that our sewage treatment plants including South Subburban clean water coming out of the plants to a cleaner

state than ever existed or ever can exist with modern treatment methods. The ODEQ has steadfastly refused to review the Upper Klamath Lake TMDL as was required by law every five years. We should be close to a review with an update status of the incorrect data in the Upper Klamath Lake TMDL. Instead the ODEQ has refused to review it even once in the ten year time period. Senator Whitsett as a Senator, requested the then ODEQ director Stephanie Hallock to review the Upper Klamath Lake TMDL and was told by ODEQ legal staff that ODEQ does not have the money to do what is required by law. The obstruction that I can only assume comes from the Oregon Governor's office regarding the Upper Klamath Lake TMDL is beyond comprehension. After this official request was made to the ODEQ, a letter was delivered to Senator Whitsett's office saying there was no evidence that this natural background occurrence of high phosphorous exist in this basin. This letter was signed by then acting Director Dick Pederson of the ODEQ and Vicki McConnell head of DOGAMI. This letter is in direct contradiction to DOGAMI's own on-the-ground scientist and empirical data set that's showing the increased phosphorous. Additionally, DOGAMI purchased the data set of geochemical analysis from a professor at a Pennsylvania University showed the increased natural phosphorus in some volcanic bedrock units. I would who directed McConnell and Pederson to send a letter to Senator Whitsett denying the facts. This is really an inconvenience to the Governor and the Interior Department for the agenda of the Klamath dams but there is proof that removing the Klamath dams cannot and will not ever clean up the water in Klamath River from the natural background phosphorus which is ubiquitous to the Upper Basin and on which the Upper Klamath Lake TMDL and The Klamath River TMDL are based upon. Furthermore, the Federal government's biological opinions for the long and short nosed suckers factors of Upper Klamath Lake and the lower salmonid biological opinions of the lower Klamath River are in jeopardy of being incorrect if the Upper Klamath Lake TMDL is actually corrected for background phosphorus since both of these biological opinions use the Upper Klamath Lake TMDL as a cornerstone for their science. Additional examples of data sets which are not corrected in the Upper Klamath TMDL include the primary data set regarding cores taken from the lake by an individual named Joe Eilers. It is my understanding that Joe Eilers worked closely with Jake Kann who was hired by the Bureau of Reclamation under Mark Buettner's direction. This core work included three cores which supposedly showed increased sedimentation due to anthropogenic causes but after asking to review the raw data for the study, I found out that the K2 core was disregarded without an explanation, the K3 core was disregarded due to the fact that its strength was too erratic and did not match what was expected. The third core was used. This third core, K1, was supposed to represent such fine stratigraphic delineation that Eilers wrote an entire paper on it and it was used in the present biological opinion. The problem is that the core shows bioturbattion by small insects called Chironomidae otherwise commonly known as midges. There is no possible way that sedimentation patterns or stratigraphic records could be derived from living larvae migrating from the top of the core down to the bottom. Their migratory movement wouldn't have caused mixing of the layers. His paper has removed any sensible scientific methodology and statistical methods for confidence. If this TMDL remains still in its entirety and unchanged and unchecked and is ripe with computer generated models based on incorrect data. The TMDL is littered with disclaimers from the from Kann, Eilers and others such as quote "There is always some concern that when most of the analysis is comprised of a single core and results are artifacts of atypical patterns from sediment samples" translation; this core may not represent anything factual at all. And this core data is still being used by the State DEQ and now the California Water Quality Control Board. This TMDL serves as literally a cornerstone of all biological opinions in the Klamath Basin and its farmers and ranchers are suffering through the biological opinion. A letter was hand-delivered to the BOR and the U.S. Fish and Wildlife Service stating my concerns with the data as did Ken Rykbost. We have not had our concerns heard during the entire time and I just want to tell the record that I believe the Upper Klamath Lake TMDL is scientifically incorrect in many aspects, it should have been reviewed. And it's the problem with almost everything that is going on in this basin right now. Thank you.

Response – Upper Klamath Lake TMDL: Pending the availability of adequate resources, DEQ will review the water quality model used to develop the Upper Klamath Lake TMDL and work cooperatively with USGS, USBR, and other stakeholders for revising the TMDL for Upper Klamath Lake.

Response - Phosphorus levels in springs: The document *Response to Public Comments, Upper Klamath Lake Drainage TMDL/WQMP, May 2002* (http://www.deq.state.or.us/wq/tmdls/klamath.htm) states: "The Department agrees that background conditions for all areas of Upper Klamath Lake drainage are not

equivalent to spring concentrations. The Upper Klamath Lake TMDL does not make any conclusions about the natural background condition of nutrient loading. The Department feels that inadequate information exist to quantify "natural" pollutant loading rates and that Lake nutrient loading targets should be water quality based. Information regarding the total phosphorus levels in springs is provided in Section 2.5.3.2 Upland Sources of External Phosphorus (Upper Klamath Lake Drainage TMDL, 2002)".

Response - Phosphorus in rocks: The Department does not disagree with the geologic mapping of the upper Klamath basin conducted by Oregon DOGAMI. The commenter appears to draw unsubstantiated conclusions regarding the nature and magnitude of phosphorus partitioning from the solid phase to the aqueous phase, and rates of sediment transport based on the geologic maps by DOGAMI and whole-rock lab analysis. DOGAMI's analysis did not extend beyond a mapping and description of rocks.

Response - Paleolimnology of Upper Klamath Lake: We respectfully disagree with the commenter. The commenter discredits the peer reviewed research conducted by Eilers, Kann, Cornett, Moser and St. Amand presented in the journal *Hydrobiologia* (Eilers, J. M., Kann, J., Cornett, J., Moser, K., & St. Amand, A. (2004). Paleolimnological evidence of change in a shallow, hypereutrophic lake: Upper Klamath Lake, Oregon USA. *Hydrobiologia, 520*, 7-18.). The peer reviewed research by Eilers et al has been supported by additional research of Upper Klamath Lake by Colman et al. (S M Colman, J P Bradbury and J G Rosenbaum, Paleolimnology and paleoclimate studies in Upper Klamath Lake, Oregon, *Journal of Paleolimnology* 31: 129–138, 2004.). Based on more than 40,000 years of continuous paleoclimatic record for Upper Klamath Lake, Colman et al. concluded that both diatoms and remains of blue–green algae mark progressive eutrophication of the lake in the 20th century, especially after about 1920. Colman et al stated: "These conclusions are compatible with a parallel study of recent limnological changes by Eilers et al." Further, Colman et al. concluded: "The results also provide a comparison between natural conditions in Upper Klamath Lake and current, anthropogenically disturbed conditions, and show that the lake has been significantly impacted by human activities."

Finally, DEQ staff responded to previously to similar comments (see Response to Public Comments, Upper Klamath Lake Drainage TMDL/WQMP at http://www.deq.state.or.us/wq/tmdls/klamath.htm) DEQ staff have also met with Gail Whitsett and Joe Eilers on several occasions to discuss issues with the sediment core analysis.

Comments by Betty Dickson – Klamath Falls City Council

We need to hire Gail. I am too concerned about the TMDL's study and its direction that we should follow. One of our concerns is arsenic. We have not got the equipment to measure arsenic and were wondering if you guys do. We would also like to know if natural conditions are taken into consideration, our sewer treatment plant with the City of Klamath Falls is putting out water that is excellent for this industry, cleaner than the water that is already in the river, than how are we expected to come up with any cleaner lake. It doesn't really make sense and I don't understand how our economy is going to handle it, not only the 22 million plus just to get the treatment plant up to whatever, whoever standards but I am also concerned about the ongoing costs once we try to meet whatever this standard is going to be there has to be additional cost on a daily bases to keep up these standards so not only do we have the cost of building up our treatment plant we have the ongoing cost of trying to keep up with whatever it is we have to do to treatment to have our water even cleaner than it is now but we also have to put that burden on our tax payers and I also appreciate Mr. Adams putting it into perspective that 22 million dollars equates to one thousand dollars per person and that is just the beginning. Thank you.

Response: DEQ will continue to work with the City of Klamath Falls during the TMDL implementation process.

Comments by Bob Flowers – Ady District Improvement Company

I served for several years with people on this TMDL board which was closed down and opened back up in its present form and at that time there was a lot of concern all along how it was set up and as we all know if the board is not active, the whole process is skewered, and it was pretty obvious to me at least that there was a lot of ineptitude involved and I haven't seen that being corrected. A lot of things have

changed, how they approach this, the different nonpoint sources became point sources. It's pretty bad when we're talking about when we have to live by and you have to meet and showing will actually show that we have a pretty big impact. From the District's standpoint, it still amazes me that they been working over ten years to create this plan and in my opinion, there is really no provision to make it accountable. If it's just something that happens, in this district there are 18 votes for submitting a plan that meets goals that are unattainable. DEQ says don't worry about, if you can't reach it, it's not a problem, but to me as president of the district that's a supreme problem. A couple of other things that really bother me is there's a lot of different districts and a lot of individuals out there. Districts can't control certain things that come into their district, i.e. they have limited control as a district and yet the district is responsible. This is one of my main questions. I'll shut up now. Thank you very much.

Response: The Water Quality management plan identifies various water management districts as sources or potential sources that are required to submit TMDL implementation plans. The size and scope of the individual plans can be tailored to the relative size of the individual water management district. DEQ staff will assist the water management districts in drafting implementation plans that meet DEQ expectations. Regarding accounting and tracking of TMDL implementation, see Section 5.4.1 Water Quality Credit and Tracking Opportunities.

Comments by Therese Cartwright

I am a resident and also work with a non-profit organization PACE and worked on the removal of the Chiloquin River Dam. And mostly what comment I think that doesn't speak of water quality here in the basin and especially Upper Klamath Lake, everybody knows waters are over allocated and quality is important and that's all I have to say. Thank You.

Response: Comment noted.

Comments by Claude Hagerty - Shasta View Irrigation District

I have watch over the last 10 years or better of what the endangered species act has done. In my farm, at least in my district, the money that we have expended to fight this issue, after all these years I haven't seen more sucker fish. I don't see any more salmon. I don't see any results from that. I see the extent of control by government, that's what I see and that's what I think is going to be the occasion here. This Clean Water Act, I'm all in favor of clean water, as Lester Horesly is on this and I'm in favor of more fish, I'm in favor of lots of things. But I'm interested in protecting the answers and so are the people in our irrigation district. I sense what will happen with these rules is we will be given rules to comply with that have very little effect on the environment but will be extremely expensive, in some cases prohibitive. As a result I want that included in this testimony. Thank you.

Response: Comments noted.