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TO: Water Resources Commission

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SUBJECT: Agenda Item I, November 19, 2010
Water Resources Commission Meeting

Ecological Flow White Paper Development

I. Introduction

In the summer of 2009, the Oregon Legislature passed House Bill 3369 which provides grant and loan programs for water conservation and development projects. The bill further allows that proposed storage projects include protection for "peak and ecological flows." In an effort to define a process for implementation of this mandate, the Oregon Water Resources Department (OWRD) organized a group of expert scientists with the title of the Ecological Flow Technical Advisory Group (EFTAG). The EFTAG was tasked with developing a scientific framework for protecting peak and ecological flows in Oregon.

II. Discussion

The purpose of the EFTAG is to provide technical information about peak and ecological flows in terms of 1) defining what they are, 2) describing methods that are commonly used to determine them, and 3) providing recommendations regarding how these methods might be applicable to Oregon. The technical information is intended to be used by policy makers in crafting rules, guidance, or other strategies to implement HB 3369.

A draft paper was completed by the EFTAG and sent out for peer review in July 2010. Four peer reviews were completed by August 1, 2010, along with additional edits and comments from the members of the EFTAG. Over the last 3 months the edits, comments and suggestions were incorporated into the paper as appropriate. Most of the substantive content remains unchanged. Structurally, however, the format of the paper has changed considerably, including the addition of information that provides clarification and examples. The paper references 93 endnotes which provide a library of relevant scientific literature for future use.

Peak and ecological flows can be defined as: "*instream flows needed to sustain ecosystem functions that native fish and wildlife species require to survive and flourish. These streamflows include baseflows and flow protections over a range of flows that provide habitat maintenance and other ecological functions".*

Ecological flow functions in scientific literature are often grouped into the following categories:

> Baseflow functions such as minimum or optimum habitat flows. These represent the low flow functions of a stream that provide minimal direct habitat for fish and other aquatic organisms.
> Biological triggering flows represent elevated streamflows that may trigger or facilitate a behavior in an aquatic organism that is essential for its survival such as migration or spawning.
> Channel habitat maintenance flows are elevated streamflows (often flood or peak flows) that rework the channel or its streambed rejuvenating or cleaning gravel, reforming habitat features, replenishing/rejuvenating riparian vegetation, and/or re-establishing connectivity with off channel habitats.

Oregon's current screen for determining water availability for storage applications is a comparison of the 50% exceedance estimated natural streamflow with the instream and out of stream flow rights. Values for the 50% exceedance flow are calculated for each month of the year. The total of all consumptive use, storage, and instream flow allocation is subtracted from each monthly value. If the remaining value is a positive number, water is considered to be available for a new appropriation. The "storage season" typically spans from November through April, with some variation regionally. The 50% criteria, although partially protective, does not take into consideration peak flow events, nor does it consider the total yield of a basin and the extent to which projects are encroaching on that yield.

Methods for determining peak and ecological flows vary with the type of ecological function being examined; and between hydrological, hydraulic, habitat simulation and holistic approaches. Instream flow protection methods developed in other states were examined to better understand the range of approaches possible. From these examinations it is apparent that some criteria could be developed to distinguish low, medium and high impact projects. Low impact projects may not require as detailed an analysis as would high impact projects. The approach California took for five coastal counties appears promising for apparent low-impact projects in Oregon. It consists of three criteria including seasonal restriction, baseflow bypass, and a percent threshold related to the 1.5 year peak flow. Those criteria were applied to proposed Oregon projects using commonly available and established parameters similar to those used in the California approach. The results are included in the white paper.

In addition to a criteria threshold approach to screen projects, this paper examines various available evaluation methods and criteria for projects with greater projected impacts. A three tier approach is postulated that could have increasing levels of scrutiny for higher impact projects and/or for projects on stream systems with greater sensitivity or value.

The EFTAG concluded the following are important basic considerations as Oregon moves toward implementation of HB 3369:

The definition of ecological flows must include baseflows and a range of flows that create or maintain key ecosystem functions and habitat features.

The inclusion of relatively simple screening criteria for evaluating low impact storage projects may be something for policy makers to consider. A screen for high impact projects and the concept of tiers for the level of analysis effort based on quantitative criteria may also be desirable to policy makers.

When in-depth analyses are needed for ecological flows, it is essential to classify the stream's hydrological behavior and geomorphologic setting early in the process.

The degree of intensity of methods used to evaluate and protect peak and ecological streamflows as they relate to the effects of a proposed storage project should relate to the size or impact of the project, and the value and sensitivity of the stream to new withdrawals. Also necessary is consideration of the previous and cumulative impacts of other projects when deciding on specific analytical methods.

To take advantage of existing science and methods employed by other states and jurisdictions and apply them in Oregon, several factors must be considered:

1) What quantitative tools does Oregon have in comparison with other states?

2) What are the target species (if any) of the ecological evaluation and do the aquatic organisms in Oregon have needs different from populations in other states?

3) Oregon is very diverse hydrologically and geomorphically. How many different regions need to be defined?

4) What is Oregon's current method for screening storage projects? Can that process serve as a basis to create meaningful criteria for ecological flows?

In examining quantitative tools, Oregon has several advantages over neighboring states. First, instream flow basin investigations have been completed for baseflow needs for fish on approximately 2500 stream reaches. Another advantage is that Oregon has a sophisticated water availability program, with water availability evaluated for approximately 2200 "water availability basins" (WABs). Oregon also has a robust and consistent method for predicting peak streamflows that can be applied at any watershed location. Peakflow numbers have already been calculated at gages and water availability basins. From a practical perspective, policies that protect flows should build on and incorporate these tools whenever possible.

As a first level screen for proposed projects Regional Protective Criteria (RPC) could be developed for Oregon that would be similar to what was used in the California program. The RPC would be applied over broad regions using the same three criteria used in the California example, but modified somewhat to take advantage of the tools that are

currently available and easily accessible in Oregon. The new criteria could be used in addition to WRD's current 50% water availability screening. The three new criteria might look something like this:

1) Season of diversion: (varies by region but generally a subset of the time period from November 1 to April 30 – a map of Oregon could be produced with these variations)

2) Bypass flow discharges could be set at the instream water right level for reaches that have instream water rights. For streams that lack these values, Basin Investigation Reports where available can be checked and those values can be used as bypass flows. Other flow studies based on PHABSIM analysis or similar methods can also be examined. For streams that lack an instream water right or flow study value, the monthly 50% exceedance flow can be used as a bypass flow for larger watersheds (size criteria for the watershed will vary regionally). For smaller watersheds, the monthly 50% exceedance criteria may be multiplied by some factor to increase its relative flow. However, because there is greater certainty on instream flow values this may not always be necessary.

3) The screen for a channel habitat maintenance flow threshold could be based on a percentage of the two year peak flow that will be determined by gaging where available or by modeling where gaging is not available. This percentage may also vary regionally, but could fall somewhere in the range of 5-15% based on results from the California study. The two year flow is proposed instead of the 1.5 year flow used in California because the peak flow model for Oregon is available and readily calculates a two year value. Another reason is that many Oregon streams are sediment limited (i.e. they have more transport capacity than sediment supply) and consequently have heavily armored streambeds that are likely to move less frequently thereby requiring greater intervals between bed moving events. Another screen would be to compare 5-15% of the peak flow event to the total cumulative out-of-stream allocation. If the total amount, including any additional or proposed diversion, is below the threshold the proposed diversion could be allowed under the RPC.

Projects exceeding limits set in the RPC would be investigated according to higher standards set in rule according to a tiered system. An example of this might be a project that makes a request for more water than what appears to be available within the RPC threshold criteria. Another example might be a project that proposes diversions outside the RPC season of use. The level of cost and intensity required for investigations outside the RPC criteria would increase substantially.

Peer review comments were received from the Independent Multidisciplinary Science Team (IMST); Steven Cramer, consulting fish biologist; Richard B. Shepard, consulting ecologist; and Niki Iverson, Water Resources Manager for the City of Hillsboro.

Generally, the reviewers praised the makeup of the EFTAG, and the amount of information that is provided in the white paper. Reviewers recommended that additional information be added to clarify some of the concepts such as the adaptation of the north coast California process to a program in Oregon. Also, reviewers expressed concern that enough specific information about a tiered program for categorizing projects according to their impact on streamflow, and the associated level of investigation, is not clear enough in the white paper. Other concerns expressed by reviewers related to inclusion of social and economic impacts that should be included in any determination of the level of protections for peak and ecological flows.

Considerable effort was made to address all of the concerns expressed in the peer reviews. Where it appears these concerns can be better addressed in the HB 3369 implementation phase of this effort, they were not addressed in the white paper. However, the peer reviews are contained in Appendix D of the white paper as a reference for future policy work.

III. Conclusion

The EFTAG was tasked with development of a white paper that sets a scientific framework defining peak and ecological flows, how they can be determined, and how the process for determining might work best in Oregon. The white paper is nearly complete and should be released by the end of November 2010.

This is a discussion item. No WRC action is requested.

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