Oregon
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Megan Hill
Fisheries and Water Quality Manager
Pelton Round Butte
Portland General Electric
726 SW Lower Bend Rd, Madras, OR 97701

May 23, 2016

Dear Megan:

DEQ staff have reviewed the recent report, "Final Report: Lower Deschutes River Macroinvertebrate and Periphyton Study", prepared for PGE by R2 Resource Consultants, Inc. This report outlines the results of a study that was done in 2013-2015 to examine the ecological effects of implementation of selective water withdrawal (SWW) at Round Butte Dam. The study was done in response to requirements that were conditions to the Clean Water Act Section 401 Certification issued by DEQ in association with the Federal Energy Regulatory Commission license. Section 6.2.6 of the Water Quality Management and Monitoring Plan (Exhibit A of the 401 certification) requires the Joint Licensees to conduct this study, repeating an earlier study that was done in 1999-2001. We acknowledge that the work reported fills the basic expectation of the 401 Condition, but we believe there are serious shortcomings in the analysis of the macroinvertebrate data at several levels.

We have attached a memo from Shannon Hubler, Natural Resources Specialist with DEQ's laboratory, who routinely collects and analyzes this type of data and is familiar with the intended experimental design. In the memo, Shannon outlines his concerns with the analysis and interpretation of the macroinvertebrate data collected. As you will see our concerns range from the quality of the data, standardization of taxonomy, and the types of statistical analysis done. We are concerned that the contractors have limited the analysis to a point that it is not reliable for assessing the impacts of changes to the complex.

We request that PGE provide a response to each of the recommendations in the memo, and an explanation for the shortcomings described by Shannon. We believe these shortcomings indicate a lack of quality assurance and want to ensure the most is made of what data is available.

Please respond with a plan for mitigating or eliminating these shortcomings by 30 June 2016.

Thank you.

Sincerely,

Eric Nigg

ec: Robert Brunoe, CTWSR
Ryan Smith, CTWSR
Jonathan Treasure, CTWSR
Roy Spino, CTWSR
Shannon Hubler, DEQ

Memo

To: Bonnie Lamb, Eric Nigg, Aaron Borisenko

From: Shannon Hubler

Date: May 16, 2016

Subject: Review of PGE's study of the Lower Deschutes macroinvertebrates and periphyton assemblages following implementation of the Selective Water Withdrawal

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The interpretations and comments provided here are my own, based on my professional experience assessing biological assemblages. They do not necessarily reflect the position of the Agency.

On Friday April 8th, 2016, I met with representatives from Portland General Electric (PGE; Lori Campbell & Megan Hill) and the consultants (R2 Resource Consultants ; Tim Nightengale & Ray Beamesderfer) in charge of assessing biological conditions in the Lower Deschutes River. We met prior to the public presentation later that evening. They also provided me with written responses to my previous review of the report by R2.

Unfortunately, the meeting and written responses left me concerned about project management and data integrity, and thus interpretations included in the final report.

BACKGROUND

As part of the Pelton-Round Butte Project's FERC relicensing, it was deemed necessary to perform monitoring of the macroinvertebrate assemblage in the Deschutes River. The objectives of the monitoring were to examine the ecological effects of the implementation of selective water withdrawal (SWW) on macroinvertebrates downstream of the project. Baseline data (pre-SWW) was collected in 1999-2001 to provide a preliminary snapshot of macroinvertebrate assemblage structure and function. Following implementation, post-SWW sampling occurred from 2013 to 2015. In addition to macroinvertebrates, periphyton assemblages were also surveyed; however, I will not be addressing that aspect of the report.

The study was based on a Before-After/Control-Impact design. The design included pre-SWW ("before") and post-SWW ("after") sampling, upstream "controls" on the three main tributaries, and downstream sites as the "impact". The study plan clearly identified that the Before-After comparisons would provide the most robust way to determine potential effects of SWW on the downstream macroinvertebrate (and periphyton) assemblages.

The general conclusion provided in the report included the following:

- Seasonal differences between Fall and Spring macroinvertebrate assemblages.
- Statistically significant decreases in Tolerant macroinvertebrates were observed, following SWW implementation.
- Differences among sites below the SWW, with sites closest to the Project showing reduced taxa richness and dominance by non-insect taxa.
- Highest densities of filter feeders near the Project, likely taking advantage of zoo- and phytoplankton released from surface waters of the Project.

Memo

- Comparisons of pre- and post-SWW assemblages showed only modest changes.
- The large increases in densities observed in post-SWW were likely due to ineffective sample preservation in pre-SWW samples and/or change sin taxonomic laboratories.

SPECIFIC DISCUSSION POINTS

1) Oligochaete (worms) density differences

One of the most striking results presented in the report is the significant increases in densities post-SWW, at least for fall samples, with Oligochaetes increasing the most. R2 suggested that these substantial differences reported for Oligochaetes may be due to poor preservation of pre-SWW samples, and/or an artifact of different taxonomists counting them differently. If true, it casts doubt on the data and the interpretations.

For such a large component of the assemblage, especially the post-SWW dataset, this is troubling. Substantial thought must be given to whether this data can be rectified and used to make comparisons between the datasets, or whether the Oligochaete data needs to be removed completely. But simply removing this data ignores a huge fraction of the total abundances, as well as eliminating a group of taxa that provides critical information in several key metrics (e.g., % Non-Insects) or tolerance designations (e.g., Tubificidae/Naididae are deemed highly tolerant). Careful deliberations need to take place to make this data useable and more trustworthy.

On the possibility that different taxonomists could have enumerated or identified the worms differently, that is definitely true. But standard practice in a pre- and post- survey is to standardize taxonomy where possible within the same laboratory, to eliminate these types of effects. Where that cannot be controlled, then at least a subset of the previous samples should have been examined by the post-SWW taxonomist to examine potential biases in the data. Significant differences in processing and identification like those hypothesized by R2 would then require all pre- data to be re-assessed by the second taxonomist. Were any of the samples retained and available for a separate look-back by the same taxonomist?

2) Taxonomic consistency

Given the switch between labs for pre- and post- datasets, it is imperative that the datasets are rectified for taxonomic consistency. Given that the data was only made available in tabular form, by site and sampling event, I was unable to do a thorough scan for inconsistencies. But I did find at least one very important example: see Tubificidae in pre- data and Naididae in post- data. These two Oligochaete families are one in the same, with Tubificids having been moved to the Naididae around 2005. Just this one example alone is important because the tolerance designations used by R2 show Tubificidae as tolerant, but Naididae was absent from the tolerance designations, thereby not showing up as tolerant. Tubificids were relatively rare in the pre-SWW dataset, while common and highly abundant in the post-SWW datasest. A dramatic increase in tubificids is a strong indication of degraded water quality post-SWW, one that is not captured due to taxonomic inconsistency.

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2) Data availability.
R2 suggested, in both the 1:1 discussion and written comments, that either the pre-SWW data was unavailable to be analyzed in a manner consistent with post-SWW data, or it would be too costly to go back and make the pre- data available. It is not entirely clear to me why this was the case.

These responses are highly troubling. The entire purpose of this study was to compare pre- and post-SWW datasets. The Final Study Plan highlighted the need to do full comparisons of pre- and post-SWW datasets.

This diminishes the ability to draw complete conclusions from the data.

3) Water quality data.
I asked about the high pH values presented in this report. The data was collected at the time of macroinvertebrate sampling, as single in-situ samples, not continuous measurements. Table 6 shows high values in 2014 (many at or near the WQS). But in 2015, pH's were extremely high—around 9.6-9.7 at sites close to the dam. R2's response was that they believe the meter they were using was not calibrated correctly, and that it was likely reading high.

This claim of poor meter readings is concerning. Readings were taken over the course of several days. Standard procedures require daily calibration checks at the beginning and end of a study. It was not clear that calibration checks were completed. If the data was presumed to be of questionable quality, it should have been flagged as such, or simply removed to avoid providing potentially misleading data that could provide false conclusions.

I understand that water quality was not a focal point of this study. But inclusion of, or failure to document adequately, erroneous data erodes the integrity of the study.

GENERAL OVERVIEW OF THE REPORT

1) I disagree with R2's statement that full comparisons of pre- and post-SWW data are not possible due to data incompatibility. Nor do I believe it to be a highly time-consuming and expensive task. The comparisons of pre- and post-SWW datasets using multivariate statistics was clearly identified as part of the comparative analyses, and standardization of datasets was identified as critical. Not managing the data in this regard represents a significant failure.

- Both pre- and post-SWW datasets should be available in electronic format.
- Taxonomic consistency needs to be verified among pre- and post- datasets.
- Analyses should be completed again, after a comprehensive review.

2) I also disagree with the assertion that the observed changes in macroinvertebrates are suggestive of WQ improvements. In my opinion, the data as presented is inconclusive on whether or not there have been substantial changes to the macroinvertebrate assemblage in the Lower Deschutes River following implementation of the SWW. The inconclusiveness is largely due to a failure to properly manage the data for complete comparisons. Qualitatively, without strong data to back my opinions, I interpret the results as more suggestive of negative changes in water quality and biological integrity.

This is different from the general conclusions by R2, that changes were largely minor and indicating improved water quality.

One of the main lines of evidence supporting R2's conclusion is that %_Tolerant macroinvertebrates declined significantly from pre- to post-SWW. These tolerance designations are from DEQ's own database, but I do not support their use due to no supporting documentation for their derivations. To the best of my knowledge, they are designations from Bob Wisseman, provided to DEQ in the early 1990's. Since then, taxonomy has changed considerably, and many of the taxa in our database are not described as tolerant simply due to not being present in the database at the time of the initial import into our database. Or they may not be tolerant due to taxonomic name changes (e.g., Naididae). So using these old, undocumented, and unverified tolerance designations is perilous.

Alternative, published options exist that would be more appropriate and defensible (Whittier and Van Sickle, 2010; Carlisle et al., 2007; Relyea et al., 2012; Huff and Hubler, 2008 & 2016). (It was identified in the Final Study Plan that the same metrics of tolerance would be used to assess post-SWW as was used to assess pre-SWW. I acknowledge that in reviewing the Study Plan, I did not suggest different tolerance designations be used.) But just looking at the types of macroinvertebrates showing the largest increases in densities, they appear to be tolerant (subjectively, my opinion): Oligochaetes—especially the large increase in Naididae (Tubificids), Gastropoda (snails), Hydropsychidae (the ones in the Deschutes are largely tolerant). I don't see how these taxa increase so dramatically in densities and %_Tolerant shows a decline. Take out the Oligochaetes, and this still presents a more tolerant shift (again, my qualitative opinion). I would need the raw data, standardized across time and in electronic format, to confirm.

- Alternative tolerance designations should be used. Possibly across multiple sources to capture specific stressors (Relyea et al. 2012, Huff and Hubler 2008), or more general tolerances (Whittier and Van Sickle, 2010; Carlisle et al. 2007).
- Tolerance metrics and significance testing should be recalculated on new designations.

3) The presence of two new taxa, the polychaete worm (*Manayunkia speciosa*) and the colonial goblet worm (*Urnatella gracilis*), is concerning. I am not familiar with these taxa, knowing very little of their ecology. We do not see them in our database—no records at all. It's concerning whenever any new taxa show up in a system in such large numbers. Both appear to be filter feeders, with evidence in the R2 report suggesting they are feeding largely (at least goblet worms) on zooplankton and surficial-detritus from the reservoir. The occurrence of these "new" taxa (they may have simply been undocumented in the system before)—at high densities—plus the large increase in Hydropsychidae, and significant increase in collector-filterers overall is suggestive of a substantial shift in the food web below the SWW.

The fact that the polychaete worm *Manayunkia speciosa* is known as an intermediate host for parasites that can impact salmonids and other fish species seems like a significant concern that should be included in the report. In talking with ODFW staff, they have seen occurrences of *Ceratomyxa shasta* (a myxosporean parasite) increase in Deschutes

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River Chinook populations since 2012. *C. shasta* has been shown to decrease salmonid health, or increase rates of pre-spawning mortality.

- Fisheries managers should be consulted to determine if the uptick in *C. shasta* is related to hatchery operations located at the Project, changes in flows due to SWW, or a response to warmer waters overall during drought conditions.
- Fisheries managers should be consulted to determine if consistent monitoring of fish populations is necessary to track potential upticks in related diseases.

4) I do not agree with the statement that only minor changes occurred to the macroinvertebrate assemblages post-SWW. Based on the quantitative results presented, the significant decline in scrapers is *supportive* (but not conclusive) of the hypothesis there has been change in algal composition less suitable for algal grazers (e.g., increased stalked diatoms). The significant increase in filter feeders is *supportive* of the hypothesis that surface water outflows are modifying the food web in the Lower Deschutes. The very large increases in densities, mostly across what I would designate as tolerant taxa, indicates lower biological conditions post-SWW.

- Significant review of taxonomy and standardization of datasets is necessary.
- This should be followed up with recalculating results to verify the extent of effects from the SWW on the macroinvertebrate assemblage.

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RECOMMENDATIONS

- All datasets, pre- and post-, need to be in consistent electronic format.

- DEQ should request an independent review of the taxonomic consistency between pre- and post- datasets.

    1. An independent taxonomy lab should examine preserved samples and verify identifications.
    2. An independent review of taxonomic consistency across all samples should be completed.

- DEQ should request further analyses:

    1. Subsample the data accordingly to make pre- and post- datasets comparable.
    2. Recalculate all metrics (including updated, published tolerances).
    3. Do a full multivariate comparison of pre- and post-SWW macro data. This is essential and was outlined as a deliverable in the Final Study Plan. NMDS ordinations should be used, with all taxa. The use of PCA, along with removing rare taxa, is inappropriate.

- DEQ should request all the data from this study, for verification purposes.

Given that this work was outlined as critical deliverables in the original project plans, I suggest PGE is responsible to pay for this extra work.