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May 6, 2015

Paula Wilson
IDEQ State Office
Attorney General's Office
1410 N. Hilton
Boise, ID 83706

**RE: Docket No. 58-0102-1502 - Negotiated Rulemaking**
**IDEQ Update to Copper Criteria for Aquatic Life Use**

Dear Ms. Wilson:

Clearwater Paper is pleased to offer this comment letter on the subject rulemaking. We appreciate the Idaho Department of Environmental Quality's (IDEQ) work on this very important matter and look forward to our continued participation in this rulemaking process.

The rulemaking process presented four options for consideration as detailed below:

Option 1: Move forward with current preliminary draft rule – all implementation (including default parameter values) left as guidance. Aquatic life criteria for copper are derived from the Biotic Ligand Model (BLM).

Option 2: Model after EPA's Oregon proposal

- 10th percentile of IWQCs
- Use DRAFT missing parameters approach to produce conservative defaults when data are absent
- Measure pH and temperature

Option 3: Use low end of distribution of IWQC ($10^{th}$ percentile/minimum)

- Use conservative default criteria when data are absent
- Follow NOAA BiOp and expand to all waters (Appendix C)

Option 4: Use low end of distribution of IWQC ($10^{th}$ percentile/minimum)

- Collect statewide data to identify critical conditions throughout state

- Develop conservative default criteria to use when data are absent

Clearwater Paper believes Option 1 provides both DEQ and the permittee significant advantages by utilizing the BLM with site specific parameters to derive a site specific copper water quality criteria. With this option, permittees and DEQ would have the option of collecting site specific information over default BLM inputs. National Council for Air and Stream Improvements, Inc. (NCASI) recently submitted some excellent technical comments to the U.S. EPA on the BLM Missing Parameters Draft Guidance. These comments are attached as Attachment A. One item of particular note in these comments is that NCASI highlighted the seasonal variability of key input parameters. In order to ensure this variability is addressed, NCASI recommended collecting data throughout the year to capture seasonal variations. Adequate sampling time should be allowed for this important data collection if Option 1 is implemented as recommended.

Options 2 through 4 all use conservative default values for parametric values (e.g., 10$^{th}$ percentiles or minimums) when site specific data are unavailable. This approach will result in compounded conservatism in the BLM output and does not allow the BLM benefits of site specificity to be realized. NCASI provided comments to Oregon DEQ on 10% percentile default values. These comments are attached as Attachment B which further document this issue.

Option 1 incorporates the best science and risk management choices for Idaho by utilizing the BLM model which allows the option of using site specific input parameters to derive site specific water quality criteria.

On behalf of Clearwater Paper, we appreciate the opportunity to provide comments on this important matter and look forward to participating with IDEQ as this rulemaking goes forward. Please contact me at 509-344-6419 or malisa.maynard@clearwaterpaper.com with questions.

Sincerely yours,

Malisa Maynard

Malisa Maynard
Environmental & Sustainability Manager

# Attachment 1

ncasi

**NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT, INC.**
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**Paul Wiegand**
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April 18, 2016

Water Docket
U.S. Environmental Protection Agency
1301 Constitution Avenue, N.W.
Washington, D.C. 20460

Attention: Docket ID No. EPA–HQ–OW–2015–0469, Regarding Comments of the National Council for Air and Stream Improvement, Inc. on "Draft Technical Support Document: Recommended Estimates for Missing Water Quality Parameters for Application in EPA's Biotic Ligand Model"

Docket Coordinator:

The National Council for Air and Stream Improvement, Inc. (NCASI) respectfully submits the following comments on "Draft Technical Support Document: Recommended Estimates for Missing Water Quality Parameters for Application in EPA's Biotic Ligand Model," (subsequently referred to as the "draft TSD"). NCASI is an independent, non-profit research institute that focuses on environmental topics of interest to the forest products industry. Members of NCASI represent over 90% of the pulp and paper production in the United States. In its capacity as a research organization, NCASI has a long history of working to inform the science needed to address numerous environmental topics related to the forest products industry including effluent regulation, water quality management, and relationships between human and natural stressors on aquatic ecosystems. The following comments are provided to help ensure that numeric criteria derived using biotic ligand models (BLMs) make full use of the predictive power of these models in order to maximize their benefits for water quality management.

**Introduction**

The development of biotic ligand models (BLMs) has been shown to provide significant improvements over approaches for deriving water quality criteria to protect aquatic life for copper and other metals that are based on water hardness (Erickson 2013). Guidance on ways to estimate input parameters for which little or no data are available could increase the use of BLMs and lead to associated improvements in the accuracy of those criteria. However, there are a number of reasons for caution when developing and communicating guidance of this nature. Among these are:

1. Potential for application of such guidance to BLMs for other metals in the future;
2. Input parameters can have a significant impact on the resulting criteria;
3. There has been considerable investment in the development of BLM science and usability over multiple decades that could be substantially undermined without proper attention to the estimation of missing input parameters;

4. BLM users need a thorough understanding of the basis for, and limitations of, the estimated parameters and the water quality impairment decision error consequences associated with their use.

In light of these reasons, we offer the following comments and recommendations for improvements to the document.

**Specific Comments**

1. Comment: Water quality criteria generated by use of the draft TSD appear to provide a level of protection that is more conservative than intended in EPA's primary guidance document for the derivation of water quality criteria to protect aquatic life, commonly referred to as the 1985 Guidelines (EPA 1985). EPA should revise the draft TSD approach using a broad range of percentiles of BLM inputs to provide a higher likelihood of consistency with the level of protection provided by other aquatic life criteria generated using the 1985 Guidelines.

Discussion: Several places in the draft TSD indicate that criteria generated through the use of this guidance are likely to be more protective than other water quality criteria generated using the EPA's primary guidance document for the derivation of aquatic life water quality criteria, referred to here as the 1985 Guidelines (EPA 1985). For example, p. 101 of Appendix B contains the following statement:

> "BLM criteria predictions made for a site using the corresponding percentiles (i.e., 2.5%) of the water quality parameter distributions will be a conservative approximation of this protective criterion."

Similar statements can be found in Appendix C. The 1985 Guidelines provides a useful description of an important goal of aquatic life WQC derivation:

> "If it were feasible, a freshwater (or saltwater) numerical aquatic life national criteria for a material should be determined by conducting field tests on a wide variety of unpolluted bodies of fresh (or salt) water. It would be necessary to add various amounts of the material to each body of water in order to determine the highest concentration that would not cause any unacceptable long-term or short-term effect on the aquatic organisms or their uses. The lowest of these highest concentrations (*emphasis added*) would become the freshwater (or saltwater) national aquatic life water quality criterion for that material, unless one or more of the lowest concentrations were judged to be outliers. Because it is not feasible to determine national criteria by conducting such field tests, these Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses (hereafter referred to as the National Guidelines) describe an objective, internally consistent, appropriate, and feasible way of deriving national criteria, which are intended to provide the same level of protection as the infeasible field testing approach described above." (p. 1)

This description indicates that in deriving aquatic life WQC, protecting aquatic life is a very important goal, but it is also not the only factor to be considered (if it were, an infinitely low WQC would be set in all cases). Rather, an additional goal identified in the 1985 Guidelines is also to "to determine the highest concentration that would not cause any unacceptable long-term or short-term effect on the aquatic organisms or their uses". A reasonable interpretation of the role of a WQC is to establish a level that, when exceeded, is expected to cause harm to the aquatic ecosystem. A singular focus on protectiveness is not the intent of the 1985 Guidelines.

The authors of the draft TSD appear to agree with his interpretation because the approach relies on predictions of the 10th percentile of geochemical ions (GI) and dissolved organic carbon (DOC), rather than a percentile that is lower still (e.g. 1st percentile, 2.5th percentile, etc.). Yet, by proposing an approach that only uses predictions of the 10th percentile BLM inputs, the potential for use of this guidance to derive criteria that are substantially more protective relative to other 1985 Guidelines procedures appears to be considerable. This potential outcome for users of the draft TSD is not clearly described or evaluated, as detailed in the following comments. EPA should revise their guidance to be less prescriptive in the degree of conservatism that must be adopted if there guidance is used.

2. Comment: The evaluation of the degree of conservatism built into this approach is incomplete and not adequately transparent. State environmental programs that apply highly conservative approaches to derive all their water quality criteria can be expected to wrongly declare large numbers of water bodies as impaired when, in fact, all aquatic life uses are being attained, creating a considerable unnecessary burden for those programs and affected parties. A more meaningful and quantitative description of the uncertainties and potential designated use impairment decision errors associated with the use of this draft TSD are needed. Also, more information is needed about how the fixed site criterion (FSC) is used to estimate the level of conservatism associated with use of this draft TSD.

Discussion: Given that criteria generated using this guidance document are likely to be more conservative than is typically the case in aquatic life water quality criteria derivation using the 1985 Guidelines (see Comment #1), the guidance should provide a clear indication of the degree of conservatism that may be anticipated. Acknowledgment that the draft TSD yields a conservative approximation of a protective criterion raises the question "just how conservative?" Unfortunately, the degree of conservatism associated with criteria derived using the draft TSD is a critical element that has not yet been adequately addressed by the authors.

A better understanding of the magnitude of conservatism in aquatic life criteria is important because states are required by the Clean Water Act to use approved numerical water quality criteria as a basis for determining whether designated uses of its water bodies, including various biological aspects of aquatic ecosystems, are being protected and attained. As states and other interested parties derive and evaluate proposed water quality criteria, they must balance a goal of protectiveness with the science of identifying levels of the pollutant that cause harm. Although final WQC often consist of a single numeric value, the science behind the derivation of these criteria is imprecise. The final criterion often reflects the selection of a single value from a range of science-based possibilities. Barber et al. (2004) also discuss this topic in the context of assessing risks to aquatic ecosystems where a criterion forms the bases for inferences about the condition of aquatic ecosystems and its implications for environmental management. They state that a criterion should be "both ecologically meaningful and statistically robust," balancing the chances of inferring from comparisons to the criterion that a site is impaired when in fact it is not (referred to as a Type I error) with the chances of inferring that it is unimpaired when in fact it is impaired (referred to as a Type II error). Understanding the rates of Type I and Type II errors associated with a numeric criterion allows states and other parties responsible for environmental management to fully consider the level of protectiveness and the state of scientific knowledge associated with a proposed water quality criterion.

Although Appendix C provides some of the information needed to develop this understanding by comparing 10$^{th}$ percentile-based predictions with fixed site criteria (FSC), the analyses and information presented do not provide a transparent description of the potential for making Type I and Type II decision errors by using the draft TSD. Appendix C provides several tables that compare estimates of FSC with BLM model projections. In Section 4, the appendix presents information on use of conductivity-GI regressions combined with geostatistically-based predictions. Yet, the draft TSD simply refers the reader to an EPA 2002 citation for information on the derivation of FSCs. This important document does not appear to have been made available by EPA (as an appendix to the draft TSD, or on its website, for example), and it also does not appear to be readily available on the internet. EPA should make this document readily available as part of the information needed to adequately review the draft TSD, such as the assumptions and protective targets used in the FSC determinations.

Furthermore, the analyses in Appendix C provide a very limited validation of the approach recommended in the draft TSD. The tables that are presented and discussed provide only a summary of the analyses that were conducted. It would be much more useful for EPA to provide detailed analyses so that the derivation of FSCs is more transparent, and a clearer picture of the overall predictive performance of the draft TSD beyond the FSC endpoint could emerge. Approaches for carrying out a more thorough and transparent analysis, including the estimation of Type I and Type II errors associated with numeric water quality criteria, can be found in the peer-reviewed literature, including McLaughlin (2012, 2015) and references therein. Among the significant benefits of such analyses is the characterization of decision errors in terms that are most relevant for making environmental quality and management decisions and that are understandable by a broad audience of stakeholders. NCASI would be happy to collaborate with EPA to develop Type I and Type II error rate estimates associated with various percentile alternatives.

3. Comment: The transparency of the draft TSD is limited by the lack of quantitative information about the quality of statistical relationships between conductivity and BLM water quality parameters at other percentiles, not just low-end percentiles.

Discussion: The draft TSD approach is dependent upon EPA first making the determination that the 10$^{th}$ percentile of BLM input parameters is the appropriate level for establishing values for missing parameters. This determination is apparently due, in part, to stronger correlations at low-percentiles (Appendix B). Such a finding is similar to one that might come from a quantile regression in which relationships among percentiles are quantitatively assessed. However, no such analysis is offered in the document. In its place is simply the statement that the relationships at higher percentiles are not as good. The transparency of the guidance document suffers here, because EPA is making a choice that may dramatically affect the quality and utility of their recommended approach without providing the detailed information needed to review the basis for that choice.

4. Comment: Evaluating sets of water quality measurements from individual river systems would provide a better reflection of seasonal patterns affecting all BLM parameters rather than combining the 10$^{th}$ percentiles across multiple data sets.

Discussion: EPA proposes the use of 10th percentile ecoregion level III values for the geochemical ions (alkalinity, calcium, magnesium, sodium, potassium, sulfate, and chloride) and for dissolved organic carbon (DOC) as default data inputs into the biotic ligand model when measured data are lacking. Lower concentrations of geochemical ions (such as 10th percentile ecoregion level III values) tend to produce lower chronic and acute instantaneous water quality criteria (IWQC) because there are lower concentrations of anions to complex with copper and form non-bioavailable or non-toxic aqueous complexes, and lower concentrations of cations in which to compete with copper for biotic ligand binding sites (Smith et al. 2015). Lower concentrations of DOC (such as 10th percentile ecoregion level III values) tend to produce lower chronic and acute IWQC because there are lower concentrations of DOC to form complexes with dissolved copper that would reduce the metal's bioavailability and/or toxicity (Richards et. al 2001; Ryan et. al 2004).

It is most appropriate to use **sets** of water quality measurements that were measured during the same sampling event versus individual water quality measurements to determine appropriate data inputs into the biotic ligand model. Biotic ligand model input parameters vary temporally, but vary differently depending upon the input parameter. Export of DOC from most aquatic systems is driven by hydrological processes (Schlesinger and Melack, 1981). It is commonly observed that DOC concentrations in streams peak during periods of high flow and then decline rapidly, which typically occur during times of snow melt runoff in early spring (Lewis and Grant 1979; Boyer et al. 1997; Sebestyen et al. 2008). The temporal pattern of DOC in snowmelt dominated systems is thought to be due to flushing of pore water from the upper soil horizons as the water table rises (Hornberger et al., 1994) and this flushing phenomenon often exhausts the terrestrial DOC pool for the year (Boyer et al., 1997). In contrast with DOC, the concentration of geochemical ions often peak in concentration during the late summer months to early fall months when steam flow is at its lowest. The USGS has comprehensive statistics on stream flow by state within their National Streamflow Statistics Program[1], and that program's results consistently show the lowest stream flow during the months of July, August and September in many parts of the country.

By selecting 10th percentile ecoregion level III values for data input values and ignoring the temporal dynamics of the data input parameters, a suite of 10th percentile data inputs is generated that does not occur in reality, and creates overly conservative BLM model output that will not reflect measured bioavailable copper stream concentrations. In addition, some of the BLM model inputs are not independent. There is a well-known relationship between alkalinity and pH (Monhoven 2013) so alkalinity cannot be varied without affecting pH and vice-versa. The use of water quality sets help ensure that consistent data inputs are used for the copper biotic ligand model.

5. Comment: DOC is the most important BLM model input and unlikely to be estimated with sufficient accuracy. DOC should be made a mandatory measured, rather than estimated, parameter.

Discussion: BLM model output is most sensitive to changes in DOC concentration, i.e., output is 100% sensitive to changes in DOC[2] (and shown in Di Toro et. al 2001). In addition, there are no more easily

[1] https://water.usgs.gov/osw/programs/nss/NSSpubs_Rural.html#or

[2] EPA draft TSD, pg 2

obtained, measured parameters such as conductivity that correlate satisfactorily with DOC to provide adequate predictions of site specific DOC measurements[3]. Because DOC is the most important parameter needed to generate site specific copper IWQC, it is suggested that, along with temperature and pH, only measured DOC values be used to generate copper IWQC.

Both the quantity and quality of the dissolved organic carbon present in natural waters is expected to differ between wet (rainy) and dry seasons. Given that DOC is the most important driver affecting BLM-based copper IWQC, differences in both the quantity and quality (or character) of DOC present in a water body are expected to result in different IWQC. The draft Technical Support Document should include examination of the impact of pooling seasonal-specific data to calculate a single criterion vs. calculating season-specific criteria (i.e., developing separate wet and dry season criteria).

We appreciate the opportunity to offer suggestions on the draft TSD and would be happy to respond to questions concerning these comments.

Sincerely,

Paul Wiegand

Paul Wiegand
Vice President, NCASI

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[3] https://www.oregon.gov/deq/RulesandRegulations/Documents/BLM-TSD.pdf

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# Attachment 2

ncasi

NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT, INC.
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Barry Malmberg
Project Leader
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October 27, 2015

Andrea Matzke
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Dear Andrea:

Thank you for inviting The National Council for Air and Stream Improvement, Inc. (NCASI) to provide comments on the Technical Support Document: Deriving Statewide Copper Criteria Using the Biotic Ligand Model. NCASI is a non-profit environmental research institute that seeks to create credible scientific information required to address the environmental information needs of the forest products industry in North America. NCASI conducts surveys, provides advice regarding technically appropriate methods of conducting environmental field measurements, undertakes technical studies such as scientific literature reviews and research compilations, and sponsors scientific research by universities and others to document the environmental performance of industry facility operations and forest management, and to gain insight into opportunities for further improvement in meeting sustainability goals.

I would like to commend the staff at the Oregon Department of Environmental Quality (DEQ) for preparing the document. DEQ has done a good job assembling and analyzing data for use in developing the State copper water quality criteria. Specific comments using the track changes feature are interspersed throughout the draft document but I did want to summarize some main points in this memo.

**Recommended Performance Equation**

There is no recommended form of a Biotic Ligand Model (BLM) based performance equation such as the current hardness based performance equations for chronic and acute copper toxicity (see Table 19). The BLM was designed for the development of site-specific copper water quality criteria by taking into account important parameters that vary geographically and temporally such as dissolved organic carbon (DOC), pH, aqueous geochemical ions, and temperature. DEQ has convincingly demonstrated that BLM criteria output are especially sensitive to variations in DOC and pH (see Figure 12) and that there are no more easily obtained, measured parameters such as conductivity that correlate satisfactorily with DOC and pH values. DEQ has credibly

demonstrated that State-specific correlations as a function of conductivity can adequately be used to calculate geochemical ion input to the BLM when such measured data are not available. It is recommended that DEQ develop a performance equation based BLM framework for calculation of chronic and acute copper toxicity with a hierarchy based upon availability of data and assumptions. The general equation form could be:
$BLM_{CCC\ or\ CMC} = f(DOC, pH, Temperature, Conductivity)$ and may resemble the functional form of the current hardness-based copper criteria. DEQ has done a good job detailing various levels of estimation or simplification that may help reduce the complexity of the general equation, e.g., use of georegions to obtain default conductivity inputs by location, use of a default TOC/DOC conversion factor when TOC data are available but DOC data are lacking, etc.

**Compounded conservatism of using 10% percentile default values**

In the Phase II work, section V.B, DEQ evaluated the possibility of using regional default DOC and pH values for inputs into the BLM when measured values were not available. DEQ generated median and 10th% values for DOC and pH for Level-III Ecoregions and DEQ physiographic regions. It should be stressed that the use of 10% percentile values for both pH and DOC as inputs into the BLM compound the conservatism of the BLM result, and DEQ has not adequately addressed how this will impact the "protectiveness" of any final BLM criteria. Ultimately, the amount of conservatism embodied in the final copper criteria is a policy decision. To facilitate this policy decision, DEQ should provide additional plots as in Figure 41 comparing measured IWQC to IWQC developed using various percentiles (such as 10%, 25%, median, 75%) of DOC and pH (and combinations thereof). Some estimate of the amount of conservatism each percentile choice results in, such as the percent of calculations where the estimated IWQC exceeds the measured IWQC would be helpful to policy makers. Another means of illustrating the amount of conservatism resulting from use of various defaults ($10^{th}$ percentiles or otherwise) for DOC and pH is to reproduce Table 26 for the four DEQ physiographic regions using various default levels for DOC and pH. Number of exceedances and exceedance percentage (column 3 and 4 in Table 26) using the various defaults will provide policy makers an indication of the conservatism inherent in the final criteria. Finally, it is suggested that comparing outcomes using OR-specific vs. EPA defaults is irrelevant because of the site specific nature of the copper water quality criteria, and that these comparisons actually confuse the decision making of potentially selecting relevant regional default values for DOC and pH that generate protective criteria within Oregon when measurements for DOC and pH are not available. It should be reiterated within the document that, once sufficient data are collected, measured site specific values for DOC and pH should take supremacy to default values as BLM inputs.

**Comparison of measured copper concentration to BLM based IWQC results**

DEQ compares measured copper concentrations to calculated BLM IWQC in Section V.B.3.a. Chronic toxic units (CTUs), a ratio of the IWQC to measured copper, were greater than 1, indicating exceedance of the IWQC for 0.5% to 7.3% of the measurements dependent upon the DEQ physiographic region. Of the 1,630 copper measurements, there is no differentiation between total and dissolved copper measurements. Any CTU based upon a total copper measurement will be inherently conservative since only a portion of the measured copper will be in the dissolved phase and potentially bioavailable. In addition, it has been shown that at least for Oregon stormwaters, the vast majority (>99.9%) of dissolved copper is complexed with organic ligands in stormwater and can be expected to be non-bioavailable[1]. So even CTUs based upon dissolved copper measurements with be inherently conservative since only a portion of the dissolved copper is bioavailable. Even given these levels of conservatism due to overstating bioavailable copper, the percent exceedances ranged from 0.5% to 7.3% of the measurements. For the Willamette Valley, where most Oregon point sources are located, exceedance frequency was only 2.7%. It is recommended that clarifying language be inserted within the document regarding the number of total copper and dissolved copper measurements used to generate Table 26, and that language should be added clearly stating that these results are conservative. On a side note the number of measurements in Table 26 is 4,607, the total number of samples with sufficient BLM parameters to calculate an IWQC, but only a subset of these samples with the additional copper measurements (1,630) can be used to calculate CTUs and hence the number of exceedances and % exceedances. It is suggested that the number of samples in Table 26 be replaced with the number of samples with copper measurements.

**Insufficient data for implementation of the Fixed Monitoring Benchmark (FMB) paradigm**

The final section of Phase II evaluates site specific criteria using the FMB. The FMB is an attempt to characterize the inherent variability of environmental conditions that affect the copper toxicity. While the FMB may be a relevant approach to characterizing variability, it is recommended that any approach using FMBs be postponed until there are a sufficient number of sites with a sufficient number of samples across all DEQ physiographic regions to conduct a more complete Oregon BLM FMB analysis.

I hope these comments will constructively build upon the good work that DEQ has already performed. If you have any questions regarding my comments, please don't hesitate to contact me.

Regards,

Barry Malmberg

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| cc: | Steve Stratton, NCASI | Kathryn VanNatta, NWPPA |
| | Paul Wiegand, NCASI | Michael Campbell, Stoel Rives |
| | Doug McLaughlin, NCASI | Jerry Schwartz, AF&PA |

[1] Nason, J.A., Sprick, M.S., and Bloomquist, D.J. (2012). Determination of copper speciation in highway stormwater runoff using competitive ligand exchange – Adsorptive cathodic stripping voltammetry. *Water Research*. 46:5788-5798.