Nevada Division of Environmental Protection
Bureau of Water Quality Planning
Triennial Water Quality Standards Review
2011 Public Comment Period and Workshops

Clean Water Act (CWA) Section 303(c) requires that water quality standards be reviewed at least once every three years. The Nevada Division of Environmental Protection (NDEP) Bureau of Water Quality Planning (BWQP) opened a public comment period (January 6 through February 25, 2011) and held 3 public workshops to receive public comment on Nevada's surface water quality standards, particularly standards that BWQP should consider for review, revision and/or development during the next triennial review period (2011 through 2014/15).

Public workshops were held in Carson City, Las Vegas and Elko. During the workshops, BWQP provided an overview of the water quality standards program and then opened the discussion for questions and comments. Table 1 shows attendance at the workshops. Table 2 summarizes comments received during the workshops and public comment period, and BWQP's responses. The letters submitted to BWQP during the public comment period are attached.

Please contact John Heggeness at (775) 687-9455 or jheggene@ndep.nv.gov with questions or comments.

Table 1. Public Workshop Attendance

DATE	Venue	BWQP Staff	Attendees
02/07/11	Carson City	John Heggeness Randy Pahl Dave Simpson Kathy Sertic	Chris Katapothis, Pyramid Lake Paiute Tribe Bruce Holmgren, NDEP BMRR Jim Smitherman, Washoe County Steve Bradhurst, Central Nevada Regional Water Authority Barbara Drake, US Forest Service Kerensa King, US Fish and Wildlife Service Lynell Garfield, City of Reno Terri Svetich, City of Reno Stephanie Wilson, US Environmental Protection Agency (USEPA) Joy Peterson, Washoe Tribe
02/09/11	Las Vegas	John Heggeness Randy Pahl Dave Simpson Pam Willard Kathy Sertic	Jack Osburn, Nye County Tim McCall, Nye County Sandra Donnelly, Clark County Water Reclamation District (CCWRD) Sonnia Lewandowski, CCWRD Devon Morgan, CCWRD Doug Drury, CCWRD Schott Schiefer, City of Las Vegas Kate Hoffman, CCWRD Peggy Roefer, Southern Nevada Water Authority Levi Kryder, Nye County Dan Fischer, City of Las Vegas
02/11/11	Elko	Heggeness, Pahl, Simpson, Willard	No attendees

Table 2. Summary of Comments Related to Water Quality Standards Received during the Public Workshops and Comment Period and NDEP's Responses to Comments

Date	Workshop Letter or Email	Submitted By	Comment/Question	NDEP Response
02/07/11	Carson City Public Workshop	City of Reno	Expressed support for NDEP's Nutrient Criteria Strategy and requested that NDEP review Truckee River nutrient standards in conjunction with the TMDL review.	BWQP will review the nutrient standards in conjunction with the TMDL review currently underway by the Cities of Reno and Sparks, Washoe County, Truckee Meadows Water Authority, NDEP and USEPA.
		Pyramid Lake Paiute Tribe	Temperature standards are being exceeded on the Lower Truckee River. Turbidity standard is being exceeded during high flows. How does NDEP calculate 7Q10 flows? How are reaches determined? Is it possible to consider different flow regimes for reach designations?	The Lower Truckee River is 303(d) listed for temperature and turbidity. BWQP will initiate evaluation of temperature standards throughout the state during this triennial review period. USGS flow data is used to determine 7Q10 flows. NDEP can consider flow regimes in determining reaches.
		Central Nevada Regional Water Authority	What water quality standard options would the State consider for public water supply?	The question is related to requirements of the Safe Drinking Water Act. CWA surface water quality standards require that waterbodies must be capable of being treated to meet Nevada's drinking water standards.

Date	Workshop Letter or Email	Submitted By	Comment/Question	NDEP Response
02/09/11	Las Vegas Public Workshop	Clark County Water Reclamation District	Questioned the Las Vegas Wash warmwater fish beneficial use because erosion control structures restrict fish movement. Questioned NDEP's approach for addressing water quality standards particularly total dissolved solids and total inorganic nitrogen as Lake Mead levels decline.	The aquatic life beneficial use for the Las Vegas Wash excludes fish. NDEP does not intend to review the Lake Mead water quality standards during this triennial review period. The lake level is expected to rise this year with the release of water from Glen Canyon Dam to equalize Lake Powell and Lake Mead.
02/22/11 02/25/11 02/22/11	Letters	City of Reno City of Sparks Washoe County	Re: Request for Review of Total Phosphorus (TP) and Total Nitrogen (TN) Standards Attachment 2 of Nevada's 2006 303(d) Impaired Waters List indicates three reaches of the Truckee River from East McCarran Blvd. to Wadsworth have been delisted for TP because there is a USEPA approved TMDL; however, it is noted by NDEP that, periodically, the phosphorus concentration in the river "does not meet water quality standards". This highlights the fact that there are inconsistencies between the existing TMDL and TP standard, and provides justification for a review of the TP standard. Because both nitrogen and phosphorus impact periphyton productivity in the river and dissolved oxygen levels, the standards for both TP and TN should be reviewed for potential revision.	BWQP will review the nutrient standards in conjunction with the TMDL review currently underway by the Cities of Reno and Sparks, Washoe County, Truckee Meadows Water Authority, NDEP and USEPA.

Date	Workshop Letter or Email	Submitted By	Comment/Question	NDEP Response
02/15/11	Letter	Queenstake Resources USA, Inc.	RE: Periodic Review of Water Quality Standards under the Tributary Rule Queenstake Resources requests that several drainages and creeks in the Independence Range in Elko County be reviewed to establish appropriate water quality standards including: Jerritt Creek and Snow Canyon Creek, tributaries to the Owyhee River; and Sheep Creek, tributary to the North Fork of the Humboldt River.	BWQP will initiate review of these streams during this triennial review period.
02/21/11	Letter	GEI Consultants, Inc.	Re: Support the Use of the Biotic Ligand Model for Copper Aquatic Life Criteria The USEPA updated the freshwater aquatic life copper criteria using the Biotic Ligand Model (BLM) in 2007. GEI and the Copper Development Association request that NDEP consider updating Nevada's aquatic life standard to the USEPA recommended criteria using the BLM.	BWQP acknowledges the advantage of using the biotic ligand model over the traditional hardness method to establish the aquatic life criteria, and therefore will initiate review of EPA's 2007 copper criteria during this triennial review period.

Date	Workshop Letter or Email	Submitted By	Comment/Question	NDEP Response
02/25/11	E-mail	Briscoe, Ivester & Bazel	NAC 445A.144 sets two standards for cyanide, a 1-hour average of 22 ug/l, and a 96-hour average of 5.2 ug/l, both applicable to the Aquatic Life category. The USEPA cyanide water quality criteria for both the 5.2 ug/l and 22 ug/l criteria have two footnotes. One refers to the 2005 criteria document. The other states: "This recommended water quality criterion is expressed as g [grams] free cyanide (as CN)/L." This second footnote is missing from NAC 445A.144. Without it, there may be some question about whether the cyanide referred to is free cyanide or some other form of cyanide. Please add a footnote to the cyanide numbers in NAC 445A.144 to make clear that they refer to free cyanide, as the EPA criterion does.	BWQP will initiate review of the cyanide standard during this triennial review period.

Date	Workshop Letter or Email	Submitted By	Comment/Question	NDEP Response
02/18/11	Letter	International Zinc Association and Windward Environmental	The current Nevada acute and chronic zinc criteria are calculated as a function of water hardness, and are based on the 1995 EPA criteria update for zinc (EPA 1996). A more recently developed tool for deriving water quality criteria for several metals, including zinc, is the biotic ligand model (BLM). The BLM accounts for several factors that influence metal bioavailability. The EPA has yet to review and release the draft BLM-based zinc criteria for public comment. While EPA review and issuance of nationwide criteria is a principal pathway for states to update their own criteria, it is not the only means of doing so. States can provide their own updates following EPA guidance and procedures and these can be approved by EPA, as required. We strongly encourage use of the BLM-based criteria for zinc and other metals.	BWQP acknowledges the advantage of using the biotic ligand model over the traditional hardness method to establish the aquatic life criteria. States can develop water quality criteria with USEPA approval; however due to BWQP staff resource constraints, BWQP does not intend to review the zinc standards until the USEPA formally publishes revised criteria.

Attachments

Letters and email submitted to BWQP during the public comment period

PUBLIC WORKS DEPARTMENT
1 East 1st Street, 7th Floor
PO Box 1900
Reno, NV 89505

Feb 22, 2011

John Heggeness
Nevada Division of Environmental Protection
Bureau of Water Quality Planning
901 S. Stewart Street, Suite 4001
Carson City, Nevada 89701

Re: Request for Review of Total Phosphorus and Total Nitrogen Water Quality Standards

Dear Mr. Heggeness:

In response to the public notice of intent to conduct a triennial review of water quality standards issued by the Nevada Division of Environmental Protection (NDEP) on January 6, 2011, the City of Reno is submitting a request for a review and potential revision of total phosphorus (TP) and total nitrogen (TN) water quality standards (WQS) for the Truckee River. We have three primary reasons for requesting this review: 1) the phosphorus TMDL currently in place is insufficient to meet the existing WQS, 2) a review is consistent with goals identified in NDEP, Bureau of Water Quality Planning's (BWQP) 5-Year Plan, and 3) legal, technical and operational changes in the watershed warrant a review.

TMDL Does Not Meet WQS

Attachment 2 of Nevada's 2006 303(d) Impaired Waters List indicates that three reaches of the Truckee River from East McCarran Blvd to Wadsworth have been delisted for Total Phosphorus because there is an EPA approved TMDL; however, it is noted by NDEP in Attachment 2 that, periodically, the phosphorus concentration in the river "does not meet water quality standards". This documentation highlights the fact that there are inconsistencies between the existing TMDL and TP water quality standard, and provides justification for a review of the TP WQS. Because both nitrogen and phosphorus are interrelated in how they impact periphyton productivity in the river and resulting dissolved oxygen levels, it is proposed that the water quality standards for both TP and TN be reviewed for potential revision.

Consistency with Goals Identified in the BWQP's 5-Year Plan

Two primary goals identified in the BWQP's 5-Year Plan: July 2006 – July 2011 (NDEP, 2006, p. 1) are:

- Improve water quality standards through more appropriate beneficial use assignments (including tiered aquatic life uses), more appropriate numeric criteria; and

- Develop effective TMDLs which address real problems (based upon appropriate beneficial uses and numeric criteria) and where needed to support local efforts to address the problems.

The BWQP 5-Year Plan also recognizes support of a Truckee River 3rd Party TMDL Review and notes the following (NDEP, 2006, p. 16):

> *"a majority of Nevada's 303(d) listings have significant issues associated with beneficial uses and numeric criteria appropriateness. Inappropriate uses and criteria could lead to unsuitable TMDLs. Nevada desires to first address the use/criteria issues (see **Standards** Section) and verify that a use impairment actually exists before developing a TMDL."*

A review and potential revision of both TP and TN WQS before progressing with the NDEP-supported 3rd Party TMDL review would be consistent with goals outlined by the BWQP.

Legal, Technical and Operational Changes in the Watershed

Since adoption of the Truckee River water quality standards for TP and TN in 1984, and the adoption of the TMDLs for those constituents in 1994, a number of legal, technical and operational changes have occurred that warrant a review of the Truckee River WQS. Conditions that have changed include:

- development of an extensive database of river water quality, flow and condition data;
- development of improved scientific methods of modeling and analyzing river conditions;
- upgrades and improvements to the operation of Truckee Meadows Water Reclamation Facility (TMWRF);
- adoption of Pyramid Lake Paiute Tribe (PLPT) Water Quality Standards for the Truckee River and Pyramid Lake;
- adoption of the Truckee River Water Quality Settlement Agreement;
- measurable progress towards implementation of the Truckee River Operating Agreement;
- purchase and control of river water rights by the municipalities; and
- changes in the status and operation of the Truckee Canal.

The current TP WQS for the Truckee River has been in place for many years and was based on non-site specific national standards. As noted above, the PLPT recently developed a site specific criterion based on orthophosphate for the downstream reaches of the river within the PLPT's jurisdiction. Given the inconsistency between the State of Nevada and PLPT standards, and the more current nature of the scientific studies underlying the tribal standards, it would appear to be appropriate to evaluate alternatives to the TP WQS. Similarly, the TN WQS has been in place for many years, although, little documentation has been found to explain the source of these criteria. The state of science relating nitrogen concentrations (and phosphorus) to dissolved oxygen (DO) has progressed significantly since the WQS was developed.

A review and potential revision of TP and TN water quality standards supports NDEP's goal of the triennial review which is to *"update or revise the WQS in order to remain consistent with State and federal law and to ensure that Nevada's WQS continue to reflect the best available science and support sound water quality management policies to improve and protect the water resources of the state."*

Thank you for soliciting our input regarding the review of the state water quality standards. Please contact me at 775-334 3314 if you have questions concerning this submittal.

Sincerely,

E. Terri Svetich, P.E.
Engineering Manager

February 25, 2011

City of Sparks
Community Services

John Heggeness
Division of Environmental Protection
Bureau of Water Quality Planning
901 S. Stewart Street, Suite 4001
Carson City, Nevada 89701

Re: Request for Review of Total Phosphorus and Total Nitrogen Water Quality Standards

Dear John:

In response to the public notice of intent to conduct a triennial review of water quality standards issued by the Nevada Division of Environmental Protection (NDEP) on January 6, 2011, the City of Sparks is submitting a request for a review and potential revision of total phosphorus (TP) and total nitrogen (TN) water quality standards (WQS) for the Truckee River. We have three primary reasons for requesting this review: 1) the phosphorus TMDL currently in place is insufficient to meet the existing WQS, 2) a review is consistent with goals identified in NDEP, Bureau of Water Quality Planning's (BWQP) 5-Year Plan, and 3) legal, technical and operational changes in the watershed warrant a review.

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- development of an extensive database of river water quality, flow and condition data;
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Thank you for soliciting our input regarding the review of the state water quality standards. Please contact me at 775-353-2304 if you have questions concerning this submittal.

Sincerely,

Neil C. Krutz, P.E.
Director of Community Development
Acting Director of Public Works

Washoe County
Department of
Water Resources
4930 Energy Way
Reno, NV 89502-4106
Tel: (775) 954-4600
Fax: (775) 954-4610

February 22, 2011

John Heggeness
Nevada Division of Environmental Protection
Bureau of Water Quality Planning
901 S. Stewart Street, Suite 4001
Carson City, Nevada 89701

Re: Request for Review of Total Phosphorus and Total Nitrogen
Water Quality Standards

Dear Mr. Heggeness:

In response to the public notice of intent to conduct a triennial review of water quality standards issued by the Nevada Division of Environmental Protection (NDEP) on January 6, 2011, Washoe County is submitting a request for a review and potential revision of total phosphorus (TP) and total nitrogen (TN) water quality standards (WQS) for the Truckee River. We have three primary reasons for requesting this review: 1) the phosphorus TMDL currently in place is insufficient to meet the existing WQS; 2) a review is consistent with goals identified in NDEP, Bureau of Water Quality Planning's (BWQP) 5-Year Plan; and 3) legal, technical and operational changes in the watershed warrant a review.

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alternatives to the TP WQS. Similarly, the TN WQS has been in place for many years, although, little documentation has been found to explain the source of these criteria. The state of science relating nitrogen concentrations (and phosphorus) to dissolved oxygen (DO) has progressed significantly since the WQS was developed.

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Thank you for soliciting our input regarding the review of the state water quality standards. Please contact me at 775-954-4666, if you have questions concerning this submittal.

Sincerely,

Rosemary Menard, Director

RM:jb:mv

Queenstake Resources USA, Inc.
Jerritt Canyon Mine
HC 31 Box 78 Elko, Nevada 89801
TEL (775) 738-5006 **FAX** (775) 758-9231

February 15, 2011

John Heggeness
Nevada Bureau of Water Quality Planning
901 South Stewart Street, Suite 4001
Carson City, Nevada 89701-5249

Re: Periodic Review of Water Quality Standards under the Tributary Rule

Dear Mr. Heggeness:

Queenstake Resources requests that several drainages and creeks located in the Independence Range in Elko County, Nevada, be included in the reviews by the Bureau of Water Quality Planning under the Tributary Rule to establish appropriate water quality standards. The drainages and creeks to be included in the reviews are:

- Jerritt Creek, and Snow Canyon Creek, tributary to the Owyhee River; and
- Sheep Creek, tributary to the North Fork of the Humboldt River.

Should you have any questions or require further information, please do not hesitate to call me at (775-738-5600 ext. 219) or send an email to jbarta@jerritt.com.

Cordially,
Queenstake Resources USA, Inc.

John Barta

Mr. John Barta
Environmental Manager

CC: Bruce Holmgren, NDEP/BMRR
Guy Simpson, QRUS

GEI Consultants

February 21, 2011

Geotechnical
Environmental
Water Resources
Ecological

John Heggeness
Bureau of Water Quality Planning
Nevada Division of Environmental Protection
901 S. Stewart Street, Suite 4001
Carson City, NV 89701

Re: Proposal to Support the Use of the Biotic Ligand Model for Copper Aquatic Life Criteria in Nevada

Dear Mr. Heggeness:

We have been in contact with you since last fall on behalf of our client, the Copper Development Association (CDA), to obtain information concerning the upcoming triennial review of surface water quality standards in Nevada. CDA played a significant role in sponsoring scientific research used in development of the freshwater Biotic Ligand Model (BLM) for copper, which was adopted by the United States Environmental Protection Agency (EPA) in its latest national ambient water quality criteria (EPA 2007). CDA is now encouraging efforts by states and tribes to incorporate these latest recommended EPA national criteria for copper into their water quality standards programs.

It is our understanding that the Nevada Division of Environmental Protection (NDEP) is building its list of water quality review items for the next triennial review and suggestions for topics for this review are due by Friday, February 25, 2011. Thus, the purpose of this letter is to urge the NDEP to consider updating its aquatic life criteria for copper to use the BLM as currently recommended by EPA. GEI and CDA would like to support NDEP in the process of accepting the use of the BLM to derive copper criteria and permit limits in Nevada surface waters.

Nevada's current aquatic life criteria used to derive copper standards, like most states' criteria, only take into account hardness as a factor that modifies toxicity. Using only hardness as a modifying factor for metals criteria is an outdated approach that excludes a substantial body of peer-reviewed scientific literature demonstrating that additional modifying factors can and should be incorporated into regulatory benchmarks or standards, while providing the same levels of aquatic life protection required under the Clean Water Act (EPA 1985, 1994, 2001, 2007). Copper toxicity is a function of its bioavailability, which in addition to being controlled by hardness, is also strongly related to other important factors such as dissolved organic carbon (DOC), alkalinity, pH, and temperature. The key strength of the BLM is that it accounts for multiple factors—in addition to hardness—that mitigate or exacerbate copper's toxic effect on aquatic life. There also are practical advantages for using the BLM; it is a cost effective regulatory tool compared to

GEI Consultants, Inc./Ecological Division
4601 DTC Boulevard, Suite 900, Denver, CO 80237
303.662.0100 fax: 303.662.8757

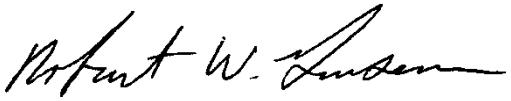
other site-specific toxicity test procedures (e.g., water-effect ratios), and the BLM software is publicly available, sanctioned by EPA, and requires only brief training to generate rapid and useable output. Therefore, BLM-based criteria provide a practical means of deriving demonstrably more accurate levels of aquatic life protection across a broad range of water quality conditions.

Please let us know how we can assist the NDEP in its consideration of the BLM during the upcoming triennial review. GEI or CDA could help in a variety of ways, including preparation of written or oral testimony supporting the technical basis of the BLM, providing general guidance on application of the BLM to water quality criteria, and providing guidance on what type of implementation approach would best fit your available water quality data. CDA has also sponsored BLM training sessions over the past several years, and they have been well-attended by both regulators and the regulated community. If desired, it may be possible to provide this course or related education materials if you would find that helpful as a means of helping inform the public and stakeholders as to the basis and application of the BLM. In addition, we would be interested in assisting with analysis of NDEP's water quality database to determine how much data are currently available for use in the BLM and how to best use the available data.

We appreciate the opportunity to provide you with this proposal to consider updating Nevada's water quality criteria for copper. Please let me know if you have any questions. We look forward to discussing this with you further.

Sincerely,

GEI CONSULTANTS, INC.



Robert W. Gensemer, Ph.D.
Senior Ecotoxicologist

RWG
cc: Joe Gorsuch, CDA
Steven Canton, GEI
Stephanie Baker, GEI

References

U.S. Environmental Protection Agency (EPA). 1985. Guidelines for deriving numerical national water quality criteria for the protection of the aquatic organisms and their uses. PB85-227049, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1994. Interim guidance on determination and use of water-effect ratios for metals. EPA-823-B-94-001, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2001. Streamlined water-effect ratio procedure for discharges of copper. EPA-822-R001-005, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2007. Aquatic life ambient freshwater quality criteria – copper. EPA-822-R-07-001, U.S. Environmental Protection Agency, Washington, D.C.

EMAIL

From: Lawrence S. Bazel
Sent: Friday, February 25, 2011 11:43 AM
To: Kathy Sertic; John Heggeness
Subject: Triennial review of WQS

Kathy and John,
According to my calendar, we were asked to comment by today if we identified any issues that should be considered as part of the triennial review of water quality standards. We've found one.

NAC 445A.144 sets two standards for cyanide, a 1-hour average of 22 ug/l, and a 96-hour average of 5.2 ug/l, both applicable to the Aquatic Life category. Both of these numbers are accompanied by a reference to footnote h, which identifies as their source EPA's National Recommended Water Quality Criteria, dated May 2005.

When you go to the EPA website on water quality criteria . . .
http://water.epa.gov/scitech/swguidance/waterquality/standards/current/index.cfm

. . . you find that the cyanide criteria (both the 5.2 and 22 ug/l criteria) have two footnotes. One is to the 2005 criteria document.
The other is:

"This recommended water quality criterion is expressed as g free cyanide (as CN)/L."

This second footnote is missing from NAC 445A.144. Without it, there may be some question about whether the cyanide referred to is free cyanide (which I'm told is the toxic form) or some other form of cyanide. So please add a footnote to the cyanide numbers in NAC 445A.144 to make clear that they refer to free cyanide, as the EPA criterion does.

You may notice that EPA's footnote refers to grams of free cyanide per liter. I've quoted it correctly. But I've also taken a quick look at the 1995 update, which refers to micrograms of free cyanide per liter.

Thanks.

Larry

February 18, 2011

John Heggeness
Nevada Division of Environmental Protection
Bureau of Water Quality Planning
901 S. Stewart Street, Suite 4001
Carson City, Nevada 89701

Subject: Comments on the Nevada Triennial Review: Recommendation for Updating the Aquatic Life Criteria for Zinc

Dear Mr. Heggeness:

As requested by the Nevada Division of Environmental Protection (NDEP), this letter provides comments for the current triennial review (TR) of surface water quality standards (WQS) in Nevada. The comments provided here are primarily related to the numeric zinc criteria for protection of aquatic life. These comments are being provided jointly by the International Zinc Association (IZA) and Windward Environmental. The IZA is a non-profit industry association dedicated to the global market for zinc and the role of zinc in sustainable development. As such, the IZA actively supports research programs on the fate and effects of zinc in the environment and supports the adoption of regulatory standards for zinc that reflect the current state-of-the-science. Windward Environmental is a consulting firm consisting of environmental scientists and engineers who support the IZA on zinc research projects and work with the regulated community in complying with water quality standards for zinc and other metals. The remainder of this letter provides a brief summary and basis of our recommendation with regard to updated aquatic life criteria for zinc in Nevada.

The current Nevada WQS include aquatic life criteria that have not been updated for many years, in some cases more than 16 years. These criteria include the priority pollutant metals arsenic, chromium, copper, lead, nickel, selenium, silver, and zinc. Since 2007 when Nevada last updated the aquatic life criteria, other states and various organizations have updated criteria for many of these metals and other non-priority pollutant metals, such as aluminum, cadmium, and zinc. These updated criteria are based on more current scientific information and were developed following the EPA's criteria update procedures. For example, Colorado and New Mexico each adopted updated zinc criteria in 2010 using EPA procedures based on numerous additions to the scientific literature. Colorado zinc criteria were similarly

updated earlier and have been approved by EPA. It is the EPA's policy to update criteria as new scientific information becomes available, especially that which could significantly affect environmental management decisions. Therefore, these updates give Nevada an opportunity to bring their state WQS up-to-date and provide more appropriate policy and more accurate tools for regulating and managing water quality in Nevada.

The current Nevada acute and chronic zinc criteria are calculated as a function of water hardness, and are based on the 1995 EPA criteria update for zinc (EPA 1996). A more recently developed tool for deriving water quality criteria for several metals, including zinc, is the biotic ligand model (BLM). The BLM accounts for several factors that influence metal bioavailability. Technical details regarding the BLM are provided as an appendix to this letter, in case there is interest. Another set of comments submitted to the NDEP on behalf of the Copper Development Association (CDA) and International Copper Association (ICA) is recommending that the NDEP consider updating the freshwater aquatic life criteria for copper using the BLM.

Draft BLM-based zinc criteria were submitted to the EPA in 2006, but the EPA has yet to review and release the draft BLM-based zinc criteria for public comment. While EPA review and issuance of nationwide criteria is a principal pathway for states to update their own criteria, it is not the only means of doing so. States can provide their own updates following EPA guidance and procedures and these can be approved by EPA, as required. We strongly encourage use of the BLM-based criteria for zinc and other metals and its adoption in standards as more states undergo their WQS triennial reviews.

In Nevada, it would be expected that numerous National Pollution Discharge Elimination System (NPDES) permittees are subject to compliance based on the EPA's 1995 zinc criteria. The NPDES permits are the principle regulatory vehicle for Clean Water Act implementation to protect and restore water quality in the state. The NPDES permits rely on state WQS and criteria for setting appropriate compliance levels. Water quality criteria drive permit compliance decisions and can lead to significant capital expenditures. Water quality criteria also drive the 303(d) and TMDL process for identifying and cleaning up impaired water bodies. Using outdated criteria for NPDES, 303(d), and TMDL purposes could lead to wasted resources on unnecessary listings (i.e., false positives). In fact, there are currently 49 sites listed as impaired due to zinc in the state of Nevada. Using outdated criteria may also result in under-protection of aquatic life (i.e., false negatives).

In summary, although we recommend that the NDEP ultimately adopt the BLM as the basis for numeric zinc criteria in Nevada, adoption of BLM-based zinc criteria within EPA may not occur within the timeframe of the current triennial review.

Accordingly, we recommend that the NDEP consider an update to the aquatic life criteria for zinc as follows:

1. Update the hardness-based zinc criteria using the substantial body of zinc toxicity data published in the last 16+ years; and
2. allow use of the BLM to derive site-specific zinc criteria.

Thank you for the opportunity to provide these comments for consideration by the NDEP during the Nevada triennial review process. Please let us know if you have any questions or if you would like to discuss this further.

Sincerely,

Eric Van Genderen, Ph.D.
Manager, Environment & Sustainability
International Zinc Association

David DeForest
Sr. Environmental Toxicologist
Windward Environmental

Scott Tobiason
Sr. Environmental Engineer
Windward Environmental

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APPENDIX – TECHNICAL DETAILS ON THE BLM

The following provides technical details on the biotic ligand model (BLM) as a tool for deriving site-specific metals criteria for aquatic life.

Overview

The EPA recently released aquatic life criteria based on the BLM for copper (EPA 2007a). The BLM represents a significant step forward in the best available science of not only copper, but several other metals, including zinc. A few states, including New Mexico, have recently adopted the EPA's BLM-based copper criteria in their WQS, but to-date mostly as a tool for deriving site-specific WQS rather than as the default basis for statewide numeric criteria.

The BLM is easy to use and the data required to run the BLM are a marginal increase in costs for data already needed to calculate hardness-dependent criteria. The BLM generates instantaneous acute and chronic criteria using 10 water quality input parameters that typically cost less than $200 per sample. These 10 input parameters are: temperature, pH, and concentrations of dissolved organic carbon (DOC), calcium, magnesium, sodium, potassium, sulfate, chloride, and alkalinity. The BLM software is publicly available, sanctioned by EPA for copper, and requires only brief training to generate rapid and useable output. The BLM for zinc can be readily obtained (http://www.hydroqual.com/wr_blm.html) and uses the same input data set as the copper BLM.

Nevada's current zinc criteria, like most states' criteria, only take into account hardness as a factor that modifies toxicity. Using only hardness as a modifying factor for metals criteria is an outdated approach that does not take into account a substantial body of science. The peer-reviewed scientific literature demonstrates that additional modifying factors can and should be incorporated into regulatory benchmarks or standards, while providing the same level of aquatic life protection (EPA 1985, 1994, 2001). Zinc toxicity is a function of its bioavailability, which in addition to being controlled by hardness, is also strongly related to other important factors such as pH and DOC. The key strength of the BLM is that it accounts for multiple factors—in addition to hardness—that influence the amount of zinc that is bioavailable to aquatic life and, hence, potentially toxic. Therefore, the BLM-based criteria can provide more accurate levels of aquatic life protection across a broad range of water quality conditions than the hardness-based criteria.

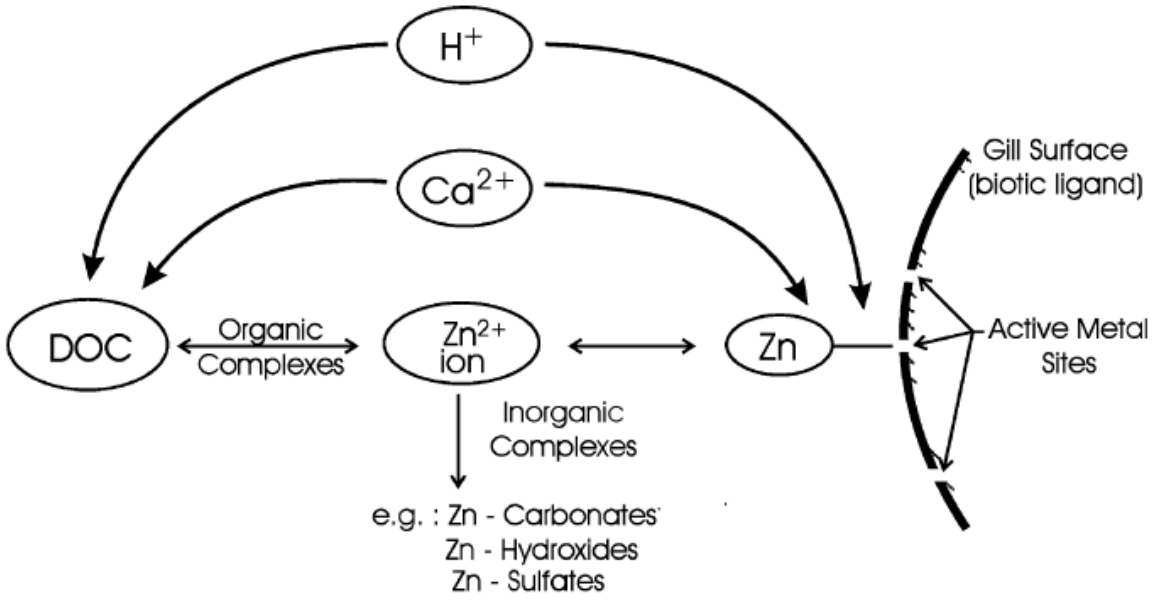
Technical Basis of the Zinc BLM

Like the copper BLM recommended by the EPA for copper criteria development, the zinc BLM is a computational model that incorporates chemical reaction equations to evaluate the amount of metal that would bind to organism tissues (termed the "biotic ligand", such as a fish gill) and thus be ultimately responsible for causing toxicity. By incorporating chemical equilibria, the BLM better represents the complex chemical factors that influence zinc bioavailability, more so than the simple hardness-based approach (Di Toro et al. 2001, Heijerick et al. 2002). Unlike the hardness-based equation for zinc criteria, the BLM explicitly accounts for more of the important water quality variables that determine zinc bioavailability, and the BLM is not limited to a particular correlation between toxicity and these variables.

The mechanistic principles underlying the BLM follow general trends of zinc toxicity as related to individual water quality variables and their combinations. The basic premise of the BLM is that changes in water quality will cause a corresponding change in the concentrations of toxic forms of zinc (primarily Zn^{2+}) that can potentially bind to biological surfaces (i.e., the "biotic ligand"; Di Toro et al. 2001). Zinc bioavailability is also affected by competitive chemical binding interactions at the biotic ligand (e.g., fish gill) with calcium, in particular (Santore et al. 2002). The interactions between zinc, other ions, dissolved organic carbon (DOC), and the biotic ligand are shown in Figure 1. Each of the dissolved chemical species, with which the biotic ligand reacts, is represented by characteristic binding site densities and conditional stability constants (Playle et al. 1993). In turn, each of the chemical species can be predicted as a function of inorganic and organic equilibrium reactions. The thermodynamic constants used to simulate these equilibrium reactions are empirically derived and do not change for simulations involving different organisms.

Predictions of zinc toxicity are based on the relationships between the dissolved zinc LC50 and a critical level of zinc accumulation at the biotic ligand. This critical accumulation is called the median-lethal biotic ligand accumulation concentration, or LA50. While LA50 values can vary based on differential species sensitivity (i.e., more or less zinc-gill accumulation required to exert a similar toxic response), they are assumed to be constant within individual species regardless of water quality (Meyer et al. 1999). Overall, increases in hardness and natural organic matter tend to decrease zinc bioavailability, while changes in pH may have a variable influence on Zn bioavailability (Santore et al. 2002; Clifford and McGeer 2009).

Figure 1. Conceptual Diagram of the Biotic Ligand Model for Zinc



Source: Santore et al. (2002)

The draft BLM-based zinc criteria submitted to EPA in 2006 were ultimately developed using an approach that is analogous to EPA metals criteria derivation methods that are based on normalizing available toxicity data to a similar hardness (EPA 1985). The zinc BLM was used to normalize LC50 values to a single reference exposure condition that includes all of the BLM water quality parameters. Although not all historical studies reported concentrations of parameters needed for the BLM, the dataset was supplemented by new data from current research. Once the data were normalized to the BLM parameters for this reference exposure condition, criteria derivation procedures followed EPA guidance (EPA 1985). Accordingly, the acute criterion was estimated from a ranked distribution of BLM-normalized genus-mean acute values from which the 5th percentile of sensitivity (i.e., the final acute value) was divided by two to calculate the acute criterion. Insufficient data were available to explicitly derive a separate BLM-based chronic criterion. Thus, according to the EPA guidance, the BLM-normalized acute criterion was divided by the final acute-chronic ratio to derive a chronic criterion.

Use of the BLM represents a significant improvement upon the current hardness-based zinc criteria. The BLM has been adequately validated for a wide range of water quality conditions, and therefore provides more accurate and scientifically-defensible water quality criteria. Validation studies have shown that over a very wide range of water quality characteristics (e.g., hardness, alkalinity, and ion composition), the BLM provides criteria concentrations that are more accurate and consistently protective of even the most acutely sensitive aquatic organisms (e.g., De Schamphelaere et al. 2005).

Application of the BLM to Water Quality Criteria

It is important to note that both the hardness-based and BLM-based zinc criteria rely on "models" to calculate criteria. For hardness-based metals criteria, a simple equation, which is in essence a "model," mathematically relates the criterion concentration to a single variable, in this case hardness (hardness is an aggregate measure of calcium and magnesium cations). For the BLM-based zinc criteria, a computer model mathematically relates multiple water quality characteristics, including hardness cations, to the final criterion concentration. While the BLM itself is mathematically more complex, it is mechanistically more realistic than the hardness-based approach.

Like any policy, changes to a regulatory criterion should consider implementation needs and how they will be different from the status quo. Most states have guidance documents for implementing water quality criteria in assessments and regulatory needs. Guidance documents like these can be a more appropriate place to provide the necessary details for implementation than the WQS language, especially given that rulemaking considerations affect only the standards (i.e., guidance documents are not rules). Accordingly, the NDEP should thoroughly evaluate their related guidance and policy documents so they are effective and up-to-date with best practices and EPA guidance.

In terms of data needs for implementation, for determining zinc criteria under either the hardness- or BLM-based approach, measurements of Ca^{2+} and Mg^{2+} are needed (assuming the hardness-based criterion would employ the more accurate method for determining hardness by calculating hardness from the Ca and Mg ion concentrations per SM2340B). Therefore, the difference between data needs for the hardness-based and BLM-based criteria are the remaining eight BLM parameters: temperature, pH, alkalinity, DOC, sodium, potassium, chloride, and sulfate. Temperature and pH data must be field collected, which is a straight forward process using handheld meters or simpler means. For the remaining additional parameters, the costs for analyses by accredited laboratories are typically less than $100. Furthermore, samples for these analyses are as easily collected as the samples for hardness data needs for hardness-based criteria. Note that DOC samples must be

filtered shortly after collection, which is also needed for evaluating metals criteria compliance based on a dissolved (filtered) metals sample. Therefore, the added cost and field effort for BLM data needs are minimal.

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The next criteria implementation need would address the number and location of water quality samples that need to be collected to adequately characterize a particular water body for applying the criterion. General guidance is available from EPA which provides several suggested sampling strategies depending on the type of water body and the anticipated seasonal or spatial variation anticipated in BLM parameters (EPA 2007b). This potential issue of variability over time and space would be important to address for both BLM-based and the current hardness-based criteria. It is important to note that any criterion based on an instantaneous or short-term reading such as a hardness would be susceptible to certain time-variability considerations. Therefore, this situation is not unique to the BLM, as noted in the EPA's BLM-based copper criteria (EPA 2007a):

With regard to BLM-derived freshwater criteria, to develop a site-specific criterion for a stream reach, one is faced with determining what single criterion is appropriate even though a BLM criterion calculated for the event corresponding to the input water chemistry conditions will be time-variable. This is not a new problem unique to the BLM—hardness-dependent metals criteria are also time-variable values. Although the variability of hardness over time can be characterized, EPA has not provided guidance on how to calculate site-specific criteria considering this variability. Multiple input parameters for the BLM could complicate the calculation of site-specific criteria because of their combined effects on variability. Another problem arises from potential scarcity of data from small stream reaches with small dischargers.

EPA has also provided general guidance as to the various regulatory options that could be used to encourage states and tribes to implement copper BLM-based criteria in their water quality standards programs (EPA 2007c). This guidance emphasizes that considerable flexibility exists in implementing BLM-based copper criteria, with suggested implementation options being full statewide implementation of the BLM-based criteria, or the incremental approach of using the BLM for certain water bodies (i.e. TMDLs) on a site-specific basis.

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