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Ephraim King

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Via Electronic Mail: *king.ephraim@epa.gov*

Dear Ephraim:

Thank you again for the opportunity to meet with you and your staff regarding the ongoing evaluation of the Agency's ammonia water quality criteria. During our April 3rd meeting, you requested that we speak with our membership and determine whether there may be additional scientific information available on the toxic effects of ammonia on freshwater mussels. NACWA's request for information from its members turned up some information on the potential limitations of the testing methodologies used in the recent mussel toxicity data and one study that seems to contradict the work by Augspurger et al. (2003). These concerns are outlined below.

Also, as we discussed, the clean water community is most concerned about how any new, more stringent criteria may be implemented. NACWA's request for information on ammonia's potential toxicity to freshwater mussels resulted in significant feedback on the possible impacts of more stringent criteria. Some facilities whose states just recently adopted the 1999 criteria are planning major plant improvements to meet those criteria and fear their actions may not be adequate to meet new criteria. Even those facilities that currently employ modern nitrification/denitrification processes are concerned that they may not be able to meet more stringent limits without further process refinements and flow equalization to prevent ammonia breakthrough at all flow regimes.

Several NACWA member agencies were concerned about disinfection. For those facilities that rely on chloramination for disinfection, in some cases to minimize the formation of disinfection byproducts, the reduced ammonia concentrations expected under more stringent criteria would likely require those facilities to switch to UV disinfection. Some of the information NACWA received is included below for your review. We encourage the Agency to develop the implementation guidance together

with work on the revised criteria to ensure there is clear guidance for the public utility sector and for state permit writers.

Additional Concerns and Scientific Information

The freshwater mussel toxicity tests in the studies the U.S. Environmental Protection Agency (EPA) has relied upon utilized only sediment pore waters, not ambient fresh waters or sediments. Given the many unknowns remaining regarding interstitial and pore water chemistry and ammonia availability, it is hard to judge the validity of the studies. Some of the tests went as far as flushing ammonia through the sediments making it more available to the organisms than the overlying surface waters (Newton, Allran, O'Donnell, Bartsch, & Richardson 2003), making the resulting data extremely difficult to interpret.

The toxicity tests were carried out using soft or moderately hard waters. It has been demonstrated that ammonia toxicity varies with hardness (Ankley, *et al.*, 1995; see also Borgman, 1994) and many of our nation's ambient waters, especially in the arid west, are naturally hard. Criteria based only upon studies on soft and moderately hard waters therefore would not be appropriate under all ambient conditions.

Finally, under natural conditions, Unionid mussels are primarily restricted to areas of highly fluctuating conditions between overlying and pore water (Buddensiek, 1993). Test conditions in the cited studies reviewed were static, thus not reflecting diurnal temperature, ammonia, and source water changes that would occur under natural conditions. In one major study under field conditions, survival of mussels was shown not to be related to ammonia concentrations. Indeed, "a very dense and rich Unionid community" characterized the station with the highest ammonia concentrations (Bartsch, *et al.*, 2003). Therefore, it may be premature to apply static test conditions and concentrations (unnatural conditions) to ammonia criteria for flowing waters.

Implementation Concerns

NACWA understands that the water quality criteria development process must look at the scientific information available to determine the criteria concentrations that are protective of the environment. Still, previous criteria have been developed with specific provisions that qualify how and when those criteria may apply. The 1999 ammonia criteria are one example – different values were used when salmonids were present, since, at the time, they were determined to be the most sensitive species. Given the unique geographic distribution of Unionid mussels, it appears that a similar approach may be warranted with any criteria revision. Additional study may also reveal differing impacts on mussels during cold and warm periods, making some sort of seasonal criteria more appropriate.

Below are a few brief points, in addition to those we have already discussed, on possible implementation impacts that will need to be considered in criteria development and in any work to provide implementation guidance on the revised criteria.

- Current treatment units – Many NACWA members predict that they will need to make improvements in even the most modern nitrification/denitrification units currently in use to comply with any more stringent criteria. Small wastewater systems still using lagoon-based treatment will incur additional costs due to the required construction of mechanical plants to achieve the more stringent levels.
- Lower ammonia concentrations will affect chloramination used as disinfection - Lower ammonia concentrations will make chloramination less effective to the point where it may no longer meet their

disinfection requirements. For some wastewater utilities that are involved in reuse projects, the generation of disinfection byproducts keeps them from using free chlorine. If chloramination is rendered ineffective, they will have to use UV disinfection.

- Some NACWA members are currently planning significant capital improvements to address the 1999 ammonia standards and nitrate (due to pending nutrient criteria adoption). In some cases, these projects are not expected to be completed for another 5-6 years at the earliest. The prospect of promulgation of much more stringent federal ammonia criteria within the next several years, coupled with the expected adoption of nutrient criteria complicates planning for funding and construction of future facility improvements.
- Lower limits will result in less room for error or biological upset – Operating biological nutrient removal (BNR) facilities can present a challenge when faced with operational or biological excursions. This is especially true when the room for error is very small – as in the potential case where the ammonia limits could be cut 2-3 times what they are now. A BNR facility is more sensitive to fluctuations and returning it to the desired biological environment could take days to re-establish the balance between the anoxic, anaerobic and oxic zones required to achieve BNR. Upsets could also affect denitrification and/or phosphorus removal. Current facilities would need to make adjustments in operations. These adjustments could be as easy as operational changes, more chemical use or as significant as capital expenses. Capital expenses could be as small as adding blowers or as significant as adding extra tankage, a potentially expensive option.
- The current and historical range of the endangered eastern U.S. freshwater mussel species being considered by the EPA in development of the WQC does not extend to the western U.S. Additionally, pH and temperatures frequently exceed 8.0 and 25°C, respectively, in some western receiving waters. For these waters, the estimated total ammonia water quality standard protective of eastern U.S. freshwater mussel species could be as low as 0.2 mg/L-N and possibly lower at higher pH and temperatures.

Again, NACWA appreciates the opportunity to provide EPA with this additional information. Please contact me if you have any questions about this information.

Sincerely,



Chris Hornback

Senior Director, Regulatory Affairs

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