Association of
Metropolitan
Sewerage Agencies

September 8, 2004

Water Docket
Attention Docket ID no. OW-2004-0012
Environmental Protection Agency
Mailcode 4101T
1200 Pennsylvania Ave., NW
Washington, DC 20460

Via Electronic Mail: ow-docket@epa.gov

Dear Sir or Madam:

The Association of Metropolitan Sewerage Agencies (AMSA) is pleased to provide comments on the U.S. Environmental Protection Agency's (EPA or Agency) *Notice of Intent to Re-Evaluate the Aquatic Life Ambient Water Quality Criteria for Ammonia* (July 8, 2004; 69 Fed. Reg. 41262). AMSA appreciates being afforded an additional 30 days in accordance with our July 12, 2004 letter to Mr. Geoffrey H. Grubbs, Director of the Office of Science and Technology, to provide comment on this critical notice. AMSA's nearly 300 public wastewater treatment agency members would likely be affected by any modification to the existing water quality criteria for ammonia, and therefore, have a direct stake in carefully reviewing any new studies or information that may be used to make such changes.

Recent studies evaluating the toxicity of ammonia to freshwater mussels suggest that a certain family of mussels (Family Unionidae) is more sensitive to ammonia than the aquatic life species EPA used to establish its existing water quality criteria. AMSA believes the use of these new studies by EPA to revise the ammonia criteria is premature. Specifically, these new studies highlight the lack of a standardized test protocol for the unique life stages of unionid mussels and the lack of knowledge regarding these life stages in laboratory test environments. Simply put, these studies demand additional attention and scrutiny before they are used to revise the criteria. Data derived from the new studies are suspect and the conclusion

that these mussels are more sensitive to ammonia than other taxonomic groups does not appear to be scientifically supported at this time. Furthermore, AMSA is concerned that a handful of mussel species from the Eastern U.S. is not a sufficiently representative basis on which to develop national criteria.

If EPA decides to use the new unionid mussel data to revise the criteria, despite the known limitations, AMSA recommends that the Agency consider the following options for implementing the criteria:

- Allow site-specific or region-specific modification of the criteria to adjust for the presence or absence of particular freshwater mussel species and other site-specific factors; or
- Develop two criteria, unionids present and unionids absent, similar to the approach used for salmonids in the Agency's 1999 criteria.

AMSA had hoped to provide the Agency with additional ammonia toxicity data that its members may have collected to bolster the information EPA already had. AMSA solicited its entire membership, but was unable to identify any additional studies or data for EPA to consider. The lack of ammonia toxicity data specific to mussels was not unexpected given the lack of consensus as to appropriate toxicity methods for unionid mussels.

AMSA Cautions EPA on Use of New Studies

Despite the additional time provided by the Agency, AMSA was not able to conduct a comprehensive analysis of all of the new studies EPA will consider in its reevaluation of the criteria. AMSA did, however, review key freshwater mussel studies and other relevant documents to ascertain whether the studies were consistent with normal toxicity testing procedures and sufficiently robust to be included in a national criteria database. AMSA's concerns based on its review of the studies are listed below.

Lack of Standard Methods and the Use of Early-Life Stages

- AMSA is concerned that there is no standard method or protocol specific to freshwater mussel toxicity testing. While AMSA understands that there is an ongoing study sponsored by the U.S. Fish and Wildlife Service to devise laboratory toxicity test methods through experimentation in culturing and testing mussels, the data from the studies EPA cites in its notice were released before these methods could be completed. AMSA recommends that EPA hold off on its reevaluation of the ammonia criteria, or disqualify any data from studies where the methodologies have not been peer-reviewed and generally accepted, to allow time for an appropriate methodology to be completed.

  Augspurger et al., 2003 acknowledges the limitations of not having a standard method for freshwater mussel toxicity testing:

  > "[t]he absence of standard toxicity testing methods for this taxa helps explain the lack of robust data and the hesitancy on the part of the U.S.

> EPA and others to utilize unionid ammonia toxicity data…. A need exists to work toward standardizing the toxicity tests for early life states of freshwater mussels. Challenges to using these organisms include difficulty in their laboratory culture, uncertainty over appropriate test durations relative to their long life span, lack of sensitive sublethal endpoints, and the potential importance of including sediment in laboratory exposures aimed at reproducing environmental conditions."

These issues appear to limit the utility of these data for a national criteria development process.

- Little is known about the laboratory culture requirements for unionid mussels that produce a unique life stage (Glochidia) that requires a parasitic period with a fish host. Dr. Marsha Black of the University of Georgia (Black, M.C., 2001) states that tests longer than 24 hours are likely influenced by parameters other than ammonia, and these

> "toxicity results may be too variable for confident use for regulatory purposes. Thus it is important to fully characterize the duration that glochidia are viable under control test conditions and their sensitivities to collection, transportation and handling stresses before they can be used confidently to assess chemical toxicity."

These doubts raise questions regarding the validity of mussel tests using this life stage.

- AMSA understands that the new studies also tested juvenile mussels and that many of the labs used were not able to keep the juvenile mussels alive in captivity for more than three to four weeks. This suggests that many of the toxicity tests may have been conducted on stressed or dying juveniles, not healthy organisms that would have survived in the absence of ammonia.

Other Issues Making Use of New Studies Problematic

- Augspurger et al., 2003 used studies that demonstrated what they called "acceptable survival in control treatments" (greater than or equal to 80%), which they based on a EPA's 1985 Guidelines (U.S. EPA, 1985). However, EPA's October 2002 guidance, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (U.S. EPA, 2002), indicates that for acute toxicity test results to be acceptable, control survival must equal or exceed 90%. Based on EPA's standard of performance, excessive control mortality was also noted in Mummert et al., 2003. An American Society for Testing and Materials (ASTM) procedure is quoted for acceptability but this only applies to saltwater mussels, not freshwater. A robust and representative control population is essential for the generation of valid toxicity data. AMSA recommends that EPA only use data that meet the Agency's stated acceptability criteria.

- Some of the studies (Horne, F.R. and S. McIntosh, 1979, Bartsch et al., 2003) consisted of field exposure where other environmental variables were uncontrollable. Organism response in these studies cannot be solely attributed to ammonia exposure and the data relative to ammonia sensitivity is unknown.

- pH control was not used in many tests (Arthur et al., 1987 or Mummert et al., 2003, for example). This means that unionized ammonia concentrations are only known at infrequent, specific times during the tests. This may have resulted in erroneous representations of the tested concentration and organism sensitivity. pH was measured quite infrequently in Mummert et al., 2003, Newton et al., 2003, Hickey and Martin, 1999, and Scheller, 1997, so unionized ammonia concentrations were mostly unknown during these tests. Given the importance of pH to unionized ammonia concentrations, it is not possible to have sufficient confidence in the exposure concentrations unless pH is controlled, the pH is measured at regular intervals during the tests, and pH drifts, known to occur in these tests, are quantified.

- Some tests (Newton et al., 2003, Hickey and Martin, 1999) were conducted with sediment, though the criteria are for water quality. Others utilized sediment pore waters, though knowledge of interstitial and pore water chemistry and ammonia availability is still lacking. Some tests flushed NH_3 through the sediments making ammonia more available to the organisms than the overlying surface waters (Newton et al., 2003). The resulting data are extremely difficult to interpret.

- There was a lack of documented data in two cases (A. Keller, US EPA, and Newton, T.J., 2003) in which only personal communication or unpublished manuscripts are referenced.

- Under natural conditions, unionid mussels are primarily restricted to areas of highly fluctuating conditions between overlying and pore water (Buddensiek 1993). Laboratory test conditions reviewed were fairly static, 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 not related to NH_3 concentrations; indeed, "a *very dense and rich Unionid community*" characterized the station with the highest NH_3 concentrations (Bartsch et al 2003). It may be premature to apply static test conditions and concentrations (unnatural conditions) to ammonia criteria for flowing receiving waters.

- In Goudreau et al., 1993, Arthur et al., 1987, and Tchounwou et al., 1991, dissolved oxygen concentrations were unknown or low and control survival was unknown. As such, it is uncertain whether the response measured is due to ammonia or other factors.

- In Chetty and Indira, 1995, Tchounwou et al., 1991, Black, 2003, and Horne and McIntosh, 1979, control mortality and the frequency of pH measurements are unknown. Therefore, the quality and reliability of the test results are unknown.

- In Horne and McIntosh, 1979, because multiple concentrations of ammonia were not tested, a dose response could not be established. This study does not meet the definition of a true toxicity test and an appropriate endpoint cannot be determined reliably.

- Some studies (Chetty, A.N. and K. Indira, 1995, Bartsch et al., 2003, Hickey and Martin, 1999, Goudreau et al., 1993) use non-conventional biological test endpoints (like impacts on carbohydrates or use of a relativized product index) that the 1985 Guidelines (U.S. EPA, 1985) do not consider appropriate.

- Mixtures (e.g., effluent) were used as test solutions in Horne and McIntosh, 1979 rather than pure compounds (i.e., ammonia), as required by EPA's 1985 Guidelines (U.S. EPA, 1985).

- AMSA cautions EPA over the use of Goudreau et al., 1993 (listed by EPA in its notice and referenced by Augsperger et al., 2003). Dr. Sheehan, co-author, in testimony he gave before the Illinois Pollution Control Board on October 25, 2001 during a hearing to consider whether Illinois' water quality criterion for ammonia should be based on the U.S. EPA's 1999 criteria, questioned the use of Goudreau et al., 1993 for developing national criteria. On page 61 of Dr. Sheehan's testimony, reference is made to Goudreau et al., 1993. Dr. Sheehan expressed surprise over the use of the study's results in the 1999 criteria database. Dr. Sheehan noted that this study was "cutting edge research" at the time, the first to study ammonia toxicity in larval glochidia mussels and that the toxic response they measured occurred in up to 50 percent of the control glochidia.

New Studies Address Acute Toxicity Only

- All of the new studies that AMSA had an opportunity to review are related to the acute toxicity of ammonia to freshwater mussels. No new data are available on the chronic toxicity of ammonia. Because of the limitations of EPA's 1999 ammonia criteria continuous concentration (CCC) derivation (only 15 studies (representing 9 genera) were considered acceptable by EPA for the development of chronic ammonia criteria) and the fact that no new chronic data are available, AMSA does not believe that a revision to the 1999 chronic criterion is appropriate at this time. AMSA believes that EPA instead should work to develop and approve chronic test methods for unionid mussels and collect sufficient data to revise the 1999 CCC if appropriate.

  Augsperger et al., 2003 and others derived a CCC based on available mussel data using estimated acute to chronic ratios (ACR), but recognized the limitations of using an ACR not specifically derived for freshwater mussels from a long-term test evaluating sublethal impacts. Given the limitations of the acute data and the lack of a freshwater mussel-specific ACR, AMSA does not believe that a revision of the chronic criteria at this time using ACRs is appropriate.

Studies May Not be Appropriate for National Criteria Derivation

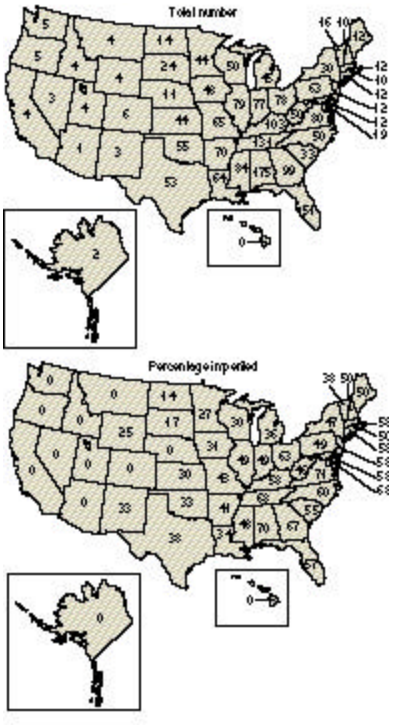
- Augsperger et al., 2003 acknowledges that the 10 species for which acute ammonia exposure data are available represent only about 3% of the known unionid species in North America. Furthermore, Augsperger et al., 2003 notes that "the addition of eight new genera all in one family and largely occurring in the eastern United States would need to be evaluated for how this might inappropriately skew a database used to derive a national criteria."

- The studies were carried out using soft or moderately hard waters. It has been demonstrated that ammonia toxicity varies with hardness (Ankley et al, 1995 and Borgman 1994). Many of our nation's ambient waters, especially in the arid west, are naturally hard waters. Criteria based only on recent studies on soft and moderately hard waters would probably not be appropriate under these conditions.

AMSA Recommends EPA Explore Flexibility in Criteria Implementation

AMSA understands that EPA is only collecting information and data relevant to its reevaluation of the ammonia aquatic life criteria but would like to encourage EPA to consider the implementation issues that may arise if the criteria are revised. As noted above, the studies cited by EPA that may be used in the revision of the criteria are problematic and limited to just a few East Coast species. The distribution of freshwater mussels in the United States, whether considering historic or current distribution, is very striking when you look at the nation from East Coast to West Coast.

Williams and Neves (http://biology.usgs.gov/s+t/noframe/f076.htm) explored the historic distribution of species and subspecies of freshwater mussels within each state and the percentage of those species that are currently imperiled.



There is a clear split between the East and West as far as freshwater mussels are concerned. The Rocky Mountains essentially divide the country, with different ecosystems and different water types in these two regions. The Southeastern U.S. is unmatched by any other area in the world for its diversity of freshwater mussels. The Western U.S. has fewer species of freshwater mussels than most individual states in the East. Clearly any revised criteria must acknowledge these differences.

When EPA developed the 1999 revisions to the ammonia aquatic life criteria, it realized that the application of the same criteria nationwide may not be appropriate given the sensitivity of salmonids to ammonia. The final criterion maximum concentration (CMC or acute criterion) for ammonia in the 1999 criteria recognizes the sensitivity of salmonids and allows for the calculation of a different CMC depending on whether salmonids are present in the waterbody.

If EPA decides to use the new unionid mussel data to revise the acute criterion, despite the known limitations, AMSA recommends that the Agency consider the following options for implementing the criteria:

- Allow site-specific or region-specific modification of the criteria to adjust for the presence or absence of particular freshwater mussel species and other site-specific factors. At least one of the studies EPA cites (Hickey and Martin, 1999), suggests that any criteria should be site-specific; or
- Develop two criteria, unionids present and unionids absent, similar to the approach used for salmonids.

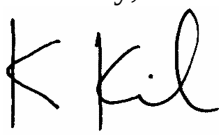
Given the fact that the suspect toxicity data suggest that unionid mussels may rank at the sensitive end of the distribution of genus mean acute values (GMAV) and therefore would drive the final acute value (FAV) and ultimately the CMC, these modifications will be critical, especially for Western states where these predominately East Coast species are not present.

Other issues that will need to be considered if EPA decides to use the new mussel data are seasonality and temperature. Is there a season and/or associated temperature range that can be used to indicate when the sensitive life stage is present and therefore the requisite level of protection is needed? This aspect of the criteria can be more significant in terms of implementation than the actual criteria values.

AMSA appreciates the opportunity to provide comments on EPA's notice of intent to reevaluate the 1999 ammonia aquatic life criteria. Given our concerns with the new studies EPA may consider in its reevaluation, AMSA strongly recommends that EPA wait until a standard test methodology for assessing the toxic responses of unionid mussels has been peer-reviewed and generally accepted by the laboratory community before it considers a potential revision of the criteria. At the very least, given the extreme differences in the number of mussel species between the East and West Coasts, AMSA hopes that EPA will consider the implementation implications of a criteria revision based on a small number of East Coast species.

If you should have any questions, please do not hesitate to contact Chris Hornback, AMSA's Director of Regulatory Affairs at 202/833-9106 or *chornback@amsa-cleanwater.org*.

Sincerely,



Ken Kirk
Executive Director

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