pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

October 26, 2017

Diana Eignor
Health and Ecological Criteria Division, Office of Water
Environmental Protection Agency
1200 Pennsylvania Avenue NW.
Washington, DC 20460

Attention: Docket No. EPA-HQ-OW-2017-0260

Re: EPA Request for Scientific Views: Draft Updated Aquatic Life Ambient Water Quality Criteria for Aluminum in Freshwater

Dear Ms. Eignor:

The Pennsylvania Department of Environmental Protection (DEP) thanks the U.S. Environmental Protection Agency (EPA) for the opportunity to comment on the *2017 Draft Updated Aquatic Life Ambient Water Quality Criteria for Aluminum in Freshwater* published on July 28, 2017 (82 FR 35198). DEP submits the following questions and comments for EPA to consider.

Comment

DEP has concerns regarding the use of a "total" rather than "dissolved" standard for aluminum and the resulting impairment issues raised with spikes in total aluminum concentrations caused by soil-laden samples that are often collected after storm events. Additionally, we would like to comment that instead of using "hardness" in its criteria, EPA consider using calcium concentration, in the hopes of correlating more precisely with the element of hardness which may be responsible for its protective effect on the metal toxicity.

1. Conflicting guidance between 1993 memo and proposed 2017 criteria

On October 1, 1993, EPA released a detailed memo entitled "Additional Material for the Water Quality Handbook." In the memo, EPA recommended that "State water quality standards be based on dissolved metal." While the agency recognized that particulate material could be toxic, it reasoned that this bioavailability/toxicity should be less than that of dissolved toxins, noting that "the primary mechanism for water quality toxicity is adsorption at the gill surface which requires metals to be in dissolved form." EPA further stated that "The ambient water quality criteria are neither designed nor intended to protect sediments…" The 2017 draft criteria on aluminum appears to contradict this earlier guidance by calling for a "total" instead of a "dissolved" water quality standard for aluminum.

Are the 1993 guidelines now considered overruled in general, or overruled only in the case of aluminum? If the latter is the case, can you clarify why aluminum is an exception?

2. Overrepresentation of bioavailable aluminum

Analyzing samples for non-dissolved aluminum requires collection of unfiltered samples, which, depending on how recently precipitation has occurred, may contain significantly varying quantities of suspended soil. Such soil-laden samples are then subjected to "digestion" per EPA method 200.7, which has been shown to extract aluminum from clays (See the 2016 work of He and Ziemkiewicz and the references cited therein).[1] Our scientists are observing surges in total aluminum to values above the EPA's impairment threshold after rain-related events where large amounts of earth are stirred up into the water column. However, such high flow events do not coincide with the adverse effects to stream biology that would be expected with toxic metals concentrations. This supports the theory that the sampling and extraction methods result in the reporting of aluminum fractions that are not readily bioavailable; over-representing the bioavailable fraction of aluminum in the sample.

Considering the forgoing, if the EPA's "total aluminum" criteria are adopted, the states would be required to list a stream as "impaired" if the total aluminum exceeds the standard during these high flow events, with soil-laden waters, which is an artifact of the analytical methods rather than related to the true risk of exposure to bioavailable aluminum.

3. Hardness vs. calcium content

Hardness has long been monitored by water companies due to its tendency to cause mineral deposits in pipes and leave soap scum on bathtubs. The correlation between hardness and ameliorative effects on pollutants has long been known, and since this discovery some work has been done to try to understand what elemental components of hardness are protective and the mechanism behind such protection. For example, research by Davies and Hall has indicated that calcium may be the component in hardness most responsible for biological protection against some common toxins.[2] Knowing what components of hardness are protective and establishing standards based upon them could ultimately lead to better criteria for aquatic life protection.

EPA should consider the possible use of calcium and/or magnesium concentrations to see if they correlate with biological protection better (or worse) than the more general "hardness" parameter.

Should you have any questions or need additional information, please contact Dr. Matthew D. Kundrat, Environmental Chemist, Bureau of Clean Water, by e-mail at mkundrat@pa.gov or by telephone at 717.772.4462.

Sincerely,

Patrick McDonnell
Secretary

---

[1] Y. Thomas He and Paul F. Ziemkiewicz, "Bias in Determining Aluminum Concentrations: Comparison of Digestion Methods and Implications on Al Management," *Chemosphere* 159 (September 2016): 570–76, doi:10.1016/j.chemosphere.2016.06.052.

[2] Trevor D. Davies and Ken J. Hall, "Importance of Calcium in Modifying the Acute Toxicity of Sodium Sulphate to Hyalella Azteca and Daphnia Magna," *Environmental Toxicology and Chemistry* 26, no. 6 (2007): 1243–1247.