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FILE NO: 29142.070292

February 1, 2016

Via www.regulations.gov

EPA Water Docket
U.S. Environmental Protection Agency
Mail Code 2822-IT
1200 Pennsylvania Ave. N.W.
Washington, DC 20460

Re: Comments on EPA's Draft Recommended Aquatic Life Ambient Water Quality Criteria for Cadmium, Docket ID No. EPA-HQ-OW-2015-0753

Dear Sir or Madam:

Attached are the Comments of the Utility Water Act Group (UWAG) in response to the *Request for Scientific Views on the Draft Recommended Aquatic Life Ambient Water Quality Criteria for Cadmium—2015.* 80 Fed. Reg. 75,097 (Dec. 1, 2015) (providing notice and request for comments by February 1, 2016).

We appreciate the opportunity to provide our scientific views. Please contact me at (415) 975-3714 if you have any questions.

Sincerely,

Samuel L. Brown

Attachments (2)

COMMENTS OF THE UTILITY WATER ACT GROUP ON EPA'S REQUEST FOR SCIENTIFIC VIEWS: DRAFT RECOMMENDED AQUATIC LIFE AMBIENT WATER QUALITY CRITERIA FOR CADMIUM—2015

EPA-HQ-OW-2015-0753

FRL-9939-57-OW

80 Fed. Reg. 75,097 (Dec. 1, 2015)

February 1, 2016

I. Introduction

These are the comments of the Utility Water Act Group (UWAG)[1] on EPA's *Request for Scientific Views on the Draft Recommended Aquatic Life Ambient Water Quality Criteria for Cadmium*—2015 (Draft). 80 Fed. Reg. 75,097 (Dec. 1, 2015).

EPA proposes to update the aquatic life ambient water quality criteria for cadmium. EPA explains that its revisions to the acute and chronic criterion values are primarily due to the inclusion of new post-2001 cadmium toxicity studies. In general, UWAG supports EPA's use of the latest scientific information on cadmium toxicity.

For the acute freshwater and estuarine/marine criteria, EPA proposes to change the criteria averaging duration from 24 hours to 1 hour. UWAG has concerns with this proposed change. In our view, EPA has not adequately justified the change in the acute criteria averaging duration because the change is not supported by the new studies and associated data that EPA provides in the Draft. EPA should retain the current 24-hour duration for the final acute criteria unless it provides a strong scientific justification for doing otherwise. UWAG believes this issue must be addressed before EPA releases the final revised criteria guidance documents for cadmium.

II. Change to 1-Hour Duration from 24 Hour Duration

EPA provides its rationale for changing the duration of the acute freshwater and estuarine/marine cadmium criteria in Section 5.1.4 of the Draft. EPAjustifies its adoption of the

[1] UWAG is a voluntary, ad hoc, non-profit, unincorporated group of 170 individual energy companies and three national trade associations of energy companies: the Edison Electric Institute, the National Rural Electric Cooperative Association, and the American Public Power Association. The individual energy companies operate power plants and other facilities that generate, transmit, and distribute electricity to residential, commercial, industrial, and institutional customers. The Edison Electric Institute is the association of U.S. shareholder-owned energy companies, international affiliates, and industry associates. The National Rural Electric Cooperative Association is the association of nonprofit energy cooperatives supplying central station service through generation, transmission, and distribution of electricity to rural areas of the United States. The American Public Power Association is the national trade association that represents publicly-owned (units of state and local government) energy utilities in 49 states representing 16 percent of the market. UWAG's purpose is to participate on behalf of its members in EPA's rulemakings under the CWA and in litigation arising from those rulemakings.

1-hour duration by rejecting fish toxicity studies that were, according to EPA, the basis of the current 24-hour duration. EPA says:

> "These studies were focused on fish and did not address trends in duration for other aquatic species, such as invertebrates. Because of the limited nature of these investigations and absence of additional supporting information, EPA decided to revise the acute duration in this draft document to be consistent with the more protective 1-hour duration, which is generally supported by and consistent with the 1985 Guidelines."

EPA also cites to the *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (1985 Guidelines) at 5-6 and the EPA *Technical Support Document for Water Quality-based Toxics Control* (TSD) at 35 (1991) to support its proposed revision.

In every prior iteration of the cadmium criteria since 1980, EPA has endorsed a 24-hour duration for the acute criteria. The Agency appears to be making a policy decision that the acute criteria *should* be 1 hour, not that the science associated with cadmium toxicity supports the revision. This decision is inconsistent with CWA § 304(a)(1), which mandates EPA establish "criteria for water quality accurately reflecting the latest scientific knowledge." *See In re Scituate Wastewater Treatment Plant*, 2006 WL 1461208, *17 (EAB 2006) ("…under section 304(a) of the CWA, the Agency is required to publish and periodically update ambient water quality criteria *that reflect the 'latest scientific knowledge'*….") (emphasis added); 45 Fed. Reg. 79,318, 79,319 (Nov. 28, 1980) ("…these criteria *present scientific data* and guidance on the environmental effect of pollutants which can be useful to derive regulatory requirements based on the considerations of water quality impacts.") (emphasis added). EPA should retain the 24hour duration in the final acute criterion unless it provides a more robust scientific justification.

Even though EPA includes new data from many post-2001 toxicity studies, EPA does not rely on any cadmium toxicity study, any new data, or any other new information to support the

proposed revision from the longstanding 24-hour duration. In 2001, EPA used data from 65 aquatic species; the Draft incorporates data from 101 aquatic species. *See* Table 2, Draft at 18; *see also* Draft at 12 ("…the updated criteria is composed of 75 freshwater genera for acute toxicity (compared to 55 genera in the 2001 criteria)[]…."). However, EPA does not ground its proposed revision to the acute criteria duration in the new data, and it does not claim that the new data provide scientific justification for the proposed switch. In choosing to select a shorter averaging period, EPA's underlying premise is that cadmium toxicity to aquatic life occurs so rapidly that an adverse effect such as mortality would occur within or shortly after 1 hour. A shorter averaging period might be acceptable ***if EPA provided time-dependent toxicity data from the scientific literature.*** The Agency provides no such information, and thus the need for a shorter averaging period is purely speculative. EPA's technical justification for a 1-hour averaging period is as follows:

> One hour is probably an appropriate averaging period because high concentrations of some materials can cause death in one to three hours. Even when organisms do not die within the first hour or so, it is not known how many might have died due to delayed effects of this short of an exposure.

Draft at 73–74.

EPA then compares the acute toxicity of cadmium to ammonia but fails to provide information that compares the time-dependent toxicity of cadmium with ammonia.

> The 1-hour acute averaging period was derived primarily from data on response time for toxicity of ammonia, a fast-acting toxicant. The 1-hour averaging period is expected to be fully protective for the fast-acting toxicants, and even more protective for slower-acting toxicants.

Draft at 74. The vast majority of acceptable acute toxicity tests involving freshwater organisms exposed to cadmium had test duration periods of either 48 hours or 96 hours. If the toxicity of cadmium was actually rapid, then significant mortality should be observed during the first 24

hours of exposure, *i.e.*, a calculated 24-hour LC_{50} should be very similar to a calculated 48-hr or 96-hr LC_{50}. Assessing the toxicity of cadmium during the first 24 hours of an acute test, however, is problematic because the vast majority of published studies reporting the acute toxicity of cadmium do not report patterns of lethality during the first 24 hours. The following table indicates whether toxicity (mortality or other acute effect) results were reported for the first 24 hours of organism exposure to cadmium. The selected studies are those that EPA deemed acceptable for derivation of the final cadmium Criterion Maximum Concentration (CMC).

Species tested	**Test duration**	**Results provided at 24 hour exposure?**	**Reference**
Mottled sculpin Rainbow trout	96 hr	No	Besser et al., 2007
Colorado squawfish Bonytail Razorback sucker	96 hr	No	Buhl 1997
Ceriodaphnia dubia Fathead minnow	48 hr	No	Diamond et al., 1997
White sucker	96 hr	Yes. 12-hour LC_{50} = 5.35 µg/L; 96-hour LC_{50} = 1.11 µg/L	Duncan and Klavercamp 1983
Various fish and invertebrates	96 hr	No	Mebane et al., 2012
Daphnia magna	48 hr	No	Nebeker 1986

For the selected studies, only one publication reported a short-term lethal concentration – Duncan and Klavercamp, 1983. Interestingly, in this study the toxicity of cadmium to white sucker after 12 hours exposure *was five times lower* than the toxicity at the end of the test (96 hours). If cadmium was a fast-acting toxicant, as EPA suggests, then the 12-hour LC_{50} value should be similar to the 96-hour LC_{50}. Therefore, EPA's proposed averaging period of 1-hour has no empirical basis because EPA provides no relevant time-dependent toxicity data.

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In addition, an earlier EPA publication also weighs against a 1-hour duration. In 1995, EPA published *Speed of Action of Metals Acute Toxicity to Aquatic Life* (EPA-822-R-95-002) ("Speed of Action"). The Speed of Action document compiles acute toxicity data for several trace elements. For each individual test, EPA estimated a kinetic coefficient (k) by regressing LC_{50} values versus time. The averaging period was then calculated as the inverse of k. The larger the k value (higher speed of toxic effect), the smaller the averaging period (more conservative). The Speed of Action document on pages 4 and 7 indicates the estimated k and averaging period (hours) for freshwater and saltwater species for which EPA had cadmium acute toxicity data available. None of the estimated averaging periods approached 1 hour. The freshwater species having the highest estimated k values (fathead minnow) had calculated averaging periods that ranged between 6 and 17 hours. The saltwater species had even higher averaging periods. UWAG believes the information in the Speed of Action document supports our contention that EPA's selection of a 1-hour averaging period is baseless and arbitrary.

Additionally, the language cited by EPA from the 1985 Guidelines does not address duration in the context of cadmium. According to EPA, the purpose of the duration, or averaging period, is to allow the concentration to be above the CMC only if the allowed fluctuating concentrations do not cause more adverse effect than would be caused by a continuous exposure to the CMC. EPA does not provide any explanation in the cadmium Draft, or identify any supporting data, justifying why the duration must be changed to 1 hour in order to avoid "more adverse effects." The 1985 Guidelines include generic, non-cadmium specific language such as "[o]ne hour is *probably* an appropriate averaging period because high concentrations of *some materials* can cause death in one to three hours." 1985 Guidelines at 5 (emphasis added). The 1985 Guidelines say the duration should be "substantially less than 48 to 96 hours," but do not say

that 24 hours is an inappropriate duration. Further, EPA acknowledges that the 1985 Guidelines – including the issues of duration of toxicity – are going to be reconsidered. Draft at 75. In short, the 1985 Guidelines do not support, and should not be relied on, to justify the proposed revision to the acute criteria duration. With the duration issue slated for review, it makes no sense to change the duration for the acute criteria for cadmium at this time.

Similar criticisms apply to EPA's reliance on the TSD. The TSD states: "For acute criteria, EPA recommends an averaging period of 1 hour." TSD at 35. However, EPA does not explain why this statement is applicable to cadmium. Further, EPA says "[t]he 1-hour acute averaging period was derived primarily from data on responsetime for toxicity to *ammonia, a fast-acting toxicant*." Draft at 74 (emphasis added). But there are important differences concerning the mode of toxicity for ammonia versus cadmium. Ammonia is a non-conservative toxicant that exists in equilibrium between the ionized form (relatively non-toxic) and the unionized form (relatively toxic). The dynamics of equilibrium between the two forms is controlled, largely, by aqueous pH and temperature. The actual mode of toxicity of ammonia has not been unequivocally identified, but four discrete modes of toxicity have been proposed (U.S. EPA 2013, p. 8). The toxicity of cadmium to aquatic life is through the free ionic form (*i.e.*, the divalent form), which causes acute toxicity by disrupting calcium homeostasis and causing oxidative damage. Draft at 10. In fish, cadmium competes with calcium at the gill site and at sufficient exposure time and concentration the fish blood becomes hypocalcemia, disrupting osmotic balance. In general, there are more dissimilarities between the modes of toxicity for ammonia and cadmium than similarities. EPA incorrectly relied on the general statement in the TSD – which was based on the response time of ammonia – to justify the proposed revision to the duration for the acute criterion for cadmium.

Further, even if the studies and EPA guidance did support EPA's proposed revision of the duration, EPA has not identified or discussed the implications of the proposed change in the averaging period on the acute criterion. For example, if the averaging period is revised to be shorter EPA has not explained why is it not necessary for a corresponding increase in the cadmium concentration required to cause the mortality in the shorter period of time. EPA must include any such discussion in the final criteria document.

Lastly, a potential problematic effect of the more stringent acute criteria averaging duration is that some states may require compliance with water quality-based effluent limits (WQBELs) for cadmium with an actual averaging period of 1 hour. In most cases, compliance with an acute criterion-based WQBEL is expressed as a daily (24-hr) maximum value. A WQBEL based on a 1-hour averaging duration could compel a permittee to collect several compliance samples during a 24-hour period. This requirement could be imposed on cadmium where there is minor variability of the cadmium levels during a typical 24-hour period. Without a sound scientific basis for imposing a one hour duration for acute cadmium criteria, there is no justification for additional monitoring of this sort.

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