

Ammonia Overview

At the June 2005 Basic Standards rulemaking, the Colorado Water Quality Control Commission adopted the 1999 EPA Update of Ambient Water Quality Criteria for Ammonia (US EPA, Office of Water, EPA-822-R-99-014, December 1999) as the numeric ammonia criteria for Colorado. The Commission provided flexibility for dischargers faced with the possibility of new, more stringent effluent limits.

Temporary modifications (to allow additional time to comply with the new standard) were applied to most areas of the state and were generally set to expire on 12/31/11. This date was set far enough in the future to allow facilities to consider their specific circumstances, collect data and develop a plan regarding how to proceed, yet soon enough to assure that facilities are making progress in developing facility plans. For those that felt the underlying standards were inappropriate, time was allowed to study the receiving water and develop a proposal for an alternate standard. For those that needed time to plan, finance or construct new facilities, time was allowed to develop that facility improvement plan. Dischargers to warm water segments, that need time to achieve compliance, will contain schedules of compliance in the next permit renewal. The Commission understands that such a compliance schedule may include time to complete necessary sub-tasks or milestones. For example, this might include time to do facility planning, make financing arrangements, pre-design, design, construction, startup and commissioning.

Pueblo completed construction in 2013 to comply with these standards at the James R. DiIorio Water Reclamation Facility as required.

I. HISTORY

Colorado's previous table value criteria for ammonia were adopted in 1987 and they were not revised until the Commission adopted the EPA 1999 Water Quality Criteria for Ammonia during the Basic Standards and Methodologies for Surface Water (5 CCR 1002-31) in 2005. The 1999 Water Quality Criteria for Ammonia are in the form of total ammonia rather than un-ionized ammonia, as was used in the 1987 standards and generally represent a less stringent standard in cold-water segments and a more stringent standard in warm-water segments. All of the EPA Ammonia Criteria documents are available at:

<http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/ammonia/>

II. REVIEW OF AMMONIA CHEMISTRY AND TOXICITY

As summarized from EPA's 1999 Ammonia Criteria document: The toxicity of ammonia to aquatic organisms depends on various properties of water, especially temperature and pH. In water, ammonia primarily exists in two forms, un-ionized ammonia (NH_3)



and ammonium ion (NH_4^+). The amount of ammonia and ammonium are strongly dependent on the pH and temperature of the water. At higher pH the fraction of total ammonia that is in the un-ionized form increases and the ammonium ion decreases. The fraction of total ammonia that is in the un-ionized form is lower at lower temperatures.

The form of ammonia is important because the un-ionized fraction is much more toxic to fish than the ammonium ion. Because of this, it became a convention in the scientific literature to express ammonia toxicity in terms of un-ionized ammonia, and water quality criteria and standards followed this convention. Recent studies however, had shown that the ammonium ion also has a toxic effect where concentrations are sufficiently high. EPA's 1999 criteria include the joint toxicity of un-ionized ammonia and ammonium ion.

III. PROPOSED CRITERIA

On July 8th, 2004, EPA notified the public of their intent to re-evaluate the 1999 Aquatic Life Criteria for ammonia in response to recent studies suggesting that some freshwater mussel species may be more sensitive to ammonia exposure than the aquatic organisms considered in deriving the 1999 Ammonia Criteria.



EPA noted that approximately one-quarter of freshwater unionid mussel species and subspecies in the United States are Federally-listed as endangered, threatened or are of special concern. While declining mussel populations may be due to many factors, the newly published ecotoxicological data indicate that freshwater mussels are more sensitive to ammonia when compared to other freshwater aquatic organisms. Given the wide distribution of freshwater mussels, including unionid mussels, EPA feels that it is important that this criteria update consider ammonia toxicity information specific to freshwater mussels. <http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/ammonia/>

EPA published the Draft 2009 Update of Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater for the protection of aquatic life for ammonia. EPA published the draft criteria in order to receive scientific input from the public. The comments collected were reviewed by EPA and EPA published the updated criteria in 2013. This document will be considered for adoption in Colorado in 2015 making the ammonia standards for Colorado more stringent. If approved, these more stringent ammonia standards would be applied to the Pueblo Water Reclamation Facility permit in 2019.

IV. IMPACT ON PUEBLO WATER RECLAMATION FACILITY

After adoption of the 2013 EPA Ammonia Criteria by the Colorado Water Quality Control Commission it will be necessary for Pueblo to determine if additional construction will be necessary to meet the revised standards. If necessary, this additional cost has to be passed on to the rate payers.