

"Update on Water Quality Criteria for Metals"

On December 10, 1998, EPA published in the *Federal Register* (63 FR, No. 237, pp. 68345-68364) the Agency's latest recommendations for water quality criteria. The criteria as published updated the so-called "Gold Book" that has been used as a national reference for several years. Maine's Surface Water Toxics Control Program (SWTCP), Chapter 530.5 of the DEP's rules, relies on these federally published water quality criteria for evaluating discharges of toxic compounds and developing effluent limitations in discharge permits where necessary.

Of particular interest to many treatment facilities is the changes EPA has made in the criteria for several metals. The criteria have changed for some metals, and the criteria may be expressed as total or dissolved metal. In light of these changes, DEP has modified the way in which metals may be evaluated. The water quality criteria published by EPA are national recommendations that do not reflect local conditions. Two important factors that may affect the toxicity of metals are whether or not the metal is in the dissolved form and, in some cases, the total hardness of the receiving water. This article provides some background information on the development of metals criteria and describes options individual treatment facilities may have for evaluation of their discharges. Most of these considerations apply to the criteria for protection of aquatic organisms, but not to the human health criteria.

The effect of hardness.

The fresh water toxicity of several common metals such as copper, lead, nickel, silver, and zinc depends on the hardness of the receiving water. The harder the receiving water, the less toxic the metal will be. EPA's published criteria are based on a hardness of 100 mg/L, and the Agency provides formulas for recalculating the criteria using a different hardness. Maine waters are considerably softer so the SWTCP assumes a hardness of 20 mg/L, although a facility may collect data to determine the actual hardness for its receiving water. When reviewing water quality criteria published by EPA, one must be careful to consider hardness and make adjustments where necessary.

Dissolved or total metal ?

Water quality criteria may be expressed as total or dissolved metal. Although dissolved metal is the most toxic form in the water column, the original toxicity studies used by EPA to establish water quality criteria are performed using total metal. Those test results may then be expressed as dissolved metal using a conversion factor that estimates the fraction of metal in the toxicity tests that was dissolved and responsible for the toxic effects that were measured. These conversion factors are equal to or less than 1.0 so the water quality criteria expressed as dissolved metal will be numerically less than if expressed as total metal. The conversion factor is developed through various national studies and may not be correct for a particular effluent or receiving water. Even though EPA's December 10 publication uses dissolved metal, states may choose to present their criteria as total metal.

EPA regulations require that permit limits be stated as total metal. In cases where water quality criteria are expressed as dissolved metal and a discharge is being evaluated on that basis, the criteria must be converted back to total metal as an effluent standard. To do this, a translator value is used to relate a water quality criterion as dissolved metal to an effluent limitation as total metal. The translator is a site-specific value representing the fraction of effluent total metal that is dissolved in the receiving water downstream of the discharge. In June 1996, EPA published a methodology for developing translators: "The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit From a Dissolved Criterion" (publication # EPA 823-B-96-007). The Guidance actually provides three methods, one of which simply uses the national conversion factor as a translator. The net result is no change from what has been done in the past where water quality

criteria were expressed as total metal. The other two methods involve site-specific studies and data analysis to develop a translator value for one or more metal(s) in an individual discharge source. This procedure can be time consuming, costly and, if the resulting translator is used in support of a permit limit, require additional on-going monitoring.

DEP's position.

To be sufficiently protective of water quality, DEP will routinely continue to use water quality criteria expressed as total metal. That is, the conversion factor discussed above will not be used and DEP criteria (total metal) will be higher numerically than those published by EPA (dissolved metal), once hardness corrections are made. This represents no change from the way metals have been evaluated in the past, although the criteria for some metals (as total metal) have changed and DEP will be using the updated values from EPA's December 10, 1998, publication. However, at their option, individual facilities may request to have their discharges evaluated using water quality criteria expressed as dissolved metal. The facility must provide the information necessary to develop a translator in accordance with procedures outlined in EPA's June 1996 publication on metals translators. Study plans for data collection must be approved by the Department in advance. DEP will need effluent and receiving water tests for both total and dissolved metal over the course of a year in order to reflect seasonal variations. Although dissolved metal may be used as water quality criteria and the individual facility's discharge will be evaluated on that basis, the final effluent limits will still be expressed as total metal as required by 40 CFR 122.45(c). The final effluent limits may be higher numerically than if the discharge had been evaluated using the total metal water quality criteria. However, this depends on the translator developed for the specific facility. Facilities with effluent limits based on dissolved metal water quality criteria will be required to do continuing monitoring to assure the original translator value remains valid.

When to consider developing a metals translator.

Given the time and expense involved in developing a metals translator, facilities should weigh carefully the potential value in such an approach. While this is very much an individual decision and depends on the circumstances at each facility, there are some general points to consider in determining if a translator would better characterize an individual discharge.

- First, if a facility does not have any exceedences or reasonable potential for exceedence of water quality standards or is not close to these critical values, there is probably little benefit in pursuing a translator.
- Second, if there is a known or suspected source of metal in the discharge, reduction or elimination of the source should be addressed before considering a translator.
- Third, if the metal in an effluent is mostly in the dissolved form, a translator will not substantially change the final effluent limit.
- Fourth, when the conversion value used by EPA approaches 1.0, the more likely a translator will be in significantly changing a permit limit.