

May 27, 2004

TECHNICAL MEMORANDUM

Details Related to Revision of Proposed West Fork Clear Creek Site-Specific Zinc Standards

Following the release by Climax Molybdenum Company of the original version of the technical report “*Development of Site-specific Zinc Standards for West Fork Clear Creek (Clear Creek Segment 5), Clear Creek County, Colorado*”, several correspondences were forwarded to Chadwick Ecological Consultants, Inc. (CEC) in the form of e-mails from Dave Moon, U.S. EPA Region VIII, and Steve Brinkman, Colorado Division of Wildlife.

Specifically, these correspondences addressed concerns related to errata found in the zinc toxicity databases compiled by EPA from other documents, including CDOW data, and used by CEC for the analysis. Those data had originally been used within the report to calculate the acute and chronic zinc toxicity equations and subsequent zinc water quality criteria derived from those equations. As a result of those e-mails from EPA and CDOW (received April 30, 2004), a number of changes were necessary for both the acute and chronic toxicity databases and the subsequent calculations of site-specific zinc standards. Detailed below is a list of the changes and the impact of those changes on the original document.

Requested Changes:

- 1) The “mayfly” and “midge” acute values had to be removed from the acute zinc toxicity database - the original data, which were taken from EPA’s Ecological Risk Assessment of French Gulch, were determined by Syracuse Research Associates (the technical advisors to EPA) to be toxicity values for cadmium rather than zinc.
- 2) The *Daphnia* sp. acute LC₅₀ value, derived from the French Gulch ERA, was corrected to 282 µg/L.
- 3) All chronic LC₅₀ values derived from the French Gulch ERA were originally reported as double their correct value and it was necessary for those values to be divided by a factor of 2.
- 4) Several trout acute LC₅₀s were removed from the original acute zinc toxicity table, based on a number of factors, including:

- Some data were not independent estimates of zinc toxicity (i.e., different lifestages within the same study). The most sensitive life stage was retained in these cases
- Some were duplicates of data resident in existing EPA databases
- One was an “acclimated-trout” point which is inappropriate for acute toxicity

Impacts of the Changes to Analysis of Zinc Criteria in General:

- 1) The pooled hardness slope was changed from 0.8533 to 0.8404
- 2) All hardness-adjusted LC₅₀ values were recalculated to compensate for the new slope.
- 3) The recalculated general acute zinc toxicity equation was changed from $e^{0.8533[\ln(\text{hardness})]+0.9976}$ to $e^{0.8404[\ln(\text{hardness})]+1.0480}$.
- 4) The acute-to-chronic ratio (ACR) was changed from 2.432 to 2.891.
- 5) The recalculated general chronic zinc toxicity equation was changed from $e^{0.8533[\ln(\text{hardness})]+0.9976}$ to $e^{0.8404[\ln(\text{hardness})]+0.6796}$.

Impacts of the Changes to Analysis of Site-Specific Zinc Criteria:

- 1) The site-specific acute zinc toxicity equation was changed from $e^{0.8533[\ln(\text{hardness})]+2.3130}$ to $e^{0.8404[\ln(\text{hardness})]+2.3523}$
- 2) The site-specific chronic zinc toxicity equation was changed from $e^{0.8533[\ln(\text{hardness})]+2.1174}$ to $e^{0.8404[\ln(\text{hardness})]+1.9840}$
- 3) The resulting proposed acute zinc standard for West Fork Clear Creek Segment 5 at hardness of 90 mg/L changed from 470 µg/l to 460 µg/l
- 4) The resulting proposed chronic zinc standard for West Fork Clear Creek Segment 5 at hardness of 90 mg/L changed from 390 µg/l to 320 µg/l

This summarizes the changes reflected in the latest version of the proposed site-specific zinc standards for West Fork Clear Creek, compared to the original version included with the Proponent’s Prehearing Statement.