

LETTER TO THE EDITOR:

Appropriate Use of Numeric Chemical Concentration-Based Water Quality Criteria: Supplemental Discussion

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Morrisey, Williamson, and Roper (1995) were critical of our (Lee and Jones-Lee, 1995) suggested approach as to how numeric chemical water quality criteria should be used in a water pollution control program. They correctly state that we propose biological effects based criteria as more reliable predictors of impact of chemical constituents than chemical-specific numeric criteria. They argue that this is not necessarily the case, since laboratory-based toxicity tests do not provide an adequate prediction of effects of contaminants under field conditions.

In fact, chemical-specific water quality criteria are, in general, based on the same type of laboratory testing as we propose to use to investigate whether regulated or unregulated chemical constituents are toxic in the waters of concern. However, such criteria do not properly consider the aqueous environmental chemistry and toxicology of the constituents of concern that leads to many constituents becoming nontoxic in ambient waters.

Morrisey *et al.* further argue that under conditions where there is a lack of site-specific information, and where regulatory agencies must make decisions on the likely impacts of a particular activity: "*Generic, chemical-based criteria often represent the best immediately-available syntheses of relevant information in such situations.*" This argument is not valid and is part of a syndrome that exists in the field "just give me a chemical-specific number and we will regulate by it," independent of whether the numeric values properly incorporate aquatic chemistry and toxicology into the regulatory process.

A far more reliable approach to determine whether regulated or unregulated chemicals are toxic is to ask appropriately sensitive organisms in a toxicity test whether the system being tested is toxic to them. While this approach does not address all

possible adverse impacts (neither does the chemical-specific approach), adopting it will be a major step toward developing technically-valid, cost-effective approaches for regulating chemical constituents over the chemical-specific approach that is being used today. Further, while the toxicity testing based impact evaluation approach has not traditionally been used, it can be less expensive and will yield more definitive, useful information than the mechanical approach advocated by Morrisey *et al.* of comparing chemical-specific criteria and standards to ambient water concentrations.

Morrisey *et al.* cite the example of the "*unavoidable need to apply chemically based criteria*" to regulate the stormwater runoff of chemical constituents from urban area development. They specifically mention the use of Long and Morgan's (1991) so-called "effects ranges" covering the accumulation of stormwater-derived constituents from urban areas in assessing the ecological impacts of the predicted buildup of contaminants in the receiving water sediments. The Long and Morgan (1991) "effects ranges" do not, in fact, represent effects related to the chemical concentrations that are represented by these so-called "effects ranges" (Lee and Jones-Lee, 1996).

Further, the Long and Morgan values are based on a fundamentally flawed approach involving the use of total concentrations of chemical constituents in sediments rather than biologically available toxic forms. It is well known that, for most chemical constituents in sediments, large parts are in nontoxic, nonavailable forms. To the extent that New Zealand is influencing urban development based on the Morrisey *et al.* approach, New Zealand is using technically invalid approaches to assess the potential impacts of stormwater runoff associated constituents that tend to accumulate in aquatic sediments.

Morrisey *et al.*'s statement, "*the use of numerical sediment- and water-quality criteria is essentially an attempt to predict environmental impacts*" represents a technically invalid approach that can lead to massive waste of public and private funds where regulated chemicals are over-regulated and the unregulated chemicals are not addressed at all. New Zealand and others who are following this bureaucratically simple, but technically invalid approach should abandon this approach in favor of focusing on biologically-based assessments of the impacts of chemical constituents on the beneficial uses of waters.

References

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