



Deriving Sediment Interstitial Water Remediation Goals (IWRGs) at Superfund Sites for the Protection of Benthic Organisms from Direct Toxicity

Peer Review Charge Questions

Background Information:

Over the past two decades, methods for measuring the concentrations of bioavailable chemical in sediments have been developed. Research has shown that the bioavailable chemical in sediment and freely dissolved chemical in the sediment interstitial water are practically equivalent. This document provides a methodology for deriving interstitial water remediation goals (IWRGs) based upon the bioavailable/freely dissolved chemical in the sediment interstitial water for the protection of benthic organisms from direct toxicity. Remediation goals are derived on a sediment interstitial water basis ($\mu\text{g/L}$) and subsequently, are converted to a bulk sediment basis ($\mu\text{g/kg}$ dry weight) using site-specific sediment/water partition coefficients. Additionally, this document contains guidance on how to compare and evaluate results from sediment toxicity tests to concentrations of chemical in the sediment interstitial water. When these two results are consistent with each other, one can be reasonably assured that the causes of toxicity to benthic organisms in the sediment have been correctly identified and that the developed IWRGs for the toxicants will be protective of the benthic organisms at the site. The consistency evaluation is an important step in developing defensible IWRGs.

Charge Questions:

As you read through the sections of this document that you have been asked to review, please provide written responses to the best of your ability to the following questions. *Reviewer comments are provided in italics below as well in in the document.*

Additional comments and recommendations for improving this document and associated methodology are also welcome:

- (1) Is the document written in a style that will be accessible for users with a range of educational and technical backgrounds? *Yes. The document style is clear and accessible. This will be a welcome and useful document for site managers.*
- (2) Is the described methodology sufficiently clear to be performed by Superfund remediation project managers, risk assessors, and consultants for Superfund sites? If not, please provide suggestions on how clarity can be improved. *Yes, but some suggestions for improvement are provided in comments in the text.*
- (3) Is the document missing any important concepts, sections, definitions, and/or text that should be provided in order to make the methodology truly implementable? *A glossary that defines acronyms would be helpful.*

- (4) Are the illustrative examples for determining IWRGs complete enough to demonstrate how the IWRGs are derived? *Yes, but suggestions for additional examples are provide in the text.*
- (5) Is the methodology for deriving interstitial water remediation goals scientifically defensible? *Yes.*
- (6) In implementing the methodology, site-specific K_{oc} s are used to convert the IWRGs on concentration basis in sediment interstitial water ($\mu\text{g/L}$) to concentrations in bulk sediment ($\mu\text{g/kg}$ dry weight). Is the discussion of the K_{oc} s adequate? *Yes.* Is the discussion of the conversion from concentrations in interstitial water to bulk sediment adequate? *Yes, with one exception as noted in a comment on page 28.* Is the discussion of which K_{oc} s should be used in the conversions adequate? *Yes, with one exception as noted in a comment on page 28.*
- (7) Passive sampling can be performed on any number of samples from a site; for example, on all samples where contaminants are measured in bulk sediment, on only the surface sediments, on the top and bottom of sediments cores, on the top and at the dredge depth of the sediments cores, on surface sediment and based of BAZ (biological active zone), or some other arrangement. Currently, the methodology allows flexibility (makes no recommendation) on which samples are measured using the passive sampling technique and how those data are used in the conversion from interstitial water IWRGs to bulk sediment IWRGs. The extremes in this process are a) perform one passive sampling measurement and assume all sediments are the same across the location of interest (horizontally and with depth) or b) perform passive sampling on all samples and develop 3-D contour plots with depth based upon concentrations in the interstitial water. Should the methodology make a recommendation on this issue? *The issue should at least be discussed.* If so, provide your recommendation. *The issue of whether to use passive samplers on only the BAZ, or throughout a deeper sediment core will depend on the conceptual site mode (CSM). Does the CSM suggest that contamination at depth could be accessible to site receptors, either now or in the future? Is sediment at depth is not currently bioaccessible and is not expected to be in the future, passive sampling may not be necessary. Would information on the potential bioavailability of samples at depth be helpful in terms of site management? A tiered approach could be used. For example, K_{oc} values in surface sediment measured using passive samplers are in agreement with standard literature-based K_{oc} values, application of standard K_{oc} values to deeper sediment could be used to assess potential future risk, and passive samplers would not be needed for deeper sediments.*
- (8) Section 5 provides information on comparing toxicity test results and developed IWRGs. Is this section sufficiently clear for the non-experts in toxicity testing and/or passive sampling? *Yes.*

Please provide your written comments to Virginia Houk (Houk.virginia@epa.gov) no later than July 15, 2016.

If you have any questions concerning the draft guidance or the charge, please do not hesitate to contact me at 919-541-2815. We sincerely thank you for your input to our peer review process.

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