

Clarification Paper:

Modifications to Ammonia and Sulfide Triggers for Purging and Reference Toxicant Toxicity Testing

Laura Inouye (Ecology), Erika Hoffman (EPA) and
David Fox (Corps) for the DMMP agencies

May 1, 2013

Introduction

The potential for ammonia and sulfides to complicate bioassay evaluations of dredged material has been addressed previously:

- DMMP (1993) The *Neanthes* 20-day Bioassay – Requirements for Ammonia/Sulfides Monitoring and Initial Weight
- DMMP (2001) Reporting Ammonia LC₅₀ data for Larval and Amphipod Bioassays
- DMMP (2002) Ammonia and Amphipod Toxicity Testing
- DMMP (2004) Ammonia and Sulfide Guidance Relative to *Neanthes* Growth Bioassay.

Problem Identification

- Ammonia: No ref tox or purging triggers for larval tests
- Sulfides: No purging triggers for amphipod or larval tests
- Bulk measurements likely not representative of bioassays conditions
- Measurements taken at start of testing may be too late to initiate purging
- Amphipod purge triggers based on NOECs while *Neanthes* triggers based on minor effects levels
- High level of effort and sediment volume needed for interstitial measurements

Literature and Data Review

- Peer reviewed literature, meeting presentations, and laboratory reference toxicity test data were gathered and reviewed (appendices A and B).
- Due to range in NOECs, LOECs, and LC_{50}/EC_{50} , overlaps in the values existed.
- After consideration, the DMMP agencies decided to use the NOEC and 0.5 NOEC values for overlying water SLs for triggering RefTox testing and purging.

Why set Purging Triggers at NOEC?

- Purging triggers based on effects levels could result in bioassay data that are rejected for use or difficult to interpret
- LC_{50}/EC_{50} would be less conservative since based on shorter exposure times and overlap within the same species
- Using lower threshold in overlying water increases chances that sulfides and ammonia in interstitial water will be below effects thresholds

Why Focus on Overlying Water Measurement?

- Eliminates potential for porewater extraction procedure to alter ammonia/sulfide concentrations
- Collecting adequate sediment volume for the sacrificial beakers needed for interstitial measurements can be a problem for some projects

Proposed Triggers (overlying water)

Trigger	Bedded sediment tests				Larval tests	
	<i>Neanthes</i>	<i>Ampelisca</i>	<i>Eohaustorius</i>	<i>Rhepoxynius</i>	<i>Bivalve</i>	<i>Echinoderm</i>
Unionized Ammonia (mg/L) Ref Tox	0.23	0.118	0.4	0.2	0.02	0.007
Unionized Ammonia (mg/L) Purge	0.46	0.236	0.8	0.4	0.04	0.014
Hydrogen Sulfide (mg/L) Purge	3.4	0.0094	0.122	0.099	0.0025	0.01

To Purge or not to Purge

Measure ammonia and sulfides in test beakers PRIOR to starting bioassays:

- One beaker for larval tests and one for bedded sediment tests
- Measure total ammonia, total sulfides, pH, salinity and temperature in the OVERLYING water
- Calculate unionized ammonia and hydrogen sulfide and compare to triggers
- Consult with DMMP agencies regarding need to purge

Case-by-Case Considerations

- If site COCs include volatiles, purging may be disallowed or restricted in duration
- If ammonia or sulfides themselves are COCs (e.g. wood waste), purging may not be allowed

Purge Method Clarification

Purging for larval tests must use aeration only

- Purging via water changes may result in loss of colloids/suspended sediments that are a critical part of the sediment evaluation
- If aeration does not reduce ammonia concentrations below the NOEC, the Ref Tox data will help with data interpretation

See Clarification Paper for More

- Options for project-specific purging regimes
- Reporting requirements
- Appendices with details of literature and data review

Questions?

- Comments due by July 3 (extended time due to late release of the paper)