Bulk Sediment TBT Bioaccumulation Trigger – Basis?

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Brief History of TBT values

- The value of 73 µg/kg was proposed as an interim screening level (SL) in 1989.
- In 1996, the porewater SL of 0.15 µg/L was developed based on the 1989 interim SL.
- A 2015 SMARM presentation detailed the uncertainties and difficulties associated with porewater evaluation and suggested a greater reliance on the evaluation of bulk sediment tributyltin (TBT) concentrations.

What was the basis of the 1989 interim TBT SL value?

Step 1 – 1989 Data Review

- TBT in four non-urban bays ranged from 0 to 37 µg/kg dry weight (dw) as tin (0 to 90.3 µg/kg as TBT).
- Concentrations in urban bays and PSDDA baseline studies of disposal sites ranged from 1 to 400 µg/kg dw as tin (2.44 to 976 µg/kg as TBT).

Step 2 – BPJ Regarding Testing

- "Professional judgment calls for initiating biological testing generally occur between 30 µg/kg and 100 µg/kg (Sandy Lemlich, San Francisco District, Corps, personal communication)" (From EPA 1996, Appendix D).

  Note: 30 - 100 µg/kg as tin is equivalent to **73** - 244 µg/kg as TBT.

Step 3 – Link to Water Quality

- An equilibrium partitioning evaluation indicated that bulk sediment concentrations of TBT less than 40 µg/kg (TBT as tin) (equivalent to 98 µg/kg as TBT) were required to meet a dissolved concentration of 0.531 µg/L, which was the acute EPA water quality advisory value at that time.

Porewater Bioaccumulation Trigger

- In 1996, the porewater TBT SL and bioaccumulation trigger was established as 0.15 µg/L.
- The value of 0.15 µg/L was calculated using the interim sediment SL from 1989 (73 µg/kg as TBT), a K_{oc} value of 25,000 from Meador et al. (1997), and an assumed TOC of 2% (Michelsen et al. 1996).
- The porewater value was evaluated relative to the available aqueous toxicity values and was less than 2/3 of the available chronic effects level values.

Bottom Line

- There is no technical basis for the bioaccumulation trigger values for TBT.
- Because there are no marine SMS criteria for TBT, the DMMP TBT values have been used as screening values.
- The DMMP TBT values have even inappropriately been used to set remedial action levels at a variety of sediment sites.

Path Forward

- When both porewater and sediment TBT data are available, the porewater evaluation will trump the bulk sediment evaluation.
- We recommend working together to identify a technically sound approach to develop TBT values for porewater and sediment.

References

- EPA 1996. Recommendations for screening values for tributyltin in sediments at Superfund sites in Puget Sound WA. Prepared for EPA Region 10, Superfund by Roy F. Weston
- Meador JP, C.A. Krone, D.W. Dyer, U. Varanase. 1997. Toxicity of sediment-associated tributyltin to infaunal invertebrates: species comparison and the role of organic carbon. *Marine Environmental Research* **43**:219-241.
- Michelsen T, T.C. Shaw, S. Stirling. 1996. SMS Technical information memorandum: testing, reporting and evaluation of tributyltin data in PSDAA and SMS Programs. PSDDA Issue Paper October 1996.