In Situ Sediment Immobilization Treatment: From Demonstration to Full-scale Implementation

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Introduction: In situ treatment via contaminant immobilization is an innovative sediment remediation approach that involves introducing sorbent amendments, such as activated carbon (AC), into contaminated sediments to alter sediment geochemistry, increase contaminant binding, and therefore decrease bioavailability of organic and metal contaminants. To date, more than 25 field-scale demonstration projects spanning a range of environmental conditions have now either been completed or are currently underway in the United States and Norway. These projects have evaluated the effectiveness and potential ecological impacts associated with a range of placement methods including:

- Direct application of amendments, with or without binder and weighting agents where mixing could occur naturally through bioturbation or enhanced using mixing apparatus
- Mixing amendments with sediment or sand with subsequent placement through mechanical or hydraulic methods
- Placement of amendments below covers or caps either in aggregate form or impregnated as a thin layer within a geosynthetic material

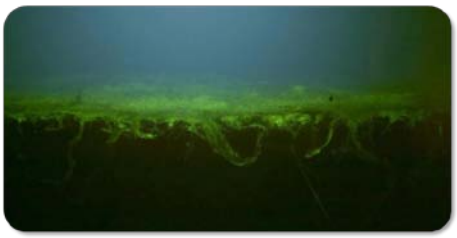

Fig. 1: Bioturbation of Sedimite™ (an amendment binder) 30 days after placement (Menzie 2011).

Discussion: The completed field projects demonstrate that in situ contaminant immobilization is a proven, permanent sediment remedial technology that improves in effectiveness over time. In comparison to other remedial technologies, in situ immobilization provides a less invasive and often more rapid reduction in contaminant bioavailability. The current body of knowledge regarding the efficacy of placement methods and the potential effects on ecological resources indicate that, with proper consideration of site-specific design requirements, the technology is ready for full-scale design and implementation.

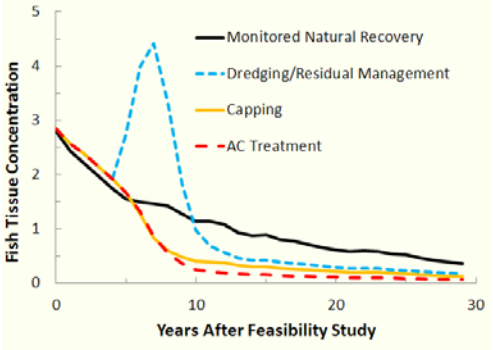

Fig. 2: Comparison of the effectiveness of various remedial technologies to reduce contaminant bioavailability over time (Patmont et al. 2013).

This presentation provides an overview of the findings from numerous pilot- and full-scale applications of the in situ immobilization treatment. Based on these findings and lessons learned during construction, the most promising techniques for cost-efficient and effective full-scale application are recommended. The presentation closes with a discussion of the important site-specific considerations that should be addressed during remedy selection and/or design.

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References: [1] Menzie, C.A. 2011. Contaminated Sediments: New Tools and Approaches for in situ Remediation - Session III. CLU-IN Internet Seminar. National Institute of Environmental Health Sciences, Superfund Research Program. January 19, 2011.; [2] Patmont, C., U. Ghosh, C. Menzie, P. LaRosa, J. Quadrini, G. Cornelissen, J. Collins, and T. Hjartland. 2013. In Situ Sediment Immobilization Treatment: A Demonstrated Sediment Cleanup Technology. Presented at the Seventh International Conference on Remediation of Contaminated Sediments. Dallas, Texas USA. February 4-7, 2013.