Use of Natural Sediments towards Enhanced Monitored Natural Recovery

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Background/Objectives. Conventional isolation capping involves the placement of 1 to 3 m of clean, sandy sediment to securely bury and isolate sediment contaminants. More recently, thin layer (10 to 30 cm) sand treatments have been increasingly employed to accelerate, or rapidly enhance, ongoing natural recovery processes and minimize potential impacts to the aquatic environment that can occur during placement of thicker caps. Thin layer treatments to facilitate natural recovery processes, termed enhanced monitored natural recovery (EMNR), typically involves clean sand, which can still act as an effective isolation barrier in some cases, but has little or no propensity (i.e., carbon, clay, or other materials) to bind contaminants. In cases where physical disturbance and/or bioturbation mix the sand with the underlying sediment, these sand layers only serve to dilute the bulk concentrations, but have limited influence on exposure and bioavailability. In contrast to conventional thin-layer sand capping approaches, thin-layer treatments comprised of natural sediment that contains fines and organic carbon have the potential for increased contaminant binding capacity, and thus could result in improved long-term outcomes compared with conventional EMNR, while also providing a potential re-use opportunity for clean dredge material. The use of these natural sediments that contain fine grained material and/or organic carbon has been termed “true EMNR” (tEMNR) because of the use of material that is more closely matched to what would truly deposit at the site. tEMNR is currently being evaluated at a mesocosm scale by the Navy at Pearl Harbor Naval Shipyard, and in benchtop evaluations by the US Army Corps of Engineers and Geosyntec.

Approach/Activities. This presentation will summarize recent US Navy and Army investments towards the practical application of tEMNR using clean dredge materials (DM) as a potentially cost-effective and beneficial use alternative to sand for meeting site-specific remedial goals. The approach focuses on both development of a literature-based comparative between EMNR and tEMNR methods and two mesocosm-scale assessments, one at a creek mouth site at Naval Base San Diego, and one adjacent to Pearl Harbor Naval Shipyard in Pearl Harbor, Hawaii. The approach integrates results from these recently completed and current efforts including:

1) Comparative analysis between EMNR and tEMNR including benefits with respect to confined disposal facility storage space, costs, and reuse potential;
2) The in situ mesocosm-scale evaluations conducted in San Diego and Pearl Harbor;
3) Laboratory assessments examining handling and placement strategies to ensure stability of placed sediments and reduce benthic community impacts;
4) Challenges and considerations towards regulatory acceptance

Results/Lessons Learned. This presentation will focus on addressing the results associated with the multiple lines of evidence presented above. Overview of a draft-Navy technical document comparing EMNR with tEMNR will be followed by empirical results associated with field studies conducted in San Diego and Pearl Harbor, which currently point to enhancement of the benthic community and reduced PCB availability, respectively. Laboratory evaluations suggest that use of natural sediments result in reduced impacts to the benthic community in

comparison to sand. Challenges associated with the use of potentially finer-grained natural sediments with detectable concentrations of contaminants of concern will be discussed.