

New Bedford Harbor Superfund Site Area D Bulkhead Project

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Cement-based solidification/stabilization (S/S) treatment technology is enabling the U.S. Environmental Protection Agency to clean up the New Bedford Harbor Superfund site while reusing the treated material to build a dewatering facility.

The New Bedford, Mass., site, located in an 7,300-hectare (18,000-acre) urban estuary, is highly contaminated with polychlorinated biphenyls (PCBs) and heavy metals. PCBs are man-made, odorless, and colorless chemicals used in the manufacture of electrical transformers and capacitors. PCB wastes were discharged directly into the harbor as well as indirectly through the city's sewer system. PCB levels are highly variable throughout the site, with concentrations as high as 40,000 parts per million (ppm) in wetland and mudflat sediments.

The New Bedford Harbor Superfund cleanup plan called for dredging approximately 340,000 cubic meters (450,000 cubic yards) of PCB-contaminated sediment from 69 hectares (170 acres) of harbor and wetlands, dewatering the sediment, and disposing it at a licensed offsite disposal facility or in a confined disposal facility. The dewatering process removes excess water from dredged sediment, greatly reducing the volume of sediment needing disposal.

Construction plans for the dewatering facility and rail car loading area included building an industrial grade waterfront bulkhead to create approximately two acres of new land at the port. Locating the dewatering facility along the waterfront provides docking facilities for the harbor cleanup operation and access to a new rail spur for transport of the dewatered sediment.

Creating the two acres of useable land for construction of the dewatering facility was called the Area D Bulkhead project. It required the installation of a series of seven circular steel sheet pile bulkhead cells connected together with steel arcs. Dredging of soft harbor sediment at the location of the cells was required prior to installation of the cells. If left in place the soft sediments would cause structural instabilities in the completed bulkhead. This dredged sediment was contaminated with PCBs at concentrations less than 50 ppm.



Steel arcs connecting circular bulkhead cells.



Dredged sediment placed directly into pugmill mixer. Foreground: Treated sediment compacted to form new land.

Cement-based S/S treatment of the sediment dredged from the area of the bulkhead cells was done ex-situ. After all of the sheet pile for each bulkhead cell were driven, the soft harbor sediments were dredged from within the completed cell and placed directly into the hopper of a pugmill. A pugmill is a continuous mixer, processing material placed into its hopper at one end of its mixing chamber and then discharging treated material from the output end of the chamber. Computer-controlled weigh belts from the hopper and reagent feed systems from cement silos measured incoming sediment and amount of reagent mixed in, ensuring a 13% addition rate of portland cement. The treated sediment was stockpiled and left to cure until it reached a workable consistency (minimum 24 hours, but in some cases as much as three months). The cured material was spread in lifts and compacted behind the completed bulkhead to create new land.

S/S treatment changed the physical and chemical properties of the sediment. Treated sediment had no free water and improved construction characteristics. The unconfined compressive strength of the compacted cured material showed strengths as high as 1.0 megapascal (150 pounds per square inch) after 14 days, significantly higher than the required 0.3 MPa (40 psi). Significant cost savings were realized by using the treated material as structural fill behind the bulkhead rather than disposing of it offsite. About 9,000 cubic meters (10,000 cubic yards) of sediment was treated. Reuse of the treated material created new useable land for the construction of the dewatering facility critical to the completion of the rest of the Superfund project.

Credits

Design and Oversight:

U.S. Environmental Protection Agency, Region 1, Boston, Mass.
U.S. Army Corps of Engineers, New England District, Concord, Mass.
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General Remediation Contractor:

Foster Wheeler Environmental Corporation, Boston, Mass.

Sub-Contractor for Dewatering Facility:

R. Zoppo Corporation, Stoughton, Mass.

Solidification/Stabilization Contractor:

United Retek Corporation, Medway, Mass.
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Photographs:

U.S. Environmental Protection Agency
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