EXECUTIVE SUMMARY

Sediments from Cohasset Harbor and Chelsea River in Massachusetts, considered suitable for unconfined open water disposal, were sequentially dredged and disposed at the Massachusetts Bay Disposal Site (MBDS) for a capping demonstration project. The objective of this project was to evaluate the feasibility of developing a discrete mound of sediment on the seafloor and then effectively adding cap material over the initial deposit at this deep-water (90 m) dredged material disposal site. Monitoring protocols developed through the Disposal Area Monitoring System (DAMOS) Program were utilized to track the formation of the mound at multiple stages of development. Overall, the Massachusetts Bay Disposal Site Capping Demonstration Project showed that dredged material could be effectively placed, capped, and monitored at this deep-water disposal site. Recommendations for improvements to the dredging and disposal operations are provided for future project considerations.

Dredging-needs analyses, performed by both federal and state agencies for ports located in the Commonwealth of Massachusetts, indicate that a considerable volume of sediments will need to be dredged in the near future to maintain the viability of many harbor areas. A percentage of the material dredged from the larger, industrialized harbors along the coast of Massachusetts will likely be considered unsuitable for unconfined open water disposal due to elevated levels of environmental contaminants (and classified as unacceptably-contaminated dredged material [UDM]). Subaqueous capping has proven to be an environmentally and economically sound method of managing moderate to large volumes of UDM.

Capping dredged material has proven successful in the shallow water depths of Long Island Sound (20 m), as well as the moderate water depths of the Portland Disposal Site (65 m) in the Gulf of Maine. However, capping at deeper water disposal sites ($>$65 m) was an unproven management method due to a variety of factors, including historical difficulties in disposal barge positioning and lack of evidence confirming the formation of distinct UDM and capping layers on the seafloor. Refinement of dredged material management techniques and the use of differential Global Positioning System (DGPS) to monitor and control disposal and capping operations improved the likelihood of being able to create discrete mounds in deeper water. This tightly controlled, closely monitored deep-water capping project has provided evidence that the technique can be successful at MBDS.

To avoid any potential adverse environmental impacts from such a demonstration, material deemed suitable for unconfined open water disposal from Cohasset Harbor, Cohasset, Massachusetts was used to represent UDM. Capping dredged material (CDM) originated from improvement dredging operations in the Chelsea River as part of the Boston Harbor Navigation Improvement Project (BHNIP). The dredged material originating from these source areas displayed sufficient visual distinction to facilitate

identification of source materials after disposal and capping were complete. The capped mound was developed in 86 m of water over a 0.64 km² area of featureless seafloor located near the southern boundary of MBDS, away from the active region of the disposal site. This part of the MBDS was designated as the Cohasset Harbor Capping Project (CHCP) area. A series of monitoring surveys were completed over the CHCP Mound during the different phases of capped mound formation.

A Baseline survey was performed over the CHCP study area in September 1998 to evaluate seafloor topography, map the distribution of dredged material from historic disposal events, and develop a basis of comparison for future survey efforts. From December 1998 through February 1999 a total estimated barge volume of 41,250 m³ of sandy silt and gravel dredged from Cohasset Harbor was transported to the CHCP study area and deposited on the seafloor. A special monitoring survey was performed over the CHCP study area after the first barge load of sediment was deposited to evaluate the effectiveness of various monitoring tools in deep water and to document the distribution of sediment resulting from a single disposal event at these water depths. At the conclusion of UDM disposal, a Precap survey was performed over the CHCP study area, which documented the development of a discrete UDM mound 0.4 m high, with a detectable footprint approximately 600 m wide.

Due to project logistics, the UDM mound was uncapped for a period of nine months on the MBDS seafloor before the next phase of operations commenced, providing consolidation time for the disposal mound. Additionally, before capping operations began, approximately 15,500 m³ of additional Cohasset Harbor UDM were deposited at CHCP in the Fall of 1999. The UDM deposit was then covered by 154,400 m³ of cap material consisting of dark silt, sand, gravel, and clumps of Boston Blue Clay, in the Spring of 2000. The Postcap survey completed in the Fall of 2000 determined that the majority of CDM had accumulated within a 100 m radius of the CHCP disposal buoy. The full extent of the CDM apron was over 800 m wide and covered all but a small area of UDM located on the northern fringe of the CHCP Mound.

The results of the single beam bathymetry, side-scan sonar, sediment-profile imaging, and sediment sampling (surface grabs and cores) surveys used to document the development of the CHCP mound agreed well throughout the demonstration project. These data indicated that a layered deposit consisting of distinct sediment strata was developed on the MBDS seafloor. Most cores collected within the CHCP project area consisted of a layer of Chelsea River CDM over a layer Cohasset Harbor UDM over a layer of ambient moist, silty clay, with little to no sediment mixing between layers detected.