EXECUTIVE SUMMARY

An investigation of nine previously constructed confined aquatic disposal (CAD) cells in Boston Harbor was performed in August 2004 as part of the U.S. Army Corps of Engineers (USACE) New England District Disposal Area Monitoring System (DAMOS). The CAD cells were constructed beneath the navigable channel as part of the Boston Harbor Navigation Improvement Project (BHNIP) carried out between 1997 and 2000. Under the BHNIP, the CAD cells received dredged harbor sediments that were identified as unsuitable for unconfined open water disposal. Following completion of disposal into the CAD cells, they were capped with a layer of sand to further isolate the dredged material from the overlying waters.

The use of CAD cells within the footprint of a navigable channel was a relatively new technique at the time of the BHNIP; as a result, a series of investigations were performed during and following completion of the project to assess the effectiveness of dredged material disposal into the cells and cap placement. The August 2004 investigation was performed as a longer term follow-up as a requirement of the Water Quality Certification (WQC), four to seven years following completion of individual CAD cells. The 2004 survey included bathymetric, side-scan sonar, underwater video and sediment-profile imaging surveys. The investigation was designed to 1) assess the general physical status of the surface of each CAD cell to evaluate cell stability, with a more detailed assessment of one cell (M19) where a linear depression in the capped surface of the cell had been identified in 2002; 2) characterize bathymetry over the CAD cells and surrounding channel; and 3) assess the benthic recolonization status of each of the nine CAD cells.

The high resolution swath bathymetry and side-scan sonar data collected as part of the August 2004 survey revealed that all nine CAD cells remained as stable structures with no evidence of significant cap disturbance or scour. As expected, additional consolidation of the material within the cells had taken place and some of the surface topography within the cells reflected cell bottom topography. Some collapse of the exposed sidewalls of the cells that rise steeply above the cell surface had also occurred. Both of these processes are expected to continue into the future, but without effect on the overall structure or integrity of the cells. The linear depression previously identified over cell M19 was clearly visible in 2004. Review of the pre-filling bathymetry of cell M19 revealed a similar feature on the bottom of the cell, and it is believed that the surface depression was the result of consolidation of material within the cell causing the surface topography to follow that of the underlying cell floor. The depression appeared stable over time.

While many of the cells had capping sand exposed at the surface at the completion of the project, follow-up surveys prior to the 2004 survey indicated that fine-grained materials were being deposited on the sand cap, and the sand caps were observed at depths increasing with time following the capping. Silt-clay was identified as the predominant surficial sediment in 2004 (based on SPI, video, and side-scan). This was consistent with earlier follow-up surveys, as the cells, depressed below the surrounding harbor bottom, continued to receive sediments transported in runoff or resuspended from other areas of the harbor. Accretion of material within the cells was not identified in comparing the 2004 bathymetry data with data collected 2 to 7 years prior, indicating that the continuing consolidation of the dredged material within the cells likely masked the deposition. Large scale debris (timbers, piles, tires, etc.) were also identified on the surface of some of the cells in 2004. Deposition of fine material (as well as larger debris) is expected to continue into the future, helping to further sequester the material deeper within the cell.

The towed video footage collected in 2004 revealed numerous small fish and crustaceans at the bottom over the CAD cells indicating that the area was providing epibenthic habitat. However, sediment-profile images taken in 2004 from the cells and reference areas revealed general benthic habitat conditions indicative of a consistently stressed environment. The presence in the urban harbor of frequent ship traffic, high organic loading and periods of low dissolved oxygen in the bottom waters creates this stressed habitat. The continual exposure to stressful conditions limited the recolonization and successional status of both the CAD cells and associated reference areas, resulting in an environment in a perpetual state of early succession. This was expected given periodic episodes of poor water quality and physical disturbance associated with a working harbor.

The 2004 monitoring survey was designed to meet the five-year post-construction monitoring requirements of the WQC for the BHNIP CAD cells. As the structure of the CAD cells was found to be stable, no further monitoring is recommended for compliance with the WQC.