EXECUTIVE SUMMARY

Science Applications International Corporation (SAIC) conducted a monitoring survey at the Central Long Island Sound Disposal Site (CLIS) from 10 to 15 July 1996 aboard the M/V *Beavertail* as part of the Disposal Area Monitoring System (DAMOS) Program. Field operations were concentrated over the new CLIS 1995 disposal mound, as well as the historic New Haven 1993 (NHAV 93), CLIS 1994 (CLIS 94), and Mill-Quinnipiac River (MQR) mounds. The July 1996 field effort consisted of precision bathymetric and Remote Ecological Monitoring of the Seafloor (REMOTS®) surveys. These surveying techniques were employed to monitor the development of CLIS 95, as well as the stability, consolidation rates, and benthic recolonization of CLIS 94, NHAV 93, and MQR capped mounds.

The CLIS 95 mound is the newest bottom feature at the disposal site and is an example of a small, capped, dredged material disposal mound. In September 1995, the CDA buoy was deployed at 41°08.660' N, 72°53.042' W (NAD 27) approximately 450 m southwest of the historic NHAV 74 mound apex. An estimated barge volume of 16,300 m^3 of unacceptably contaminated dredged material (UDM) was removed from Milford and Bridgeport Harbors and deposited in close proximity to the CDA 95 buoy, forming a small mound. The UDM deposit was then completely covered with 50,100 m^3 of capping dredged material (CDM) generated from dredging projects in the West River and Bridgeport Harbor to yield a CDM to UDM ratio of 3.1:1.0.

The results of the July 1996 field effort indicate the formation of a small, but distinct, bottom feature on the CLIS seafloor. This discrete sediment mound was found to be 3.75 m high at the apex and approximately 200 m in diameter. The CLIS 95 mound has taken on a slightly irregular shape due to the slope of the bottom as well as the distribution of capping material. REMOTS® photographs obtained over CLIS 95 documented deep Redox Potential Discontinuity (RPD) depths, mature benthic infaunal populations, and high Organism-Sediment Index (OSI) values, indicating rapid recolonization of these sediments.

No bathymetric data documenting the interim stages of development were available. However, the compact nature of the deposit, the reported barge release positions, the CDM to UDM ratio, and the results of the REMOTS® sediment-profile photography survey over CLIS 95 suggest the UDM deposit has been completely capped. Continued monitoring of the CLIS 95 mound is recommended for the next one to two years to document consolidation and detect changes in benthic community structure.

The CLIS 94 mound, developed during the 1994-95 disposal season, is also an example of a capped mound. Approximately 129,000 m^3 of UDM and 161,000 m^3 of CDM were placed at the CDA 94 buoy to form an irregular-shaped, moderate-sized disposal mound 630 m northeast of the NHAV 93 mound apex. Field operations over this bottom feature were conducted to observe changes in bathymetry due to consolidation, as well as to confirm the continued stability of the benthic infaunal community.

Depth difference calculations indicated the presence of several pockets of consolidation over the surface of the CLIS 94 mound. A 0.25 m to 0.5 m decrease in mound height was discovered at the mound apex, while smaller cells of consolidation were detected over the broader southern region of the mound. The five REMOTS® stations occupied over the center of CLIS 94 displayed some improvement relative to the conditions found during the September 1995 survey. A healthy Stage I on III benthic assemblage and deeper RPD depths over the center of CLIS 94 indicate higher dissolved oxygen (DO) concentrations and continued benthic recovery.

The NHAV 93 mound was developed during the 1993-94 disposal season as part of a large scale confined aquatic disposal (CAD) project. The management strategy of controlling the deposition of small to moderate volumes of dredged material over a ten-year period resulted in the formation of a ring of disposal mounds on the CLIS seafloor. Upon completion in 1992, this network of disposal mounds formed an artificial containment cell capable of accepting large volumes of UDM, limiting the lateral spread of the deposit, and facilitating efficient capping operations. In 1993, approximately 590,000 m^3 of UDM dredged from the inner New Haven Harbor was deposited within the containment cell and capped to a thickness of 0.5 m to 1.0 m by 569,000 m^3 of CDM.

SAIC has conducted a total of eight bathymetric and five REMOTS® sediment-profile photography surveys over the NHAV 93 mound since September 1993. This latest field effort adds to the comprehensive time-series data set that currently exists for the 2.56 km^2 area of CLIS seafloor. At 2.5 years after the completion of capping operations, the July 1996 survey has shown 0.25 m to 0.75 m of consolidation over the majority of the mound with little change in size or shape. The results of the REMOTS® sediment-profile photography survey indicate the benthic community is continuing to recover as expected.

The MQR mound is a historic bottom feature formed along the southern boundary of CLIS. This capped sediment mound is actually composed of alternating layers of UDM and CDM deposited during the 1981-82, 1982-83, and 1993-94 disposal seasons. Approximately 65,000 m^3 of additional CDM was deposited over the MQR mound during the 1993-94 disposal season in response to anomalous REMOTS® sediment-profile

photography results. A survey conducted in July 1994 detected a 1.5 m increase in mound height, a change in the position of the mound apex, and an improved benthic community structure, resulting from the deposition of additional CDM.

The boundaries of the 2100 m × 2100 m July 1996 bathymetric survey at CLIS incorporated approximately 75% of the historic MQR mound. Depth difference calculations based on the July 1994 bathymetric data discovered small to moderate pockets of consolidation near the apex and southwestern flank of MQR. This consolidation over the surface of the MQR mound is apparently the result of de-watering of the underlying silts and clays, related to the loading that resulted from the recent deposition of CDM.

The sediment-profile photographs collected over the CLIS project mounds and reference areas provided a wealth of information pertaining to the physical, biological, and chemical status of the surficial sediment layers. Data pertaining to the physical appearance of the material displayed no evidence of particle re-suspension or erosion at the sediment-water interface. The detection of Stage III activity was widespread indicating the presence of a stable benthic community population over the majority of the stations sampled. Although increased sediment oxygen demand may have affected the results obtained from a few stations, the benthic conditions detected during the July 1996 REMOTS® sediment-profile photography survey show distinct improvement relative to September 1995. Comparisons between REMOTS® images collected over the disposal mounds and CLIS reference areas (2500W, 4500E, and CLIS-REF) show significant increases in RPD depths, resulting in higher OSI values. In 1995, a trend of shallower than expected RPD depths and indications of low dissolved oxygen (DO) concentrations was observed due to the development of hypoxic conditions across the region. The 1996 Connecticut Department of Environmental Protection (CTDEP), Bureau of Water Management water quality data set was used to evaluate and compare the onset and severity of seasonal hypoxia in the bottom waters of Long Island Sound relative to 1995.

Seasonal hypoxia (DO concentrations ≤ 3.0 mg·l^{-1}) generally occurs within the western and central Long Island Sound regions in mid to late August. However, the onset and severity of seasonal hypoxia are directly dependent on many other environmental factors (i.e., nutrient input, frequency of storms, rainfall, fresh water input, water temperature, etc.). It appears that, by conducting benthic community assessment survey operations in early summer (mid-June to mid-July), before the development of hypoxia and the deterioration of benthic conditions, a more realistic perspective on the condition of the benthic environment can be gained.