

EXECUTIVE SUMMARY

Science Applications International Corporation (SAIC) conducted a monitoring survey at the Western Long Island Sound Disposal Site (WLIS) from 16 to 18 July 1996 aboard the *M/V Beavertail* as part of the Disposal Area Monitoring System (DAMOS) Program. The field efforts were concentrated over the active southwestern quadrant of WLIS and consisted of precision bathymetry and Remote Ecological Monitoring of the Seafloor (REMOTS®). These surveying techniques were used to monitor the development, stability, and benthic recolonization of the disposal mounds formed on the WLIS seafloor from 1992 through 1996.

Buoys have been deployed to control disposal operations within the boundaries of WLIS since its selection as a dredged material disposal site in 1982 (WLIS III). Upon receiving the first volumes of sediment dredged from coastal Connecticut and New York in 1982, WLIS has been monitored on a semi-annual basis for the US Army Corps of Engineers, New England District (NED). Currently, a total of eight discrete disposal mounds exist on the WLIS seafloor within an east-west trending seafloor depression that extends through the center of the disposal site. The latest survey activity was concentrated over the three most recent dredged material deposits, the WLIS H, WLIS G, and WLIS F mounds, as well as the southern flank of the older WLIS D mound.

The WLIS H mound is the most recent bottom feature formed within the boundaries of WLIS. In September 1995, the WDA buoy was deployed at 40°59.228' N, 73°28.732' W and received approximately 15,300 m³ of sands, silts, and clays dredged from harbors and creeks along the Connecticut coast and the North Shore of Long Island, New York, from 15 April to 29 May 1996. The deposition of this material resulted in the formation of a 1.5 m high disposal mound, approximately 230 m in width. REMOTS® sediment-profile photography detected a solid Stage I pioneering polychaete community with some evidence of Stage III activity, as well as deep Redox Potential Discontinuity (RPD) depths over the majority of the H mound.

The WDA buoy was placed at 40°59.158' N, 73°29.020' W, and received an estimated barge volume of 52,500 m³ of sediment originating from coastal New York and Connecticut, during the 1994-95 disposal season. The resulting dredged material deposit, the WLIS G mound, was found to be 2.5 m high and connected to adjacent disposal mounds (D and F) by a wide apron of dredged material. The infaunal population consists mainly of Stage I individuals with some evidence of Stage III activity. Sediment-profile photography also determined the RPD depths to be relatively deep, suggesting the area has been free from the effects of seasonal hypoxia.

The WLIS F mound is the product of modest dredged material deposition at WLIS over a three-year period. The DAMOS disposal buoy WDA was positioned in nearly the

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same location during the 1991-92, 1992-93, and 1993-94 disposal seasons. A total of 80,300 m³ of dredged material was deposited at the buoy from September 1991 through May of 1994. A bathymetric survey conducted in July 1992, after the deposition of 38,700 m³ of sediment, determined the F mound to be 1.9 m high and approximately 200 m wide.

Over the next two disposal seasons, approximately 41,600 m³ of material was added to the existing F mound. The July 1996 survey found that two years of disposal activity produced a 2.0 m increase in mound height and shifted the apex of the mound approximately 30 m to the south. The final product of three years of dredged material deposition was a sediment mound with a height of 3.0 m at the apex and an overall width of approximately 250 m. Limited REMOTS[®] sediment-profile data collected over WLIS F found a healthy benthic environment with deep RPD depths and Stage I and Stage III organisms.

The WLIS D mound was developed during the 1989-90 disposal season by the deposition of approximately 185,000 m³ of material generated by seven small dredging projects in New York and Connecticut waters. An initial benthic community assessment documented signs of rapid recovery over the new mound. However, annual monitoring efforts with REMOTS[®] sediment-profile photography in 1991, 1992, and 1993 detected anomalous conditions over the southern flank of the WLIS D mound. Two stations, D200S and D300S, were occupied during the July 1996 survey at WLIS to verify improvement in benthic conditions.

Station D300S displayed dramatic improvement with a median Organism-Sediment Index (OSI) value of 8.0, attributable to deep RPDs and presence of Stage III individuals. Two of the three replicate photographs collected at D200S determined that a localized problem still exists within the surface sediments. However, this problem could be resolved by developing a new disposal mound southwest of the WLIS G mound center. The new material would cover the southern flank of the D mound and isolate this apparently small patch of problematic surface sediments.

Although determined to be feasible, subaqueous capping operations have not occurred at WLIS due to concerns about impact on a thriving lobster fishery. However, efficient and controlled disposal of large volumes of dredged material could easily be facilitated within the disposal site. The strongly sloping terminal moraine margin present in the southern region of the disposal site could be utilized as a natural ridge for the development of lateral containment cells. By strategically constructing sediment mounds in a semi-circular pattern north of the terminal moraine, large volumes of dredged material could be confined, minimizing the development of a wide, thin apron and maximizing the capacity of WLIS.

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Historic dredged material disposal activity has led to a broad distribution of dredged material over the western Long Island Sound seafloor. As a result, the detection of dredged material within WLIS reference areas is possible, even though special care is taken at their initial selection. In the past, reference areas EAST, WLIS-REF, and 2000S in the vicinity of WLIS have been abandoned due to the presence of historic dredged material. The results of the July 1996 REMOTS® survey over the current WLIS reference areas suggest that the use of 2000W for comparison with WLIS disposal mounds should be discontinued as well. The presence of dark, reduced sediments and methane gas bubbles indicate the surface sediments are not representative of the ambient sediment, free from the effects of anthropogenic activity.

Seasonal hypoxia in the western Long Island Sound region was identified as an obstacle to benthic recolonization at WLIS as early as 1985. Hypoxia, a condition of low dissolved oxygen (DO; $\leq 3.0 \text{ mg}\cdot\text{l}^{-1}$) in the water column, generally develops within the bottom waters of western and central Long Island Sound 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.).

Upon review of the benthic community assessment data collected at WLIS since 1984, a trend of shallow RPD depths, indications of low DO, and poor benthic habitat can be associated with mid-summer monitoring efforts. The results obtained during the July 1996 and other recent surveys (June 1991, July 1992) suggest the completion of benthic community assessment operations in early summer, before the development of hypoxia and the deterioration of conditions, yields a more realistic perspective into the year round condition of the benthic environment.