EXECUTIVE SUMMARY

The Disposal Area Monitoring System (DAMOS) Program, managed by the New England District (NAE) of the U.S. Army Corps of Engineers, conducts detailed monitoring studies to detect and minimize any physical, chemical, and biological impacts associated with dredging and dredged material disposal activities in New England. This report presents the results of a DAMOS monitoring survey conducted in August 2001 at the Tupper Ledge Disposal Site (TLDS) near Ellsworth, Maine. The objective of this survey was to document the distribution of dredged material on the seafloor and evaluate the recovery of the benthic community.

Maintenance dredging of the Federal Navigational Channel in the Union River near Ellsworth was performed from January through April 2001. A total estimated barge volume of 50,000 m^3 of dredged material was transported by barge and placed at TLDS, a 500 × 500 m area of seafloor in Union River Bay. This site had been selected based on the results of a previous (March 2000) baseline survey conducted by the DAMOS Program, which confirmed its overall suitability as a seafloor containment site for dredged material.

As part of the August 2001 field effort, a precision bathymetric survey was performed to detect changes in seafloor topography relative to the March 2000 predisposal survey and test the prediction that the dredged material placed at TLDS would form a discrete mound on the seafloor. In addition, a REMOTS® (Remote Ecological Monitoring of the Seafloor) sediment-profile imaging survey was conducted to further delineate the spatial distribution of dredged material on the seafloor and to assess the benthic recolonization status of the disposal site relative to two nearby reference areas.

The comparison of the March 2000 and August 2001 bathymetric data indicated the formation of a discrete sediment deposit on the seafloor at TLDS, consistent with expectations. The thickest layers of dredged material occurred in a semi-circular deposit having a maximum height of 3.25 m, located in the center of TLDS. In addition to detecting the thicker, central portion of the disposal mound, a small depression was observed northeast of TLDS in the August 2001 bathymetric survey. Because of its small size and location, this feature had not been detected during the March 2000 bathymetric survey due to differences in the area covered by the successive 2000 and 2001 surveys.

The REMOTS® results agreed well with the bathymetric depth difference comparison and indicated that the dredged material remained within the confines of the disposal site. The REMOTS® images allowed measurement of relatively thin (i.e., less than 25 cm) dredged material layers that were not detected through the bathymetric depth differencing. The disposal mound as delineated by REMOTS® sediment-profile imaging was roughly circular, with a diameter of approximately 500 m covering most of the area

inside the TLDS boundary. The REMOTS® images further indicated that the dredged material constituting the TLDS disposal mound was mostly fine-grained sediment. Wood particles that had accumulated in the Union River navigation channel from the once-active lumber milling operations in Ellsworth were mixed with the fine-grained dredged material at a number of sampling stations.

The average depth of the apparent Redox-Potential Discontinuity (RPD) was relatively shallow over the disposal mound at TLDS and at the nearby reference areas at the time of the August 2001 survey, indicating poor sediment aeration. The sediment-profile images collected within TLDS and the reference areas showed the presence of distinct bands of black sediment, principally near the sediment-water interface, indicating localized zones of anoxia and sulfide production within the sediment column. The low apparent sediment dissolved oxygen conditions and increased sediment oxygen demand (SOD) were attributed primarily to decomposition of the elevated levels of organic matter present in the sediments. The annual spring runoff event and/or sporadic phytoplankton blooms within Union River Bay likely contribute pulses of organic matter to the sediments within the wider region surrounding TLDS.

Benthic recolonization over the surface of the new disposal mound at TLDS was slower than expected, as azoic conditions (i.e., absence of visible macrofaunal life) were found at a significant number of stations in lieu of the expected early colonizing community (i.e., Stage I). The inhibited recolonization of the mound was attributed to the elevated organic content and high sediment oxygen demand associated with decomposition of the wood particles in the dredged material. A more advanced, well-developed benthic community (i.e., Stage III), similar to that observed in the March 2000 predisposal survey at TLDS, continued to persist at stations surrounding the new disposal mound and at the reference areas, despite evidence of high organic loading in these locations.

Benthic habitat conditions were determined to be highly degraded over the disposal mound at TLDS, due to the widespread anoxic conditions in the sediment and associated poor infaunal recolonization. Benthic habitat conditions in the surrounding area were somewhat better, mainly due to the persistence of the advanced Stage III benthic community despite the elevated organic loading. When all of the disposal activity at TLDS is completed, it is anticipated that benthic conditions at the stations over the mound and in surrounding areas will show gradual improvement, as the elevated organic matter undergoes microbial decomposition and direct consumption by benthic organisms.

The August 2001 REMOTS® stations should be re-sampled to monitor the progress of benthic habitat recovery in the future. One or more REMOTS® station transects extending from the disposal mound to several kilometers beyond the present reference areas also could be established to determine the extent of the organic enrichment in the area.