EXECUTIVE SUMMARY

The Disposal Area Monitoring System (DAMOS) Program sponsored a physical oceanographic study at the Rockland Disposal Site (RDS) located in West Penobscot Bay in August 2001. The disposal site has been subjected to limited dredged material deposition in recent decades; however, potential channel maintenance and coastal construction projects in the future could yield significant volumes of dredged material suitable for unconfined disposal at RDS. Thus, it was deemed prudent to update existing information related to oceanographic conditions and processes within the disposal site as a basis for numerical modeling routines that predict the fate of dredged material disposal plumes in the water column.

Science Applications International Corporation (SAIC) deployed a bottom-mounted instrument array consisting of an acoustic Doppler current profiler (ADCP), an acoustic Doppler current meter (ADCM), and an optical backscatter sensor (OBS) mounted on an aluminum frame for a full month tidal cycle at a position of 44°07.093´ N, 69°00.388´ W. The ADCP provided data on the currents throughout the water column, and the ADCM provided data on the near-bottom currents and temperature, as well as water level. The OBS sensor, which was interfaced with the ADCM, provided data on the relative turbidity at the near-bottom level. A water sample was collected 75 cm above the seafloor upon deployment and recovery of the instrument array, and a hydrocast was performed with a conductivity-temperature-depth profiler (CTD) to examine suspended sediment load and physical characteristics of the water column.

Data from the current meters showed that the semidiurnal lunar tidal signal dominates the currents throughout the water column. The time series records of currents showed that the mid-water column currents were strongest, and that the Spring-Neap tidal cycle was significant at all depths. Long term mean currents were weak (< 3 cm·s^{-1}), and mean direction ranged from north to east from the surface to bottom, respectively. A harmonic tidal analysis confirmed the semidiurnal tide as most significant, but failed to delineate the fortnightly or monthly tide with confidence. Variance from the tidal analysis showed the currents to be nearly 95% tidal at many depth levels. Tidal ellipses showed the currents to be extremely rectilinear, with almost no minor axis at some depth levels. A record of residual currents, calculated by subtracting the least squares tidal fit from the raw current data, showed weak non-tidal currents, with the strongest events in the near surface. Trends in the near-surface residual currents mimicked the meteorological trends observed at a nearby buoy maintained by the University of Maine.

Data from the OBS sensor showed that significant turbidity events were rare at RDS, and were not associated with increases in tidal current velocity. As a result, increases in turbidity over RDS were attributed to the advection of turbid waters from outside the disposal site. An analysis of Total Suspended Solids (TSS) from water samples collected at the beginning and end of the deployment period showed that the bottom water had minimal amounts of suspended sediment.