DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-78-45

EVALUATION OF THE ELUTRIATE TEST AS A METHOD OF PREDICTING CONTAMINANT RELEASE DURING OPEN-WATER DISPOSAL OF DREDGED SEDIMENTS AND ENVIRONMENTAL IMPACT OF OPEN-WATER DREDGED MATERIAL DISPOSAL

VOL. I: DISCUSSION

by

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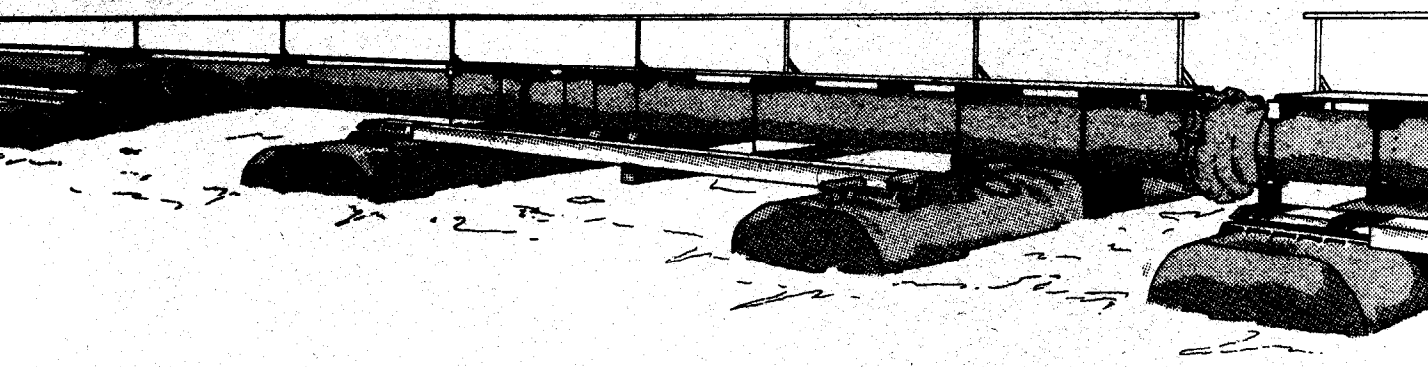

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1. The Dredged Material Research Program (DMRP) was a broad, multifaceted investigation of the environmental impacts of dredged material disposal that included the development of new or improved disposal alternatives. In the early stages of the DMRP, it became apparent that an understanding of the actual pollution potential of dredging and discharging sediments required substantial state-of-the-art improvement in a number of fundamental biochemical areas. The procedures specified in Public Laws 92-500 and 92-532 for use in predicting the pollutional impacts of the aquatic disposal of dredged material include the elutriate test, bulk sediment analyses, bioassays, and bioaccumulation tests. Particularly critical were assessments of possible biological responses to the readily mobile and bioavailable fraction of dredged material, as well as that fraction of dredged material that may have a long-term impact on aquatic organisms as the material is carried away from the disposal site by currents. A knowledge of these effects would further support the use of these procedures as meaningful regulatory tools.

2. While developing and initiating the several-year-long program of relevant research, it was found that existing and proposed regulatory guidelines and criteria for dredged material discharges did not include techniques that adequately reflected an effective and implementable procedure for assessing potential environmental impact. Provided an opportunity to help direct the criteria development for the recently promulgated regulatory programs, the DMRP initiated research to develop biological as well as chemical evaluative procedures to assess the bioavailability and mobility of constituents from contaminated dredged material and to project their effects on the ecosystem. Moreover, these newly developed procedures required active field verification of their prediction potential.

3. This report (Volumes I and II) represents the results of the further refinement and field verification of regulatory criteria and guidelines required in the ecological evaluation of dredged and fill material discharges. Volume I (transmitted herewith) contains the main text, while Volume II is a data report. This study was one of several work units included under Task 1E (Pollution Status of Dredged Material) of the DMRP; in the DMRP's management structure, it was included as part of the Environmental Impacts and Criteria Development Project.

4. The two-volume report discusses the factors influencing the results of the elutriate test and the reliability of this test in predicting the release of contaminants during actual dredged material disposal operations. Sediment samples were taken from 26 waterway locations representing marine, estuarine, and freshwater locations. Field investigations were conducted at eight active dredging and disposal operations in marine, estuarine, and freshwater areas so that a comparison could be made between the results of the standard and modified elutriate tests for water column concentrations during disposal operations.

5. Results of these assessments have shown that the standard elutriate test, involving 30-minute mixing and one-hour settling, is a reliable test for predicting the potential release of contaminants associated with hydraulically dredged sediments that are discharged into open water. These investigations have also shown that the open-water discharge of dredged sediments, including those that are highly contaminated with various types of chemical toxicants, would rarely cause an adverse effect on water column quality and aquatic organisms in the disposal site water column.

6. The information and data published in this report are contributions to the further understanding of the complex nature of sediment, water, and chemical/biological interactions and the report establishes a baseline from which to develop meaningful regulatory criteria. It is expected that the methodology employed in this study and the resultant interpretation of the biochemical interactions will be of significant value to those persons concerned with dredged material permit programs.

JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

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The U. S. Army Corps of Engineers and the U. S. Environmental Protection Agency developed the elutriate test for the purpose of predicting the release of chemical contaminants from dredged sediments upon open-water disposal. This study was conducted to evaluate the factors influencing the results of the elutriate test and the reliability of this test in predicting the release of contaminants during actual open-water dredged material disposal operations. Sediment samples were taken from waterways located at or near Duwamish River-Elliott Bay-Puget Sound, Washington; San Francisco Bay, Mare Island, Rodeo Flats, Oakland Harbor, and Los Angeles Harbor, California; Galveston Bay Entrance Channel, Galveston Channel, Texas City Channel, Houston Ship Channel, and Port Lavaca, Texas; Mobile Bay, Alabama; Apalachicola Bay, Florida; Wilmington, North Carolina; James River, Virginia; Perth Amboy, New Jersey; Bay Ridge
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20. ABSTRACT (Continued).

and Foundry Cove, New York; Newport, Rhode Island; Norwalk and Stamford Harbors, Connecticut; Menominee River, Michigan; Upper Mississippi River near St. Paul, Minnesota; and the U. S. Army Engineer Waterways Experiment Station Lake, Vicksburg, Mississippi.

These samples were subjected to the standard and modified elutriate tests in order to examine the influence of various operating conditions on the results of the test. In addition, field studies were conducted at Elliott Bay-Puget Sound, Washington; Galveston Bay Entrance Channel Disposal Area, Texas; Mobile Bay, Alabama; Apalachicola Bay, Florida; James River, Virginia; New York Bight; and the Upper Mississippi River near St. Paul, Minnesota, in which comparisons were made between the results of chemical analyses of the standard and modified elutriates and contaminant concentrations in the water column during disposal operations. These studies showed that the standard elutriate test, involving 30-minute compressed air mixing and one-hour settling, is a reliable test for predicting the potential release to the water column of contaminants associated with hydraulically dredged sediments that are disposed of in open water. The air bubbles, in addition to mixing the solution, also keep the system oxic, thus simulating the conditions of importance for water column organisms at the dredged material disposal site.

It is recommended that the EPA and the Corps of Engineers continue to use this modified elutriate test to evaluate the potential release of contaminants to the open-water dredged material disposal site water column.

This study has also shown that the open-water discharge of dredged sediments, including those which are highly contaminated with various types of chemical toxicants and nutrients, would rarely cause an adverse effect on water quality and/or aquatic organisms in the disposal site water column. Generally, the rapid dilution and dispersion and the intermittent nature of open-water dredged material disposal operations result in rapid reduction of the concentrations of any released contaminants to levels below those which are known to have adverse effects on aquatic life and/or water quality.

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