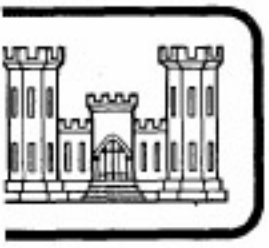


DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-78-56

METHODOLOGY FOR DESIGN OF FINE-GRAINED DREDGED MATERIAL CONTAINMENT AREAS FOR SOLIDS RETENTION

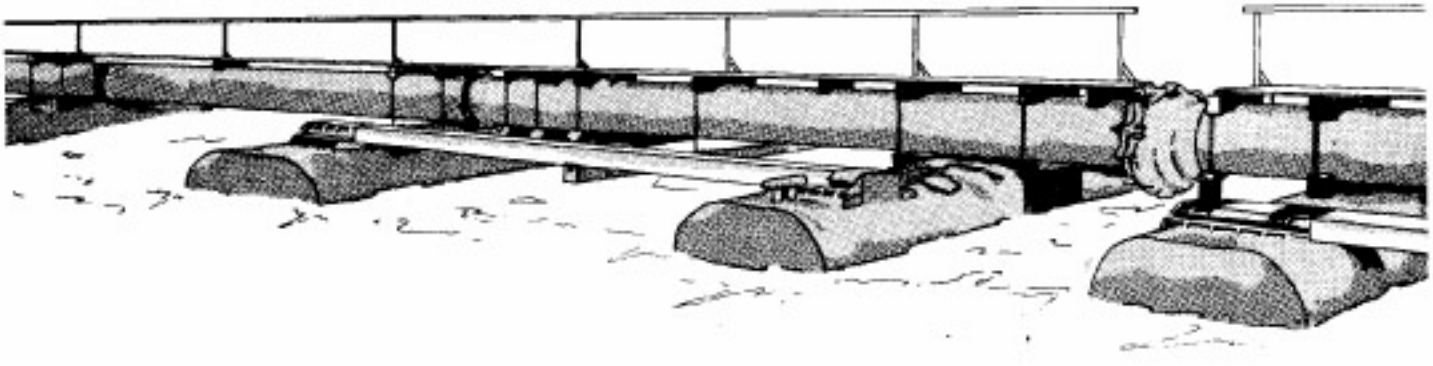
by

Raymond L. Montgomery

Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

December 1978
Final Report

Approved For Public Release; Distribution Unlimited



Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

Under DMRP Work Unit No. 5C11

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DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESEV

15 June 1979

SUBJECT: Transmittal of Technical Report D-78-56

TO: All Report Recipients

1. The report transmitted herewith is the result of a work unit initiated as part of Task 5C (Disposal Area Reuse Research) of the Corps of Engineers' Dredged Material Research Program (DMRP). Task 5C was part of the Disposal Operations Project of the DMRP and among other items included developing design procedures for reusable disposal areas. Although the work was conducted as part of Task 5C, the methods developed are also applicable to the more general Task 2C (Containment Area Operations).

2. Confining dredged material on land is a disposal alternative which few specific design or construction improvement investigations addressed prior to the DMRP. Because of the dramatic increase in the last several years in the amount of land needed for disposal, a significant portion of the work in the DMRP was aimed toward identifying ways of increasing the capacities of containment areas and designing them in such a manner that return of solid particles in the effluent would be minimized. A literature review revealed gaps in research concerning the use of existing procedures for designing containment areas for fine-grained dredged material to meet standards for effluent suspended solids level. This study (Work Unit 5C11) was conducted to provide a rational procedure for the design of confined containment areas to meet effluent quality standards.

3. Although the literature review revealed gaps in the research, it did provide the basis for developing laboratory and field investigations and for evaluating results. Samples of channel sediments and dredged material were collected at four active dredging sites for use in conducting laboratory tests, determining suspended solid levels of dredged discharges and containment area effluents, and developing profiles of suspended solids versus depth for the containment areas. Dye tracer studies were used to investigate the short-circuiting and mixing properties of containment areas.

4. Procedures are presented for designing new containment areas for suspended solids retention and for determining the suspended solids retention potential of existing areas. Design methods for saltwater

and freshwater sediments are included. The design procedures are based on gravity sedimentation of suspended solids. With proper design and operation of containment areas, the sedimentation process would normally provide removal of solids down to levels of 1 and 2 g/ℓ in the effluent for saltwater and freshwater sediments, respectively. Dye tracer studies indicated that a correction factor of about 2.25 should be applied to design area and to retention times to compensate for the deviation from ideal or plug flow conditions.

5. The results of this study were incorporated into the final recommended design procedures outlined in Technical Report DS-78-10. The final design procedure provides guidance on sizing containment areas to ensure that volume requirements are met as well as requirements for solids retention.

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

REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: Technical Report D-78-56
2. GOVT ACCESSION NO.:
3. RECIPIENT'S CATALOG NUMBER:

4. TITLE (and Subtitle): METHODOLOGY FOR DESIGN OF FINE-GRAINED DREDGED MATERIAL CONTAINMENT AREAS FOR SOLIDS RETENTION

5. TYPE OF REPORT & PERIOD COVERED: Final report

6. PERFORMING ORG. REPORT NUMBER:

7. AUTHOR(s): Raymond L. Montgomery

8. CONTRACT OR GRANT NUMBER(s):

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U. S. Army Engineer Waterways Experiment Station
Environmental Laboratory
P. O. Box 631, Vicksburg, Miss. 39180

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: DMRP Work Unit No. 5C11

11. CONTROLLING OFFICE NAME AND ADDRESS
Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

12. REPORT DATE: December 1978

13. NUMBER OF PAGES: 161

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office):

15. SECURITY CLASS. (of this report): Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Containment areas	Sedimentation
Dredged material	Suspended solids
Fine-grained soils	Waste disposal sites

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A literature review revealed gaps in research concerning the use of existing procedures for designing containment areas for fine-grained dredged material to meet standards for effluent suspended solids levels. The literature review did provide the basis for developing laboratory and field investigations and for evaluating results.

Four active dredging projects were used as sites to obtain samples of

(Continued)

20. ABSTRACT (Continued).

channel sediments and dredged material for laboratory tests, determine suspended solids levels of dredge discharges and containment area effluents, and to develop profiles of suspended solids versus depth for the containment areas. Dye tracer studies were used to investigate the short-circuiting and mixing properties of containment areas.

It was found that grab samples taken from channel bottom sediments are adequate for performing sediment characterization and settling tests. Sediment organic contents were generally less than 10 percent for all the sites except one. In general the organics were considered to be too low to be a significant factor in evaluating the settling properties of the dredged material.

Settling tests performed in an 8-in.-diam column were found to be satisfactory for defining dredged material settling behavior within a containment area. Settling behavior in the freshwater environment was best described by a flocculent settling test, while behavior in a saltwater environment was best described by a zone settling test. The same settling columns were used for both tests with only minor procedural changes.

Procedures are presented for designing new containment areas for suspended solids retention and the suspended solids retention potential of existing containment areas. Design methods for saltwater and freshwater sediments are included. The design procedures are based on gravity sedimentation of suspended solids. With proper design and operation of the containment area, the sedimentation process will normally provide removal of solids down to levels of 1 and 2 g/ℓ in the effluent for saltwater and freshwater sediments, respectively. If the required effluent standards are lower than these levels, the designer must provide for additional treatment of the effluent; e.g., flocculation or filtration. Dye tracer studies indicated that a correction factor of about 2.25 should be applied to design area and detention times to compensate for the deviation from ideal or plug flow conditions.

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