Disposal of Confined Dredged Material

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PDH: 7

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CHAPTER 1

INTRODUCTION

1-1. Purpose. This course provides guidance for planning, designing, constructing, operating, and managing confined dredged material disposal areas* to retain suspended solids during disposal operations and to provide adequate storage volume for both short-term and long-term disposal needs.

1-2. Applicability. This course applies to all field operating activities concerned with administering dredging programs.

1-3. References. The references listed below provide guidance to personnel concerned with design, construction, operation, and management of dredged material containment areas.

a. ER 200-2-2

b. ER 1105-2-10

c. ER 1105-2-20

d. ER 1105-2-50

e. ER 1110-2-1300

f. EM 1110-1-1802

g. EM 1110-2-1902

h. EM 1110-2-1903

i. EM 1110-2-1906

j. EM 1110-2-1907

k. EM 1110-2-1908

l. EM 1110-2-1911

m. EM 1110-2-2300

n. EM 1110-2-5025

o. Hydraulics Design Criteria Sheets 224-1/2 to 224-1/4. Available from Waterways Experiment Station, P.O. Box 631, Vicksburg, MS 39180.

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* The terms "confined disposal area," "confined disposal site," "diked disposal area, " "containment area," and "confined disposal facility" all refer to an engineered structure for containment of dredged material.

EM 1110-2-5025 is an overview of Corps dredging and dredged material disposal practice. This course supplements EM 1110-2-5025 by providing detailed guidance for confined dredged material disposal.

1-4. Background.

a. General. In fulfilling its mission to maintain, improve, and extend waterways and harbors, the US Army Corps of Engineers (CE) is responsible for the dredging and disposal of large volumes of dredged material each year. Dredging is a process by which sediments are removed from the bottom of streams, rivers, lakes, and coastal waters; transported via ship, barge, or pipeline; and discharged to land or water. Annual quantities of dredged material average about 300 million cubic yards* in maintenance dredging operations and about 100 million cubic yards in new work dredging operations with the total annual cost now exceeding $500,000,000. Much of this volume is placed in aquatic disposal sites, in wetlands creation or nourishment, or in unconfined disposal areas. Although no breakdown of these figures is routinely maintained, about 30 percent of the total maintenance volume, or 90 million cubic yards, is placed in diked disposal areas annually. This figure includes the majority of the maintenance for major ports along the Atlantic and gulf coasts and numerous harbors on the Great Lakes. The magnitude of confined dredged material disposal requires careful planning, design, construction, and management of containment areas that are compatible with future land-use goals and ensure environmental protection.

b. Scope.

(1) Confined disposal sites are engineered structures designed to provide required storage volume and to meet required effluent solids standards. This course provides guidelines for designing, operating, and managing dredged material containment areas. These guidelines are applicable to the design of new containment areas as well as the evaluation of existing sites, and they include data collection and sampling requirements, description of testing procedures, and design, operational, and management procedures.

(2) The testing procedures described in this course include column tests necessary for sedimentation design, chemical clarification for improvement of effluent quality, and consolidation tests for evaluating long-term storage capacity. Design procedures include the consideration of dredged material

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The US customary units of measurement are used in lieu of metric (SI) units for those cases common in dredging practice. Metric (SI) units are used in this report when consistent with standard usage.

sedimentation and consolidation/dewatering behavior and potential consolidation of foundation soils. Guidelines for containment area design for sedimentation were developed primarily for fine-grained material generated in maintenance dredging operations. Factors that improve containment area efficiency are presented and include weir design and location, effects of area size and shape, and use of interior spur dikes. Guidelines for containment areas during the dredging operation include weir operation and maintenance of adequate ponding depth. Guidelines for containment area management before, during, and after dredging operations to maximize sedimentation efficiency and long-term storage capacity are also presented. In addition, the course contains guidance on the design of chemical clarification systems for removal of additional suspended solids that are not effectively eliminated by gravity settling. Guidance is also provided on the design of containment area dikes, many of the design procedures in this course have been incorporated into the Automated Dredging and Disposal Alternatives Management System (ADDAMS), a centralized computer-program and data management system (item 19).

(3) Although not specifically covered in this course, guidelines have been developed for odor control, for mosquito and other insect control, and for minimizing the adverse visual impact of disposal areas and aspects of confined disposal for contaminated sediments. These factors should be considered in the earliest planning and design stages and carried through during construction and management phases. Information on these specialized topic areas is found in the Bibliography (items 9, 12, 17, 18, and 23).

c. Authority. The authority for implementing the planning, design, and operation and management approaches described in this course is recognized in Section 148 of PL 94-587: Sec. 148:

> The Secretary of the Army, acting through the Chief of Engineers, shall utilize and encourage the utilization of such management practices as he determines appropriate to extend the capacity and useful life of dredged material disposal areas such that the need for new dredged material disposal areas is kept to a minimum. Management practices authorized by this section shall include, but not be limited to, the construction of dikes, consolidation and dewatering of dredged material, and construction of drainage and outflow facilities.

Authority to implement management practices under Sec. 148 may be limited in some instances. If the disposal area is Federally owned, management practices can be pursued under Sec. 148. If the site is owned by others or if dikes are provided by others (such as the project sponsor), authority under Sec. 148 may be limited. Also, in some cases, the ownership of dredged material (once removed from the navigation channel) is in question. Current Corps policy on implementation of Sec. 148 should be determined on a case-by-case basis.

1-5. Considerations Associated with Confined Dredged Material Disposal.

a. Diked containment areas are used to retain dredged material solids while allowing the carrier water to be released from the containment area. The two objectives inherent in the design and operation of a containment area are to provide adequate storage capacity to meet dredging requirements and to attain the highest possible efficiency in retaining solids during the dredging operation in order to meet effluent suspended solids requirements. These considerations are basically interrelated and depend upon effective design, operation, and management of the containment area.

b. The major components of a dredged material containment area are shown schematically in Figure 1-1. Constructed dikes form a confined surface area, and the dredged channel sediments are normally pumped into this area hydraulically. Both the influent dredged material slurry and effluent water can be characterized by suspended solids concentration, suspended particle size gradation, type of carrier water (fresh or saline), and rate of flow.

c. In some dredging operations, especially in the case of new work dredging, sand, clay balls, and/or gravel may be present. This coarse material (>No. 200 sieve) rapidly falls out of suspension near the dredge inlet pipe, forming a mound. The fine-grained material (<No. 200 sieve) continues to flow through the containment area with most of the solids settling out of suspension, thereby occupying a given storage volume. The fine-grained dredged material is usually rather homogeneous and is easily characterized.

d. The clarified water is usually discharged from the containment area over a weir. Effluent flow rate is approximately equal to influent flow rate for continuously operating disposal areas. Flow over the weir is controlled by the static head and the weir length provided. To promote effective

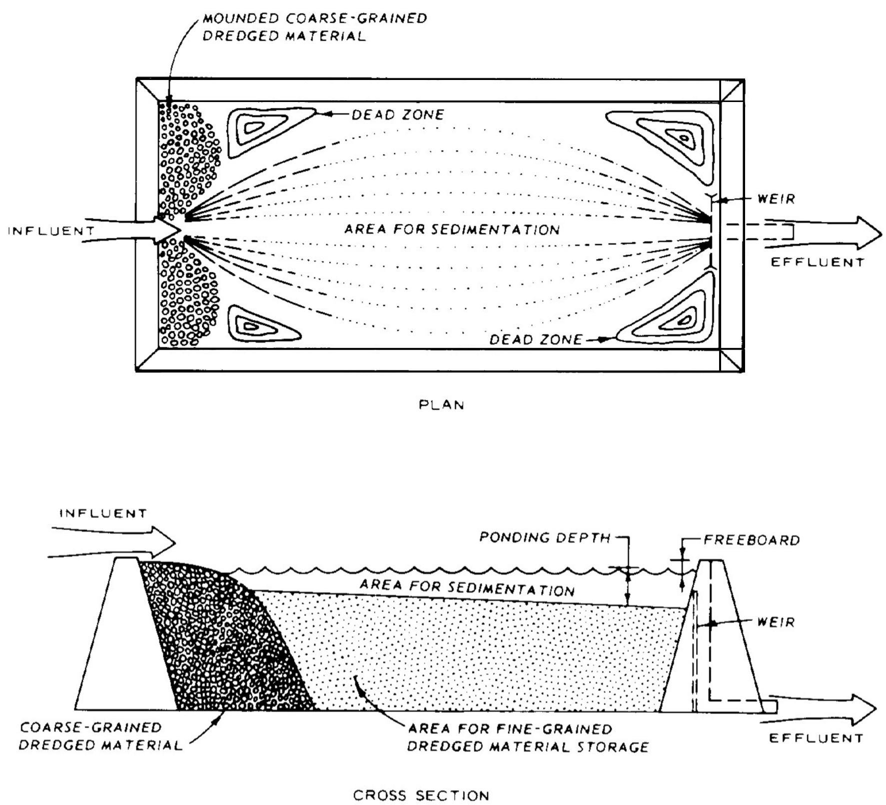

Figure 1-1. Conceptual diagram of a dredged material containment area

sedimentation, ponded water is maintained in the area with the depth of water controlled by the elevation of the weir crest. The thickness of the dredged layer increases with time until the dredging operation is completed. Minimum freeboard requirements and mounding of coarse-grained material result in a ponded surface area smaller than the total surface area enclosed by the dikes. Dead spots in corners and other hydraulically inactive zones reduce the surface area effectively involved with the flow to considerably less than the total ponded surface area.

e. Effluent standards may be imposed as a requirement for water quality certification. Standards in terms of suspended solids or turbidity may be used. Procedures in this course allow containment areas to be designed to meet such effluent standards.

f. In most cases, confined disposal areas must be used over a period of many years, storing material dredged periodically over the design life. Long-term storage capacity of these areas is therefore a major factor in design and management. Consolidation of the layers continues for long periods following disposal, causing a decrease in the volume occupied by the layers and a corresponding increase in storage capacity for future disposal. Once water is decanted from the area following active disposal, natural drying forces begin to dewater the dredged material, adding additional storage capacity. The gains in storage capacity are therefore influenced by consolidation and drying processes and the techniques used to manage the site both during and following active disposal operations.

Purchase this course to see the remainder of the technical materials.