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## CHAPTER 1

## INTRODUCTION

1-1. Purpose. The purpose of this manual is to provide guidance for incorporating environmental considerations in planning, engineering and design, construction, operation, and maintenance of deep-draft navigation projects.

1-2. Scope. Deep-draft navigation projects involve development of large channel systems with attendant turning basins, anchorages, and pier and wharfing facilities. Construction and maintenance of deep-draft navigation projects usually involve dredging large volumes of bottom sediment and resultant changes in bottom geometry of the water body. Environmental considerations associated with these actions include those related to dredging and disposal of dredged material, and the possible alteration of water circulation patterns, salinity concentrations, water levels, flushing rates, and habitats. This manual provides guidance on incorporating environmental considerations as part of deep-draft project design and construction, as well as guidance for incorporating project features for attaining environmental quality objectives. This manual is intended to be compatible with engineer manual EM 1110-2-1613, "Hydraulic Design of Deep-Draft Navigation Projects." The intended audience of this manual includes those engineers and scientists currently involved in planning studies, project design, operation, maintenance, and regulatory functions associated with deep-draft navigation projects.

1-3. Applicability. This manual applies to all field operating activities having civil works responsibilities, and is applicable across all functional areas (i.e., planning, design, construction, operation, and maintenance).

1-4. References. The references listed below provide practical guidance to Corps personnel concerned with the planning, design, construction, operation, and maintenance of deep-draft navigation projects.

- a. ER 200-2-2, Policy for Procedures for Implementing NEPA.
- b. ER 1105-2-10, Planning Program.
- c. ER 1105-2-20, Project Purpose Planning Guidance.
- d. ER 1105-2-50, Environmental Resources.
- e. ER 1110-2-400, Design of Recreation Sites, Areas, and Facilities.
- f. ER 1110-2-1404, Deep-Draft Navigation Project Design.
- g. EM 1110-2-1612, Ice Engineering.
- h. EM 1110-2-1613, Hydraulic Design of Deep-Draft Navigation Projects.
- i. EM 1110-2-5025, Dredging and Dredged Material Disposal.
- j. EP 1165-2-1, Digest of Water Resources Policies and Authorities.

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k. Miscellaneous Paper D-76-17, "Ecological Evaluation of Proposed Discharge of Dredged or Fill Material into Navigable Waters; Interim Guidance for Implementation of Section 404(b)(1) of Public Law 92-500 (Federal Water Pollution Control Acts Amendment of 1972)." Available from US Army Engineer Waterways Experiment Station, PO Box 631, Vicksburg, Miss. 39180.

1-5. Bibliography. Bibliographic information throughout the manual is denoted by author and date corresponding to the listing in Appendix A. These documents are available for loan upon request to the US Army Engineer Waterways Experiment Station (WES) Technical Information Center Library, PO Box 631, Vicksburg, Miss. 39180.

1-6. Background.

a. Deep-Draft Project Characterization. Deep-draft navigation projects are those for vessel drafts in excess of 15 feet. They comprise practically all commercial coastal ports in the United States, the lower portions of the Mississippi and Columbia Rivers, and a majority of harbors within the Great Lakes system. There is increased emphasis on expanding the capacity of these projects by deepening to accommodate the trend toward deeper draft ships in the world fleet. Several deepening projects are now in various stages of planning, design, and construction. The detailed consideration of environmental factors is as important as economic feasibility in the expeditious completion and continued maintenance of these projects. Potential problems regarding the environmental considerations may be a major factor in determining the overall feasibility of a project.

b. Manual Development. The information contained in this manual summarizes the results of research in related fields and the experience of Corps personnel involved in deep-draft projects. The manual outline was developed by an interdisciplinary committee composed of personnel from the WES laboratories and other Corps laboratories, with review and comments provided by the US Army Corps of Engineers. The text was prepared by personnel of the WES Environmental and Hydraulics Laboratories; other Corps laboratories provided brief inputs and reviews. A wide spectrum of subdisciplines and specialties was represented among the authors. Information generated by the following research programs was used to produce this manual:

(1) Aquatic Plant Control Research Program (APCRP). The main objective of the APCRP is to develop technology for controlling aquatic plant infestations in an environmentally compatible manner at the least possible cost. Comprehensive solutions are sought that involve the use of biological, chemical, mechanical, and integrated control agents. The Environmental Laboratory is the Corps' lead research laboratory for aquatic plant control research.

(2) Dredged Material Research Program (DMRP) and Dredging Operations Technical Support (DOTS). The major objectives of the DMRP, which has been completed, were to provide definitive information on the environmental impact of dredging and dredged material disposal operations and to develop new or improved dredged material disposal practices. The research was conducted on a national basis and included all major types of dredging activity, region, or environmental setting. It produced methods for evaluating the physical, chemical, and biological impacts of a variety of disposal alternatives in water, on

land, or in wetland areas, as well as tested, viable, cost-effective methods and guidelines for reducing the impacts of conventional disposal alternatives. The DMRP also included research using dredged material for the development of fish and wildlife habitat. WES TR DS-78-23 (Herner and Company 1980) provides an index of DMRP reports. The major objectives of the DOTS program are to verify DMRP findings and to provide technical support to the Corps regarding dredging and disposal.

(3) Environmental and Water Quality Operational Studies (EWQOS). The EWQOS program was initiated to solve high-priority environmental problems, primarily those related to reservoirs and inland waterways. However, some transfer of information to deep-draft and coastal area projects is possible.

(4) Natural Resources Research Program (NRRP). The NRRP seeks to address Corps recreation problems. Major categories of research include planning, design, and management problems related to carrying capacity, visitor safety, concessions, and contracting out operation and maintenance operations.

(5) Environmental Impact Research Program (EIRP). The EIRP consists of research on environmental problems not currently covered by other major programs.

(6) Improvement of Operation and Maintenance Techniques (IOMT). The IOMT program is directed towards obtaining maximum economy, safety, efficiency, and energy conservation in the reduction of navigation channel shoaling, the removal of dredged materials, and general maintenance and operations.

(7) Flood Control Hydraulics Research Program (FCHRP). The FCHRP develops improved guidance for the design, operation, and maintenance of flood channels and related hydraulic structures. Since many of the Corps' flood control activities involve multipurpose projects that impact navigation research, results from this program are often pertinent to the evaluation of deep-draft navigation projects.

(8) Navigation Hydraulics Research Program (NHRP). The NHRP seeks cost-effective, environmentally acceptable means of providing safe and efficient deep- and shallow-draft navigation channels with minimum dredging.

1-7. Definitions. An explanation of terms frequently encountered by users of this manual is provided in the Glossary.