

Technology Transfer—The Shore Protection Manual

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ABSTRACT

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Transfer of coastal engineering technology by the Corps of Engineers began with the issuance of *Technical Report No. 4*, "Shore Protection Planning and Design," in 1954. The main basis for planning and design of coastal projects was contained in that publication until 1973 when it was replaced by the *Shore Protection Manual (SPM)*. Successive editions of the SPM were issued in 1975, 1977, and 1984. Major advances in computer software and hardware are expected to reshape future editions of the publication.

ADDITIONAL INDEX WORDS: *Shore protection, coastal engineering, shoreline erosion control, beach erosion.*



INTRODUCTION

Probably one of the best known publications in coastal engineering is the *Shore Protection Manual (SPM)* prepared by the Coastal Engineering Research Center (CERC) of the US Army Engineer Waterways Experiment Station (WES), and printed and distributed by the US Government Printing Office (GPO). The present, Fourth Edition of the SPM is the most recent of a series of publications which started in 1954 with the publication of *Technical Report No. 4 (TR-4)*, "Shore Protection Planning and Design," by the Beach Erosion Board (BEB), CERC's predecessor organization.

While coastal and harbor projects have been constructed for millennia, this attempt to draw together information on the subject into a single publication has been a recent endeavor. Prior to 1929, there was no office within the US Army Corps of Engineers specifically directed to study or report on coastal problems, although much of the expertise in this area lay within the Corps because of its responsibilities for navigation projects. In 1929 the Corps of Engineers appointed a Board on Sand Movement and Beach Erosion to study the problem of coastal erosion, the first of the organizations preceding the present Coastal Engineering Research Center.

The BEB was established by Public Law in 1930, replacing the Corps' earlier Board. The initial stated purpose of the BEB was to conduct cooperative studies with the various states, but the Board quickly became involved in research to define the coastal processes observed in the field. This civil works research was interrupted by World War II, and resumed in 1945.

It became apparent to the Board, in the course of its studies, that there was a need to draw together guidance on coastal projects in a single publication. To meet this need, the BEB first issued "Special Issue No. 2," *Bulletin of the Beach Erosion Board*, in 1953, and the following year, after receiving comments from interested engineers, issued *Technical Report No. 4*, "Shore Protection Planning and Design". As stated in the preface of that report,

"The Beach Erosion Board and its staff have been engaged in the study of shore erosion problems since 1930 and since then have pursued an intensive program of research and development with a view to improving shore protection techniques. While the Board considers that this is a science still very much in the development stage, it is evident that many errors of the past may be avoided in the future by proper application of knowledge thus far gained. The need for providing a sound basis for

shore protection planning and design is evident and it is with that objective that this report has been prepared.”

The introduction to TR-4 stated,

“The nature and degree of protection required differ widely at different localities and the proper solution of any specific problem requires a systematic and thorough study. The first requisite for such a study is a clear definition of the problem and the objectives sought; the first factor to be determined in the course of the study is the cause of the problem. Ordinarily there will be more than one method of obtaining the immediate objective. In the study, therefore, the long term effects of each method should be forecast and evaluated, beyond as well as within the problem area. All advantages and effects should be considered in comparing annual costs and benefits to determine the justification of remedial measures.”

The introduction went on to state,

“Techniques presented herein are generally applicable to the broad scope of shore protection problems but competent engineering judgment is required for determining their application to any specific problem.”

The report then went on to provide a framework for carrying out the planning and design of coastal projects. While it was recognized that much was not known about the processes taking place, TR-4 provided a compilation of the state-of-the-art that existed at that point in time.

TR-4 was immediately accepted, not only within the Corps, but worldwide, as a basis for planning and design. It was the first comprehensive publication in the area of coastal engineering. In 1957, the Japan Society of Civil Engineering issued a handbook on shore protection in which they state that they used TR-4 as a basis for their work. TR-4 was printed and distributed by GPO in recognition of the fact that there was a strong interest both within and outside the Corps of Engineers, and that the publication would be widely used.

THE EVOLUTION OF THE SHORE PROTECTION MANUAL

After its publication, TR-4 was widely used in Corps of Engineers field offices, in other government agencies, by engineering firms in the private sector, and by universities as a textbook. The first edition in 1954 contained 390 pages including 6 appendices. It contained two parts, Functional Planning and Structural Design. A statement in the first edition in 1954 said, “it is expected that these techniques will be improved by further research and experience.” A form was provided in the first edition so that people holding that edition could pre-register to receive copies of updates.

The BEB, in August 1957, issued a publication containing 111 pages of revisions, corrections, and addenda to TR-4. Those revisions included the results of ongoing research through February 1957. A second set of revised pages was printed in 1961. The first printing of TR-4 had sold out in 1958. Recognizing that there was a continuing demand for copies of TR-4, the BEB had it reprinted in May 1961, with the 1957 and 1961 revisions incorporated into the new printing.

In 1963, Public Law 88-172 created the Coastal Engineering Research Center and the Coastal Engineering Research Board (CERB), replacing the BEB. Coastal engineering studies had expanded rapidly following World War II, with many universities setting up programs in that area. CERC continued the Corps leadership in coastal engineering. In 1966, a third edition of TR-4 was published by CERC. During that time period, many commercially printed textbooks related to coastal engineering began to appear including Thorn and Simmons (1960), Weigel (1964) and Ippen (1966), but TR-4 continued to be widely used.

With rapid advances in the understanding of coastal processes and their effects on coastal projects, it became evident that a new publication was needed to replace TR-4, expanding the coverage for planning and design purposes, and incorporating new knowledge that was becoming available. Planning was initiated for a new publication to serve that purpose.

In 1973, CERC ceased publication of TR-4, and published the *Shore Protection Manual* in its place. The contents were reorganized into eight chapters and 4 appendices, and the SPM

expanded the coverage which had been provided by TR-4. This first edition of the SPM contained 1160 pages including 4 appendices, compared to 390 pages in the first edition of TR-4 published almost 20 years earlier.

It soon became evident that desired guidance for planning and design of coastal structures exceeded the capacity of a single report. A program was established for publishing specialized guidance in other reports, while the basic framework for planning and design was retained in the SPM. The SPM was revised in a second edition in 1975, and a third edition in 1977. Special Reports were published separately; the last Special Report published by CERC (1983) was, "Construction Materials for Coastal Structures."

In order to publish changes in guidance between editions of the SPM, and in order to bring other material to the attention of field offices, a series of Coastal Engineering Technical Notes was established in 1979. These allowed a more rapid transmittal of guidance to field offices. In addition, the Office, Chief of Engineers, U. S. Army had begun to formalize guidance by publishing new Engineer Manuals (EM). The first EM relating to coastal projects (1961) had been, "Construction of Shore Protection Works."

WHERE DO WE GO FROM HERE?

CERC was relocated and incorporated into the U.S. Army Engineer Waterways Experiment Station (WES) in 1983. A Fourth Edition of the SPM was published in 1984, shortly after CERC's relocation. Its size had grown to about 1300 pages. (Because WES does not provide secondary distribution of its research reports, the SPM is still printed and distributed by the Superintendent of Documents, US Government Printing Office, Washington, DC). Other changes were taking place at that time which would influence the future direction of the publication. Microcomputers were coming into common use in planning and design, and graphical solutions were falling out of favor. In 1983, a preliminary assessment was made of putting coastal technology into a microcomputer format.

Work commenced on microcomputer program development in conjunction with the publica-

tion of the SPM's fourth edition in 1984. The first microcomputer programs were released in November 1984. This initial effort would result in a total of 20 microcomputer programs being released between November 1984 and February 1987. These were all released to the public domain, and came into rapid use both within the government and in the private sector (in 1987, a WES physical scientist received the Federal Laboratory Consortium's Award for Excellence in Technology Transfer in recognition for the transfer of these programs to the private sector). It was anticipated that the SPM would continue to provide a framework for the planning and design of coastal projects, while much of the actual work in performing calculations would be carried out on computers.

In 1986, a proposal was implemented to expand the computer based planning and design function. For that purpose, a new group was formed within CERC for Automated Coastal Engineering Systems (ACE). The original microcomputer programs are being integrated into a framework established by the ACE Group with oversight and guidance provided by an ACE Committee set up Corps wide. It is still anticipated that a single publication will provide the overall guidance, but that this will be augmented by an ACE System for planning, analysis and design, and by separate reports for specific information on specialized topics.

The movement into computer based systems has been accompanied by substantial advances in both computer hardware and software. Efforts are underway to develop documents in a microcomputer disk format, and to develop the means available for electronic access and transfer of available information. Major advances are expected in the near future in those areas.

CONCLUSION

It is clearly recognized that much has been done since the publication of the first edition of TR-4 in 1954, and that substantial changes have occurred in both the guidance provided and the means by which technology is transferred. The SPM is expected to continue as a guidance document, although the title and for-

mat of the document may certainly change in the future as they have in the past.

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