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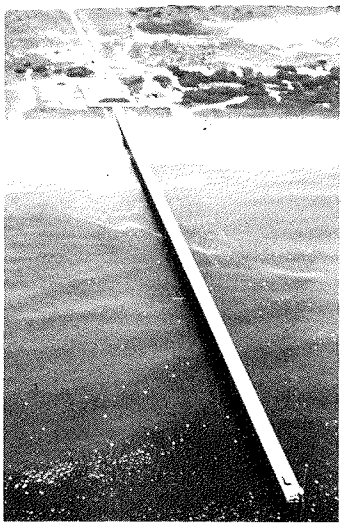

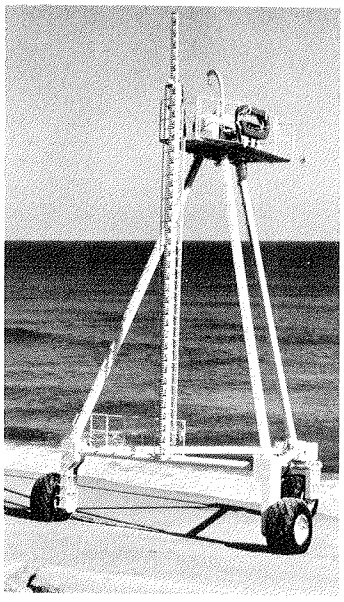

COASTAL ENGINEERING RESEARCH CENTER

TECHNICAL REPORT CERC-87-9

BEACH AND NEARSHORE SURVEY DATA: 1981-1984 CERC FIELD RESEARCH FACILITY

by

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Coastal Engineering Research Center

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

This report presents 4 years of highly accurate, approximately biweekly surveys of four selected beach profiles collected at the US Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, NC. These data are unique because they cover the most active region of the nearshore, from the dune out to a depth where net bottom changes appear to be negligible, and were collected coincident with detailed measurements of waves and water levels.

The data were collected between 1981 and 1984 using the FRF's CRAB, a 10-m-tall motorized tripod, which, combined with an electronic "total station" surveying instrument, is capable of accuracies of a few centimetres in both elevation and position.

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19. ABSTRACT (Continued).

The report discusses the data-collection methods, the sources of errors and data-editing procedures, and a brief summary of the actual profile data. Appendices contain the listings and plots of the survey data along with the tables and plots of the wave and water-level data.

PREFACE

This report was prepared at the Coastal Engineering Research Center (CERC) of the US Army Engineer Waterways Experiment Station (WES) as part of the Storm Erosion Studies Work Unit, Shore Protection and Restoration Program; Coastal Engineering Area, Civil Works Research and Development. Technical Monitors were Mr. John H. Lockhart, Jr., and Mr. John G. Housley, Headquarters, US Army Corps of Engineers.

Mr. Peter A. Howd and Mr. William A. Birkemeier of CERC's Field Research Facility Group prepared the report under the supervision of Mr. Curt Mason, former Chief, Field Research Facility; Mr. Thomas W. Richardson, Chief, Engineering Development Division; and Mr. Charles C. Calhoun, Jr., and Dr. James R. Houston, Assistant Chief and Chief, CERC, respectively. Messrs. Eugene W. Bichner, Charles R. Townsend III, Michael W. Leffler, Francis E. Sargent, and Ms. Rebecca J. Savage, plus many others, contributed to the collection of the data. Ms. Harriet M. Klein assisted greatly by untangling complexities of the English language. The wave and water-level data presented in the report were collected by CERC's Field Research Facility Measurements and Analysis Work Unit under the direction of Mr. Herman C. Miller. This report was edited by Ms. Jamie Leach of the WES Information Technology Laboratory.

Commander and Director of WES upon publication of this report was COL Dwayne G. Lee. Technical Director was Dr. Robert W. Whalin.

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BEACH AND NEARSHORE SURVEY DATA: 1981-1984
CERC FIELD RESEARCH FACILITY

PART I: INTRODUCTION

1. The Field Research Facility (FRF) of the US Army Engineer Waterways Experiment Station (WES), Coastal Engineering Research Center (CERC), was established to provide a research and development capability for field studies of coastal processes. An important part of the FRF operation has been the collection of long-term data sets of waves, currents, tides, atmospheric conditions, and beach profile change. The purpose of this report is to present the first 4 years of highly accurate profile data collected under the Storm Erosion Studies work unit.

2. This continuing data set is unique in the field of beach profile studies because of its accuracy, temporal coverage, and concomitant wave, weather, and water-level information. Surveys of four shore-normal profile lines were completed at approximately 2-week intervals. Nowhere else does such a data set exist. It provides a unique opportunity to examine natural profile changes and to test and evaluate models of beach profile response to changing wave, current, and atmospheric conditions.

3. The FRF is located just north of the village of Duck, N. C., on the Outer Banks (Figure 1). The facility includes a 561-m-long research pier and support buildings. The beach adjacent to the study area is interrupted only by open pile piers from Cape Henry, Va., to Oregon Inlet, N. C., a distance of 110 km. General information regarding the FRF and the surrounding area is provided in Birkemeier et al. (1985). A comprehensive network of weather and ocean sensors provides continuous monitoring of atmospheric and oceanographic conditions. These data are published in a series of annual (Miller 1984; Miller et al. 1985, 1986) and monthly data reports.

4. The data in this report were collected along the four profile lines shown in Figure 2 (Lines 58, 62, 188, and 190). A profile line is defined as a fixed transect across the beach and nearshore which is repetitively surveyed. Table 1 summarizes the location of these lines and the data contained in this report. Based on regular monthly surveys of the bathymetry

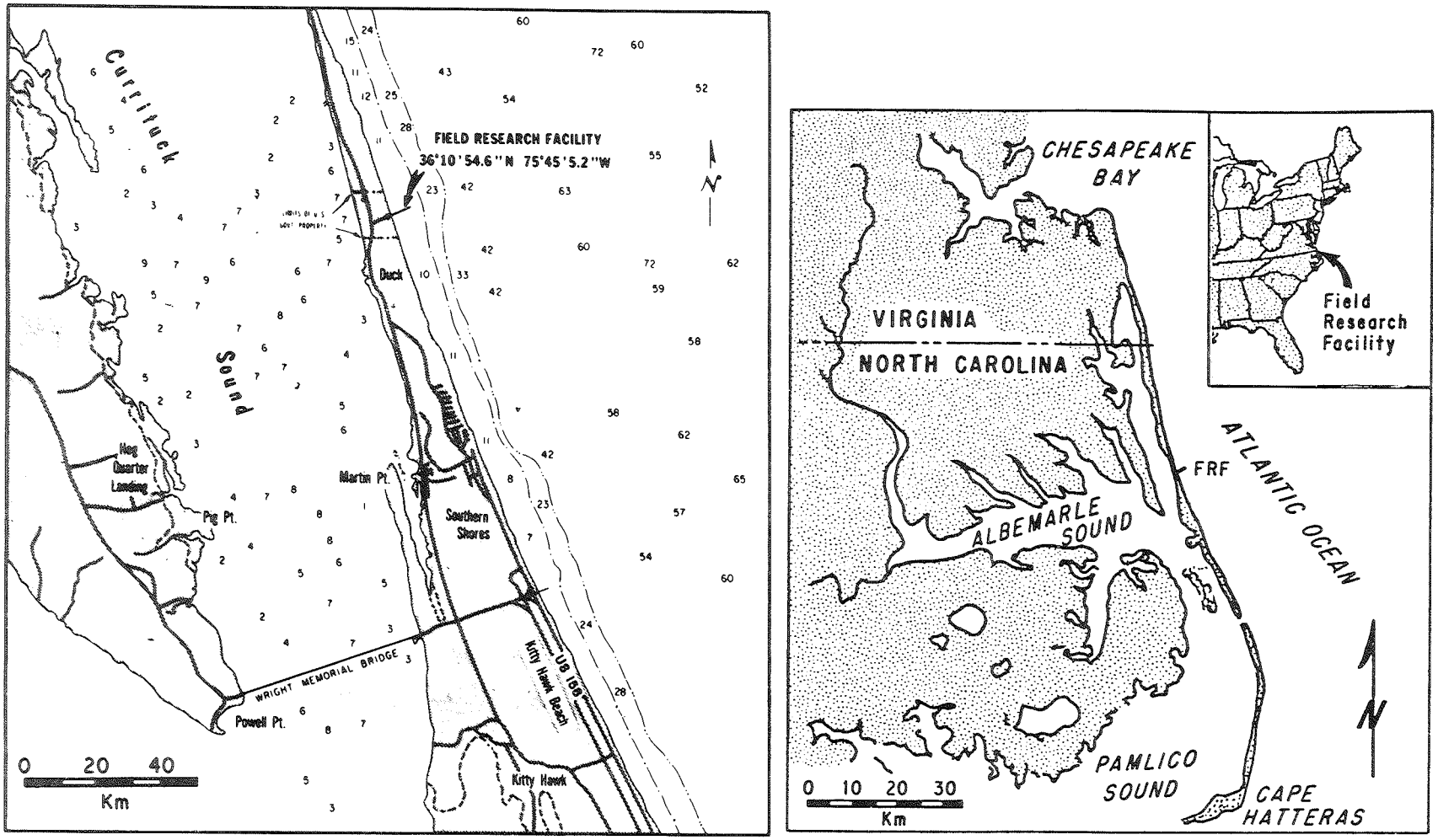

Figure 1. Location of the FRF

Table 1

Summary of Profile Line Data

Profile Line	Distance Along FRF Baseline m	Distance From FRF Pier m	First Survey	Last Survey	Number of Surveys
58	1097.31	580.64	17 Jul 81	13 Dec 84	96
62	1005.84	489.21	26 Jan 81	13 Dec 84	119
188	0.00	-516.63	20 Jan 81	17 Dec 84	127
190	-91.40	-608.07	17 Jul 81	17 Dec 84	99

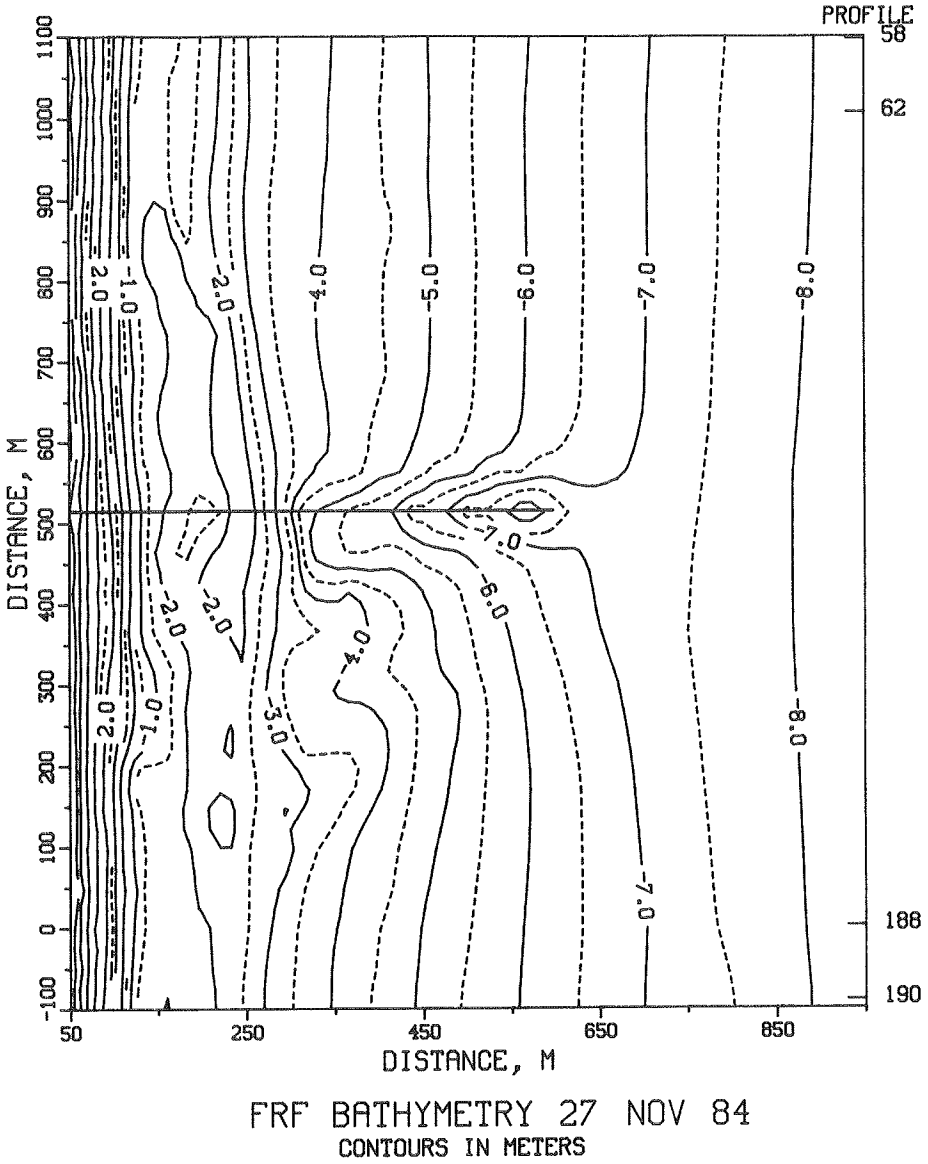

Figure 2. Bathymetric map of the study area showing locations of the four profile lines

surrounding the FRF, these lines are located in a region of shore-parallel contours and are sufficiently removed from known pier effects (Miller, Birkemeier, and DeWall 1983).

5. The beach is composed of a mixture of quartz sand and carbonate shell debris. The carbonate component may be as high as 20 percent. Mean grain size is greatest on the foreshore where it approaches 1 mm, decreasing offshore to 0.1 mm. Sorting improves in an offshore direction. Figure 3 illustrates the cross-shore variation in sediment size distribution based on a series of samples taken along profile line 188 on 17 March 1982.

6. Storm conditions at the FRF are dominated by extratropical northeasters during the winter months and occasionally by tropical hurricanes. During the period of study, a number of significant storms occurred, although no major hurricanes passed the area.

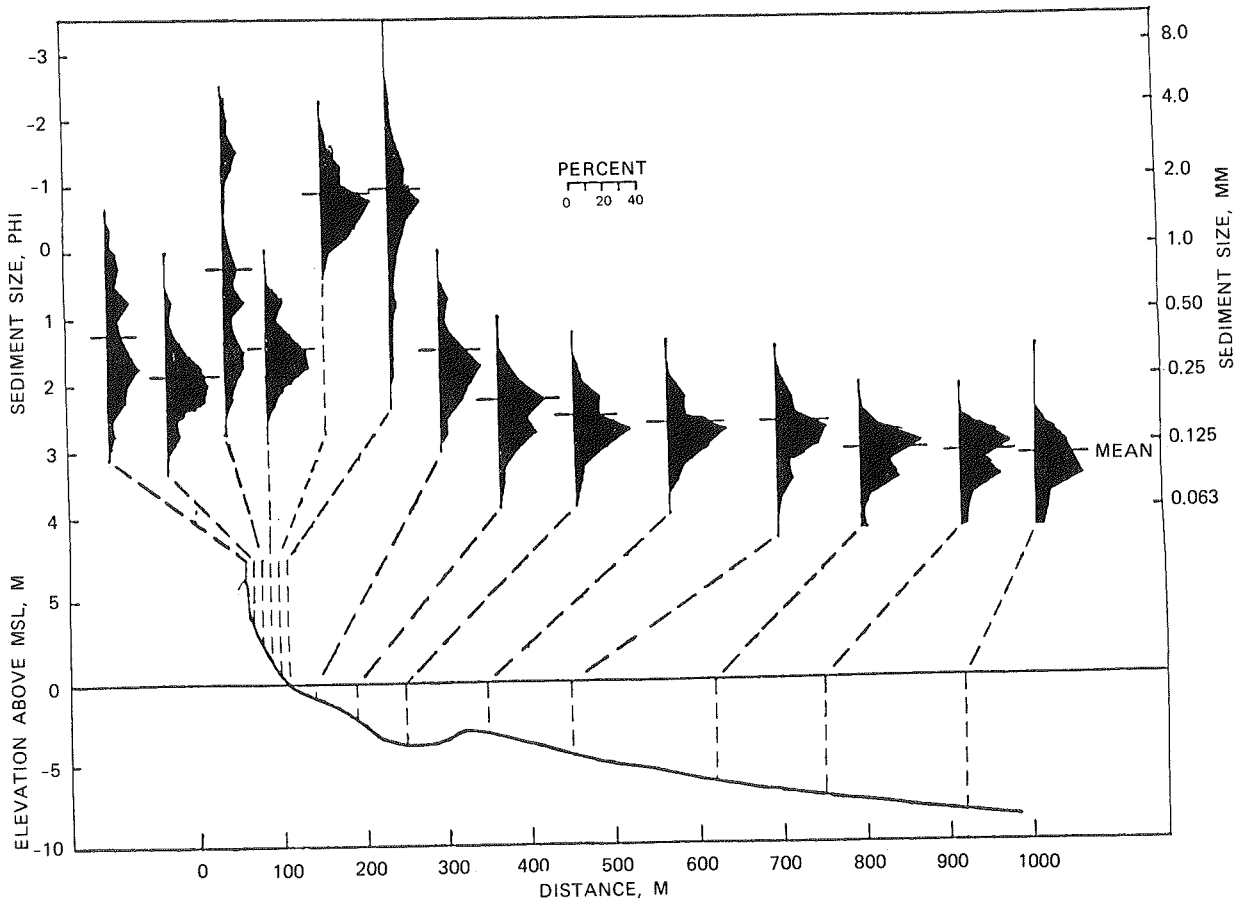

Figure 3. Distribution of sediment sizes across profile line 188 on 17 March 1981

7. The report includes five parts and six appendices. Part II discusses the survey methods used to collect the profile data and points out the sources of errors and methods used to minimize those errors. Part III presents summary comments about profile characteristics and patterns of profile change as an aid in interpreting the data. Part IV presents the associated wave and water-level data. The report is summarized in Part V. Appendices include plots of all the profiles (Appendix A), tables of the profile data along with a FORTRAN computer program to read and check the data (Appendices B and C), plots of wave height for the 4-year period (Appendix D), tables of wave height and period (Appendix E), and plots of the observed tides (Appendix F).

PART II: PROFILE DATA

8. This part describes the methods used to survey the profile data and identifies potential sources of error and how errors were handled. The data for each profile line are a series of distance-elevation pairs measured during a repetitive number of surveys. The data extend from a shore-parallel baseline, located landward of the duneline, out to a usual depth of 8 to 9 m. Elevation data are referenced to the 1929 National Geodetic Vertical Datum (NGVD) using third-order control established at the FRF. Each survey of each profile line is uniquely identified by a profile number and survey number.

9. Surveys were initially conducted biweekly, the northern lines one week followed by the southern lines the next. This sequence changed in December 1982 to biweekly surveys of all four lines. Full bathymetric surveys of 15 to 28 lines surrounding the FRF were also conducted monthly. Additional surveys were added to cover significant storms and in support of special experiments. The time interval between surveys varied from 1 to 44 days.

The CRAB

10. The method used to collect the majority of the profile data is described in Birkemeier and Mason (1984). All profiles were surveyed using the FRF Coastal Research Amphibious Buggy (CRAB) shown in Figure 4. Built by the Wilmington District of the US Army Corps of Engineers, this unique three-wheeled vehicle was modeled after a vehicle originally built by Marine Travelift & Engineering of Sturgeon Bay to monitor a Corps of Engineers beach nourishment project.

11. The CRAB consists of a tripod of 20.3-cm schedule-80 aluminum tubing, connected at the base by horizontal members 2.1 m above the ground, and an operations platform 10.7 m above the ground. Power is supplied by a 39.5-kW Volkswagen engine on the deck which drives a variable stroke hydraulic pump. This pump transfers hydraulic fluid at 5.5×10^6 N/m^2 or higher to hydraulic motors at each of the wheels. The variable stroke feature of the pump allows an infinitely variable gear ratio in either forward or reverse and constant engine speed. For strength and corrosion resistance, all hydraulic lines are stainless steel except for short flexible sections at the front steering wheel.

Table B1. (Continued)

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Table B1. (Continued)

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