

REGIONAL SAND TRANSPORT STUDY: MOREHEAD CITY HARBOR FEDERAL NAVIGATION PROJECT

SUMMARY REPORT

March 1, 2006

1.0 STUDY AUTHORIZATION AND PURPOSE

In May 2004, Carteret County retained the services of the coastal engineering firm of Olsen Associates, Inc. to perform the above referenced study of the federally maintained navigation project located at Morehead City, North Carolina. The contract was completed under the general direction of the Carteret County Beach Commission with specific guidance by the Shore Protection Manager.

Globally, the purpose of the study is: (a) to develop a regional sand budget encompassing Beaufort Inlet and adjacent shoreline segments of Bogue Banks and Shackleford Banks, (b) to quantify the impact of the construction and maintenance of the navigation channel upon the inlet and the adjacent barrier islands complex, (c) to contrast the study's findings with relevant conclusions made in a Section 111 Study for the Morehead City Harbor Navigation Project by the U. S. Army Corps of Engineers, Wilmington District, in 2001, and (d) to develop a recommended Sand Management Plan for the navigation project and adjacent shorelines. A specific intent of the present study is to evaluate natural and manmade geomorphic changes to the Beaufort Inlet environs for purpose of evaluating changes to developed barrier island shorelines potentially eligible for federal mitigation through (1) Section 111 of the Rivers and Harbors Act of 1968, and/or (2) through more practical means of mitigation which center upon modifications of disposal practices for dredged, beach quality sediments.

2.0 INTRODUCTION

2.1 Physical Setting

The Morehead City Harbor federal navigation project includes the establishment and maintenance of a commercial navigation channel through Beaufort Inlet, located in Carteret County, along the south-central barrier island coastline of North Carolina (*Figure 1*). Beaufort Inlet is a natural, non-jettied tidal inlet connecting the Atlantic

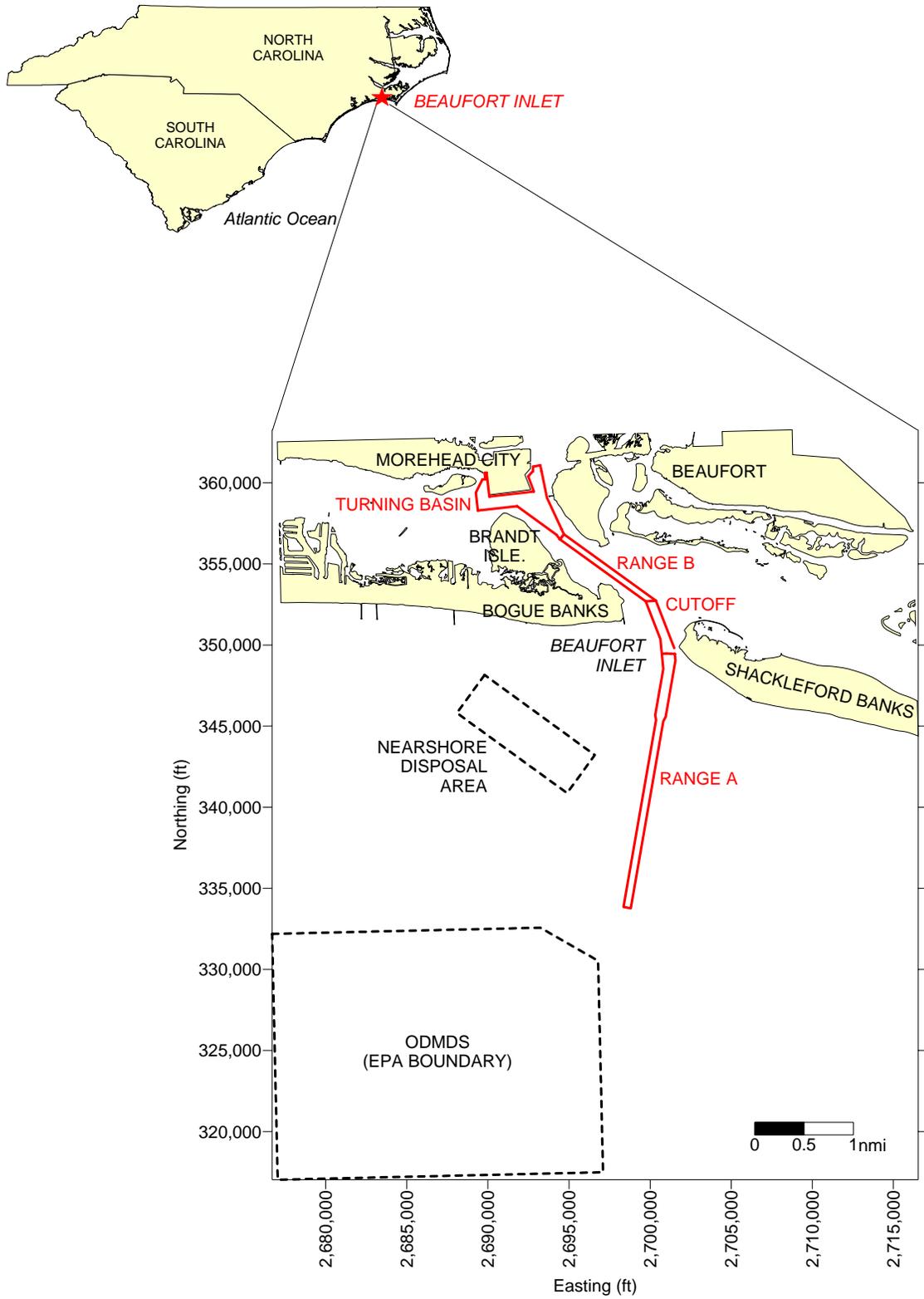


Figure 1: Overview map of the Morehead City Harbor Federal Navigation Project.

Ocean to interior waterways leading to Morehead City Harbor and the city of Beaufort, NC. The inlet channel is oriented more or less north-south and is bound by two barrier islands: Bogue Banks to the west, and Shackleford Banks to the east.

Beaufort Inlet is located about 12 miles west of Cape Lookout near the cape 'headland' of the long crenulate shoreline between Cape Lookout and Cape Fear (*Figure 2a*). As such, the adjacent shorelines are south-facing, and the inlet vicinity is significantly influenced and quasi-sheltered by the large shoal complex of Cape Lookout (*Figure 2b*).

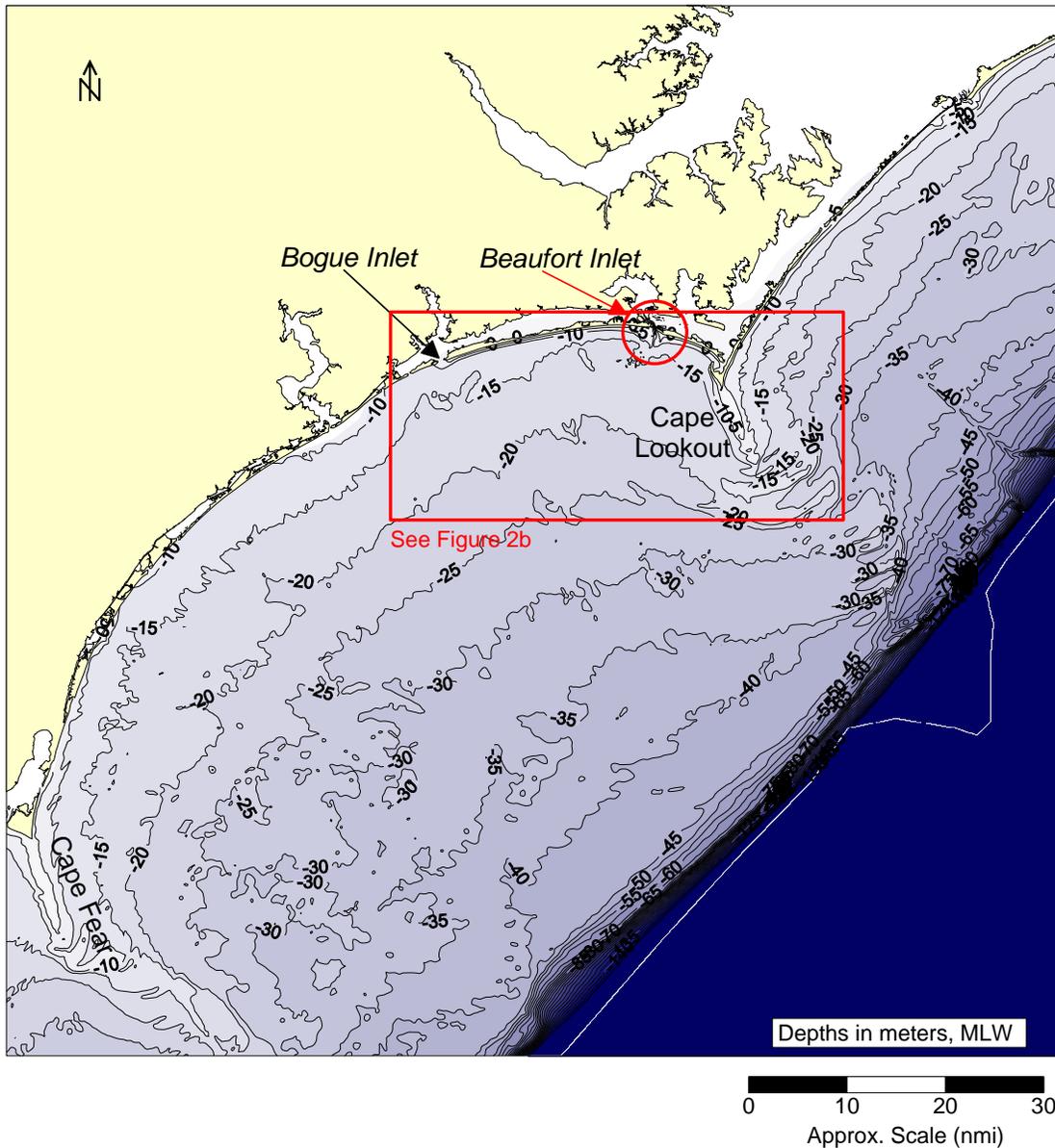


Figure 2a: Bathymetry offshore of Beaufort Inlet, between Cape Lookout and Cape Fear.

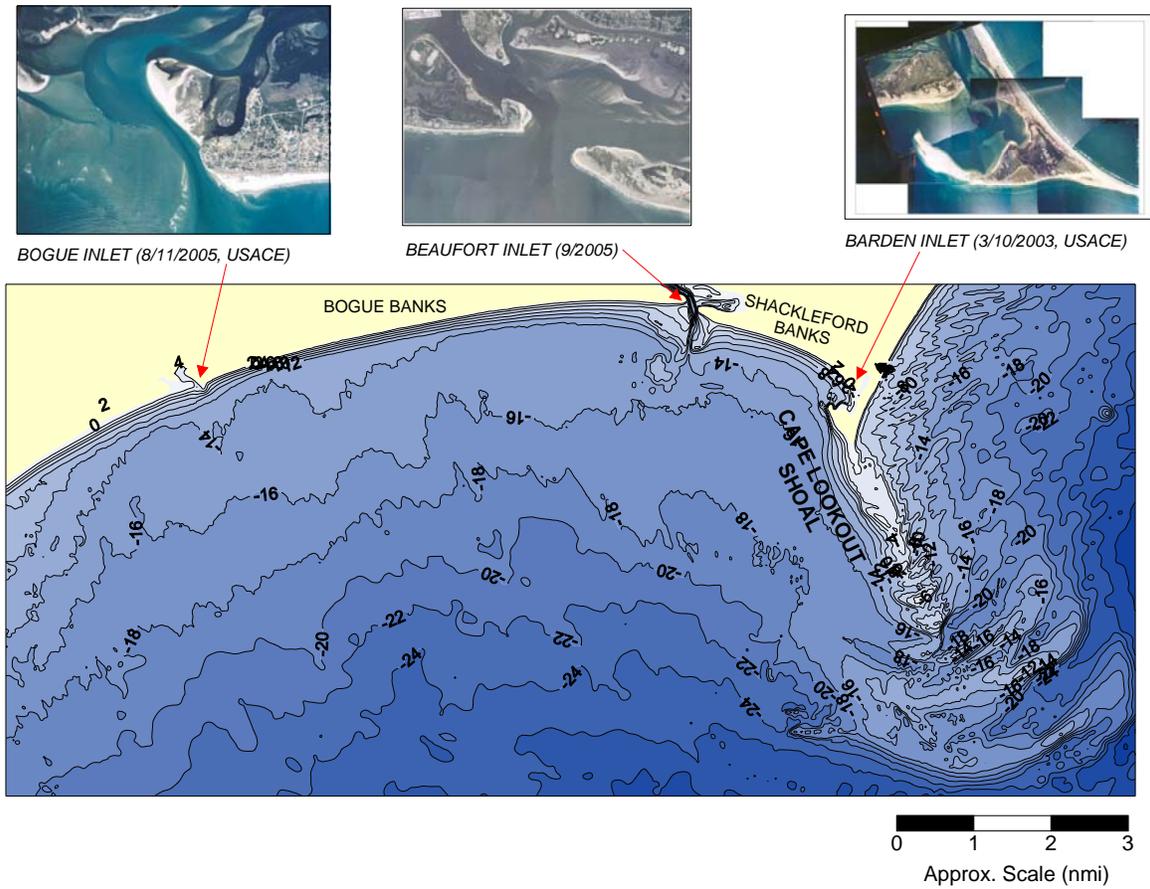


Figure 2b: Nearshore bathymetry and tidal inlets in the study area.

Bogue Banks, to the west, is a sandy barrier island of about 23 miles length and includes -- from east to west -- the municipal areas of Fort Macon State Park, Atlantic Beach, Pine Knoll Shores, Salter Path/Indian Beach, and Emerald Isle. Shackleford Banks, to the east, is a sandy barrier island of about 9 miles length and is part of the Cape Lookout National Seashore. The nearest ocean inlets are Bogue Inlet to the west and Barden Inlet to the east. Bogue Inlet is maintained for purposes of navigation and shore protection (most recently in 2004-05). Barden Inlet is a dynamic, mostly unimproved inlet which is maintained very infrequently.

2.2 Inlet & Navigation Project History

Beaufort Inlet is indicated on nautical charts dating back to at least 1850. In its natural state, the inlet was characterized by a migratory tidal channel surrounded by a broad ebb tidal shoal and ocean bar. The natural controlling depth over the bar was about -15 ft, Mean Low Water (MLW). (In this report, all depths are referenced to Mean Low Water, unless otherwise noted.) After 1910, federal improvements for navigation at the inlet commenced.

In 1911, a 300-ft wide navigation channel was dredged through the bypassing bar at a depth of -20 ft. Between 1911 and 1936, a channel was maintained at about these dimensions, but not at a fixed location.

In 1936, the outer (bar) channel was deepened to -30 ft and widened to 400 feet, and the channel location was fixed. The inner channels and basins were dredged to the same depth. In 1961, the channels and basins were deepened to -35 ft.

In 1978, the bar channel was increased to -42 ft by 450 width, and most of the interior channels and basin were deepened to -40 ft. The alignment of the bar channel was shifted slightly eastward toward naturally deeper water near Shackleford Point.

In 1994, the bar channel was deepened to -47 ft by 450-ft width, increased in length by 4300 ft to reach the -47 ft depth contour, wideners added, and the interior channels and harbors deepened up to -45 ft.¹ The 1994 modifications included disposal of dredged material from the outer channel to “construct a nearshore berm on the edges of the ebb tide delta at about the -18 to -20 ft contour”.² Maintenance dredging of the inner harbor is to be placed in an upland (Brandt Island) stockpile with pumpout to the beaches of Bogue Banks every 8 to 10 years. This represents the present authorized project conditions, and is generally referred to as the “45-ft” project.

2.3 Inlet-Adjacent Beach Conditions

Excepting minor groins at and near the historic fort at the east end of Bogue Banks, there are no major beach/inlet structures. Commencing in 1978, dredged material from the inner harbor was placed to address beach erosion along the eastern end of Bogue Banks. This action was repeated in 1986, 1994, 2002 and 2004 along the eastern 5-1/2 miles of the island, which includes Atlantic Beach and Fort Macon State Park.

In 2002-04, multiple beach nourishment projects have been constructed further west, from Pine Knoll Shores through Emerald Isle, to address chronic beach erosion. The majority of this construction was by County (non-federal) projects, with a minority constructed as a one-time Section 933 beach disposal project from the federal navigation channel, in 2004. There is no authorized federal shore protection project near the inlet.

¹ The actual depths dredged during maintenance are to include an additional 2 feet in required overdepth, such that the outer channel would be typically dredged to -49 ft. Along the bar channel, this corresponds to a 45-ft project, plus 2-ft wave allowance, plus 2-ft overdredge.

² USACE 1992, “Harbor Improvement Morehead City, NC – Design Memorandum & Environmental Assessment” U S Army Corps of Engineers, Wilmington District; March 1992; page 1.

2.4 Prior Studies

Prior quantitative reports on beach and inlet processes at Beaufort Inlet are relatively limited. The most recent studies include a Section 111 Report on Morehead City Harbor/Pine Knoll Shores (USACE, 2001) prepared by the Wilmington District, U.S. Army Corps of Engineers. This study found that from 1936-2000, 38.9 million cubic yards (mcy) of littoral sediment has been removed from the inlet/beach system as a result of the Morehead City Harbor Project. But based upon shoreline changes, the Corps concluded that there is no evidence that the harbor project has had an impact on the adjacent shorelines, and concluded that mitigation for shoreline damages under Section 111 was not warranted.

A Section 933 Evaluation Report prepared by the Corps in August 2003 concluded that historical erosion trends along the area can be expected to continue. The report recommended for cost-shared beach disposal of suitable dredged material along about 7 miles of shoreline along Pine Knoll Shores, Indian Beach and Salter Path. A portion of this work was constructed in 2004.

A synopsis of other relevant studies is presented in *Appendix G* of this report.