STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

DIVISION OF HIGHWAYS
P.O. BOX 25201, RALEIGH, N.C. 27611-5201

GARLAND B. GARRETT JR.
SECRETARY

September 30, 1996

Mr. Charles Jones
North Carolina Division of Coastal Management
Post Office Box 769
Morehead City, North Carolina 28557

Dear Mr. Jones:

SUBJECT: Carteret County, Extension of Bridges Street between Arendell Street and NC 24 in Morehead City, TIP No. U-2226, State Project No. 9.8022831, Wetland Mitigation As-Built Report

Please find enclosed three copies of the as-built for the above-cited project. This report describes the mitigation site as it was constructed during the period from May 6-June 20, 1996.

Thank you for your cooperation in this matter. If you have any questions, please contact David Schiller at 733-7844, Extension 280.

Sincerely,

H. Franklin Vick

H. Franklin Vick, P. E., Manager
Planning and Environmental Branch

Enclosures (3)

cc: (with one copy of enclosure)
Mr. John Parker, DCM
Mr. John Dorney, DWQ
Mr. Scott McLendon, USACOE
Mr. Don Morton, P. E., NCDOT, State Highway Engineer - Design
Mr. Bill Johnson, NCDOT, State Roadside Environmental Engineer
Mr. A. L. Hankins, P. E., NCDOT, State Hydraulics Engineer
Mr. Rick Shirley, Division Engineer, Division 2

As-Built Report of Wetland Mitigation
Bridges Street Extension, Morehead City
TIP Project Number U-2226
Carteret County
North Carolina Department of Transportation
Raleigh, North Carolina

COE Action ID Number 199602568
CAMA Permit Number 50-96

Prepared By:
Permits and Wetland Mitigation Unit
Planning and Environmental Branch
North Carolina Department of Transportation
September 18, 1996

1.0 INTRODUCTION

On November 8, 1995, the North Carolina Department of Transportation (NCDOT) applied for a Coastal Area Management Act (CAMA) permit for filling approximately 1.02 acres (0.41 ha) of acres of brackish marsh dominated by black needlerush (*Juncus roemerianus*). The wetland mitigation plan that was submitted with the permit application specified that approximately six acres (2.43 ha) of salt marsh would be established by planting smooth cordgrass (*Spartina alterniflora*) on the intertidal portions of two islands in Bogue Sound as compensatory mitigation for unavoidable impacts wetlands as a result of TIP Project U-2226. The detailed monitoring plan for this mitigation site was submitted on April 25, 1996.

2.0 SITE LOCATION AND DESCRIPTION

The mitigation site is located approximately 3,500 feet (1067 m) south of Morehead City and approximately 4,000 feet (1220 m) west of the bridge connecting Morehead City and Atlantic Beach (SR 1182). The location is shown on Figure 1.

Although the mitigation plan specified that salt marsh would be established on two islands in Bogue Sound (Site A and Site B), conditions encountered at the time of planting required that all mitigation activities take place on Site A. The elevation of Site B was determined to be too low for survival of smooth cordgrass. Also, the area of Site A that appeared suitable for marsh establishment appeared to have expanded over that previously determined. Thus, no planting was carried out on Site B.

3.0 MITIGATION SITE ESTABLISHMENT

3.1 Planting Materials and Methods

Smooth cordgrass was obtained from Pinelands Nursery of Columbus, NJ. All plants were grown for one year in containers in a greenhouse and acclimated to a saline environment by irrigation with water gradually increasing in salt content prior to planting.

Approximately 65,000 smooth cordgrass plants were delivered and planted over the interval of May 6-June 4, 1996, by personnel within NCDOT's Roadside Environmental Unit. Plants were established on the island designated as Site A (Figure 2). Planting consisted of establishing the plants on a 2-foot (0.6 m) grid by opening a hole in the substrate with a dibble (tree planting bar), inserting the plant material, and kicking the hole shut. Approximately one ounce (28 grams) of slow release fertilizer was placed in each hole with the plant.

3.2 Biolog Installation

Approximately 1066 linear ft (325 m) of 12-inch (30 cm) diameter biodegradable fiber "biologs" (manufactured by Bon Terra, Inc., Boise, Idaho) were installed along the

east and south perimeter of the mitigation site at the time smooth cordgrass was planted. The purpose of these was to reduce wave impacts and aid in the accretion of sand on the mitigation site. In addition, seven biolog baffles were established at an angle to the axis of the biologs along the east perimeter. All biologs were installed in 20 ft (3 m) sections in shallow trenches and held in place with pairs of wooden stakes driven into the substrate. Strong cord was used to secure each pair of stakes together, passing over the biolog. Details of the installation are shown in Photos 4 through 6.

3.3 Biomat Installation

Approximately 2,800 ft^2 (260 m^2) of 1/4 in (6 mm) thick fiber "biomat" (also manufactured by Bon Terra, Inc.) was installed at two locations in the planted area near the east perimeter. The biomat was installed in two sections, each 14 ft x 100 ft (4.25 m x 30.5 m) and was secured to the surface with 12 inch (30.5 cm) wire staples. One section was installed in the northern portion of the planted area and the other was installed in the southern portion. The purpose of these mats was to prevent erosion in planted areas adjacent to existing marsh.

4.0 SAMPLING TRANSECTS

Five sampling transects were established on May 29, 1996, within the planted area. Each transect was 30m long and oriented north-south. The ends were marked with wooden stakes driven firmly into the ground. Transects were numbered 1P (Planted) through 5P. Five identical transects were established to the west of the planted area in existing marsh. These transects were numbered 1R (Reference) through 5R. This area is to be used as a reference for the determination of success. Transect locations and establishment was coordinated with Mr. Ted Tyndall of the Morehead City office of the Division of Coastal Management. The locations of the transects are shown in Figure 2.

5.0 MITIGATION SITE SURVEY AND METHODOLOGY

The mitigation site was surveyed on July 25, 1996, by personnel within NCDOT's Locations and Survey Unit. Although the monitoring plan stated that GPS would be utilized, the survey was conducted with a Total Station. The choice of the total station was based on the increased accuracy of that method over GPS within the relatively small area of the mitigation site. Survey data was downloaded into a CAD system for use in generating a figure depicting the site. Also, data from previous surveys was merged with that from the July 25 survey to produce a figure showing the recently planted area with respect to existing, adjacent marsh and the approximate configuration of the island.

6.0 RESULTS

The survey of the mitigation site revealed that smooth cordgrass was planted over an area of 5.9 acres (2.4 ha). Primary work on the site was completed on June 4, 1996; however, NCDOT personnel checked the site several times after then to confirm that the

biologs and biomats were remaining in place. Some minor damage to these structures was noted as a result of tidal fluctuations and wave action. Remedial action on an as-needed basis was carried out to ensure that they were secured in place.

Hurricane Bertha passed through the area on July 12, 1996. Damage to the site appeared to be minimal, although it was not possible to separate the effects of the hurricane from those associated with previous wave action. Sand had been deposited along the east side of the planted area, behind the biolog. The elevation of the new surface was level with or above the biolog and the some sections of biolog were below the surface. The sand had covered irregular portions of the planted area, but it was not possible to determine the total area and depth of sand accretion. On the date the site was surveyed, smooth cordgrass appeared to be absent from these areas. However, plants were observed growing in nearby sections of biolog; considering the dynamic nature of the system, the apparent increase in elevation, and the presence of nearby plants, these areas are expected to be colonized by smooth cordgrass over time.

The biomats did not survive the combined effects of the hurricane and normal tide cycles. On the date that the site was surveyed (July 25, 1996) to determine as-built conditions, only small fragments of the biomats were visible because of a combination of partial destruction and sand accretion. Thus, the configuration of these mats was impossible to determine. The condition of the biomat located at the north part of the planted area is shown in Photo 12.

It appears that the installation of biologs resulted in significant accretion of sand on the mitigation site. This method may be of interest to other individuals and organizations attempting to reduce erosion and/or stabilize shorelines in the intertidal zone, provided the material is suitably secured.

7.0 PHOTOGRAPHS

Photographs of the mitigation site, during development and afterwards, are provided in Photo 1- Photo 12.

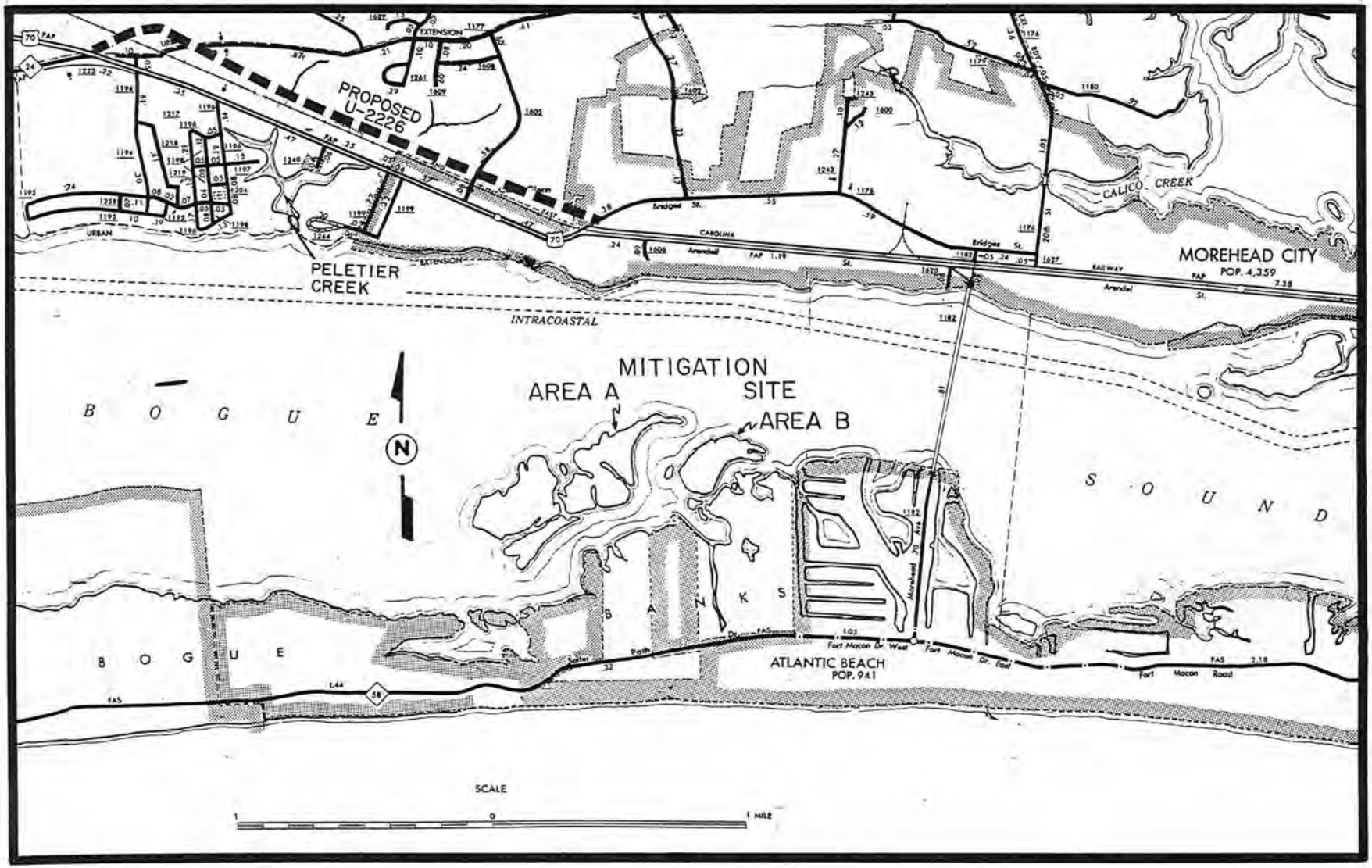
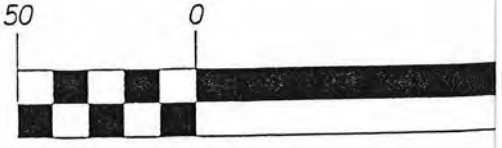


Figure 1. Location of Mitigation Site for TIP Project Number U-2226, Carteret County

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2226		

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

Approximate location of intertidal island at low



METRIC SCALE

Existing Marsh	
Planted Marsh May-June 1996	
Monitoring Transects	2R

Figure 2.

Photo 1. Establishment of smooth cordgrass on mitigation site, May 7, 1996.

Photo 2. Establishment of smooth cordgrass on mitigation site, May 7, 1996.

Photo 3. Individual plants immediately after establishment, May 7, 1996. Note fertilizer near plants.

Photo 9. Biolog on east side of mitigation site approximately one month after establishment.

Photo 10. Smooth cordgrass approximately one month after establishment.

Photo 11. Smooth cordgrass approximately one month after establishment.

Photo 12. Biomat approximately one month after establishment.