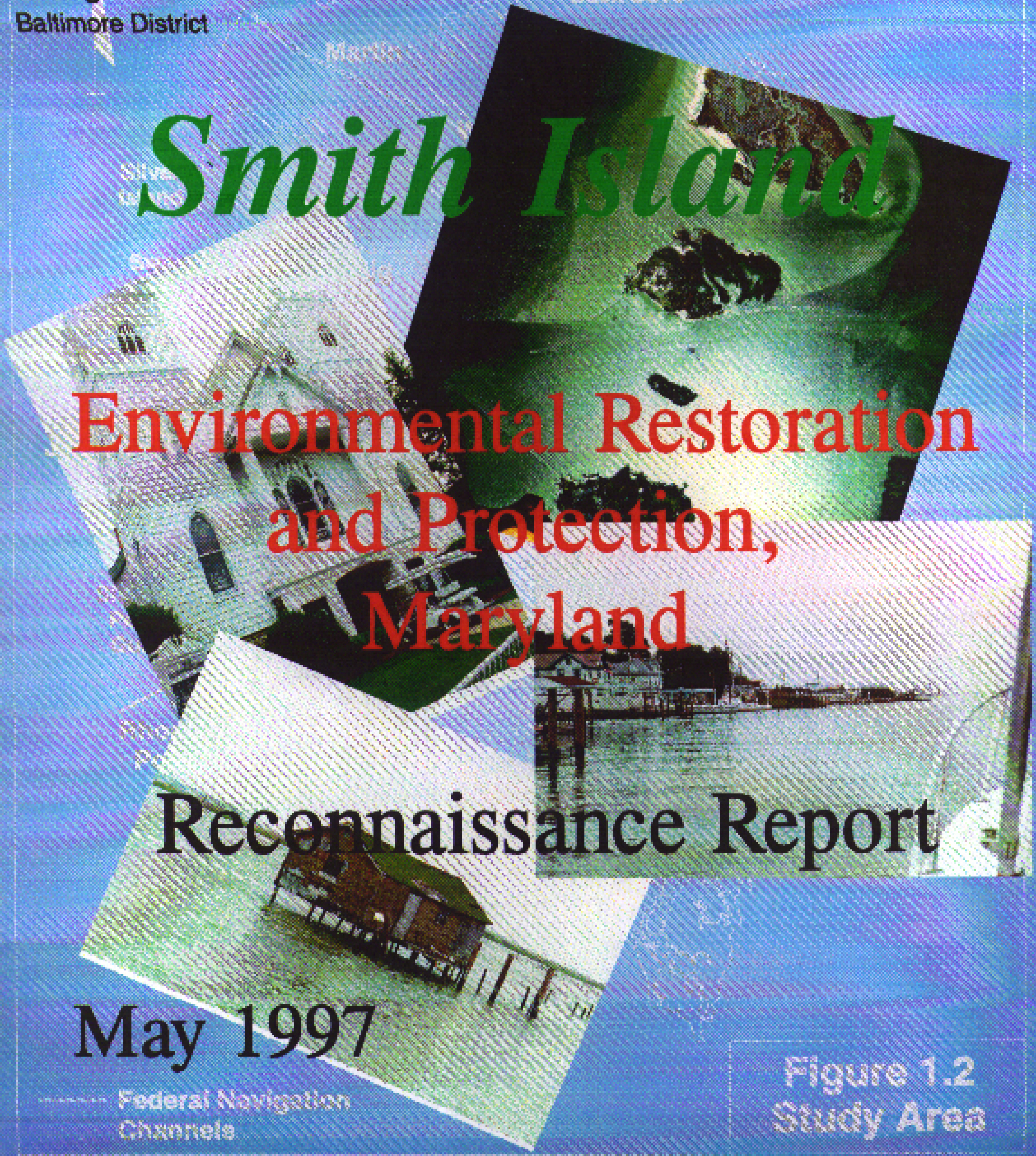
US Army Corps
of Engineers
Baltimore District

# Smith Island

## Environmental Restoration and Protection, Maryland




## Reconnaissance Report

May 1997

# Smith Island Environmental Restoration and Protection, Maryland

## Reconnaissance Report

## Syllabus

Smith Island, Maryland's last inhabited Chesapeake Bay island, is located 12 miles west of Crisfield, Maryland, 95 miles south of Baltimore, and straddles the Maryland and Virginia state line. The island is populated by a unique culture of watermen descended from the original settlers of 350 years ago. The isolation of an island in the Bay has led to a society of close-knit, independent people who speak with a distinctive accent and live lifestyles similar to their ancestors.

Smith Island is abundant in natural resources. The high concentration of submerged aquatic vegetation make the vicinity among the most prolific areas for wildlife in the Bay. The island itself is almost entirely wetlands. The upland areas provide very productive roosting areas for a variety of birds.

In recent years, this community that lives in balance with the Bay has become more and more threatened by the process of erosion. Coastal areas, especially valuable wetlands, protect the populated portions of the island and are being lost to erosion. The increased wave action and sedimentation in the region is leading to a decline in submerged aquatic vegetation.

This study was prompted by concern about the loss of fish and wildlife habitat and unique human culture. There is strong public and private interest in preserving Smith Island. The recommendations discussed below are aimed at protecting and expanding the fish and wildlife habitat and preserving the human culture on Smith Island.

Several plans of improvement were examined during the course of this study. Preliminary analyses were conducted for four problem areas; Rhodes Point, Tylerton, Ewell, and the Martin Wildlife Refuge. In the vicinity of Rhodes Point, on the western side of the island, it was determined that the mouth of Sheep Pen Gut needs to be stabilized and protected in the interest of erosion control, navigation, and habitat restoration. Such a project could include shoreline protection for the south side of the mouth using geotextile tubes and backfill. Another alternative could allow for construction of twin stone jetties to protect the mouth of the gut and the Federal channel. Further study is warranted for this project. A justified plan to protect Tylerton from continued erosion and storm damages includes a stone revetment along the length of the western shoreline, and segmented off-shore breakwaters to the south of the town. For Ewell, repairing the breaches that have opened on the peninsula between Big Thorofare and the Bay and protecting the peninsula with a series of offshore segmented breakwaters is warranted for further study. These projects in the vicinity of Ewell would help to restore the hundreds of acres of submerged aquatic vegetation that have been lost.  In the Martin Wildlife Refuge three coves on the north and northeast sides could be constructed or rehabilitated to protect and recreate shallow water and submerged aquatic vegetation habitat.

These projects would help maintain the viability of the population of the island as well as enhance the fish and wildlife habitat value of this environmentally important region of the Bay.

The results of the reconnaissance phase support further Federal involvement in the feasibility phase and other available authorities on studies for improving the fish and wildlife as well as human habitat of Smith Island.  The non-Federal participant, the Maryland Department of Natural Resources, agrees with the findings in this report and has signed a letter of intent.  In view of this expression of non-Federal support and the favorable results of the technical analyses, the District Engineer recommends that planning and engineering for improvements to Smith Island be continued.

## Smith Island Environmental Restoration and Protection, Maryland

## Reconnaissance Report

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The study team would like to give special thanks to the people of Smith Island who were always hospitable and tolerant of our intrusions.

# Smith Island, Maryland, Environmental Restoration and Protection

**Reconnaissance Study**

**Section 1**

## INTRODUCTION

The first permanent settlement on Smith Island occurred in 1657 when settlers from St. Clements Island, in the lower Potomac River, landed near the present location of Ewell. Smith Island was in the chain of islands known as the Russell Isles, after a Dr. Russell who tended to Captain John Smith in 1608 after he was injured by a stingray. The settlers bestowed the name “Island of Broken Woodlands” to the island until the name “Smith Island” was applied around the turn of the 18th century. The name was in honor of Captain Henry Smith who had 1,000 acres surveyed in the part of Smith Island known as “Pitchcroft,” which is west of Ewell.

Throughout the history of the island, many villages and homesteads have come and gone, Methodism came to the island and helped to define the culture, and the economy has gone from farming to working the waters, but the people have persevered. Today’s island culture has evolved with modern society, yet still remains deeply rooted in its heritage. Today’s islanders live lives similar to those of their ancestors and even speak with a Cornish accent descended from the original settlers. In addition to its unique cultural value, the Smith Island area is perhaps the most important and productive fish and wildlife habitat in Chesapeake Bay. The marsh areas, upland hammocks, shallow water habitat, and expansive submerged aquatic vegetation (SAV) beds provide habitat for exceptionally rich and diverse biological resources.

Erosion and storm damages have always been a way of life to island dwellers in Chesapeake Bay. However, as time has goes on and erosion has accelerated, formerly settled islands have become uninhabitable. Many of the Bay’s islands have entirely disappeared, while others remain but are no longer populated. Poplar, St. Clements, Barren, and Holland Island were all abandoned in the 20th century. Smith Island remains as the last inhabited Chesapeake Bay island in Maryland. Left unprotected, Smith Island would join the other Bay islands in first losing its population and rich cultural resources, and then its landmass and its substantial fish and wildlife habitat. In response to these circumstances, Congress authorized the Corps of Engineers to undertake a reconnaissance study of Smith Island.

### 1.1 STUDY PURPOSE AND AUTHORITY

This report is a product of the reconnaissance study process. The purposes of the reconnaissance phase are to make a determination as to whether planning studies should continue based on the existence of project alternatives that are in the Federal interest, and to identify a non-Federal sponsor who is interested in, and capable of, participating in future studies in which they will share the cost. The suggested project alternatives must also be consistent with current laws, policies, and budgetary priorities as established by the Corps higher authority, Congress, or the President.

In order for a plan to be in the Federal interest it must be considered of value to the national economy, environment, or heritage. The value of a project to the economy, environment, or culture must outweigh the project's cost to justify the expenditure of tax dollars. Beyond just an economic or environmental evaluation, the concept of Federal interest also includes policies and priorities. Each year priorities are established, dictating where funds are to be spent. Policy and priority in recent years has included environmental restoration projects.

The Corps of Engineers must be authorized by Congress before any study can be conducted. The Smith Island Environmental Restoration and Protection, Maryland, reconnaissance study was authorized by resolution of the House of Representatives on September 28, 1994. The resolution was sponsored by Representative Wayne Gilchrest, MD-1 and states:

> *Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, That the Secretary of the Army, is requested to review the report of the Chief of Engineers on the Chesapeake Bay, Maryland and Virginia, published as House Documents 176, Eighty-eighth Congress, First Session, and other reports pertinent to determine whether modifications of the recommendations contained therein are advisable at the present time, with particular emphasis on providing improvements on Smith Island, Maryland and Virginia, in the interest of navigation, flood control, erosion control, environmental restoration, wetlands protection, and other purposes.*

## 1.2 STUDY AREA

Smith Island is situated 12 miles west of Crisfield, Maryland, and 95 miles south of Baltimore, Maryland (Figure 1.1). Smith Island is bounded to the east by Tangier Sound and to the west by Chesapeake Bay. The island is approximately 8,000 acres in area and is 8 miles long and 4 miles wide. The island is actually many islands separated by guts (creeks or channels). Smith Island lies mostly in Somerset County, Maryland, although the southern tip lies in Accomack County, Virginia. All three of the island's population centers are in Maryland. Ewell, the largest town with just over 200 residents, is connected to Rhodes Point, a town of approximately 100 residents, by road. The third town, Tylerton, is not connected to the other two (Figure 1.2). Tylerton is the smallest town, at approximately 75 residents, and is accessible only by boat. There is little to no automobile traffic in Tylerton.

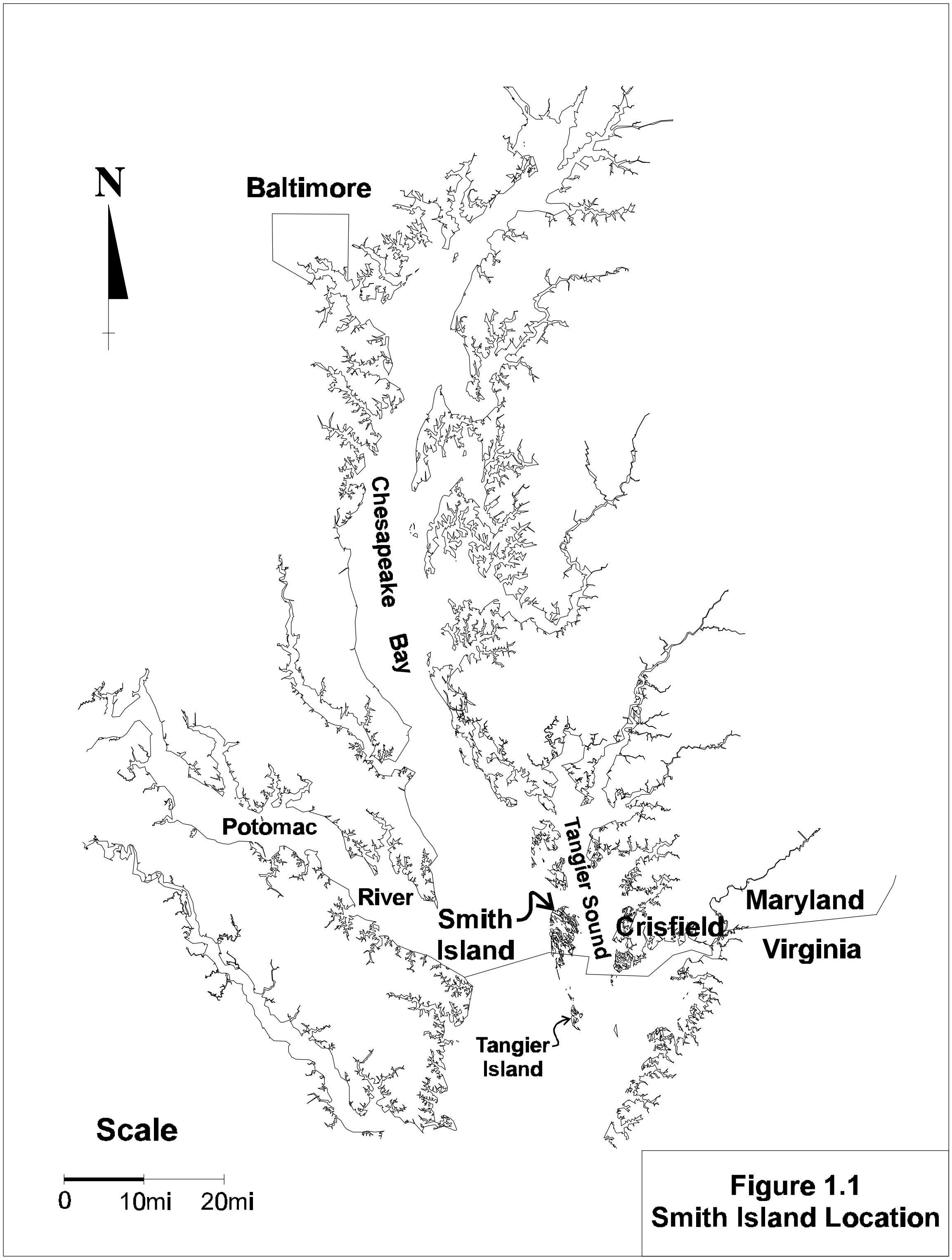



Figure 1.1
Smith Island Location

## 1.3 SCOPE OF STUDY

The scope of the Smith Island study is quite broad. The study area itself is limited to the immediate vicinity of the island. The authorizing language allows for study relative to environmental restoration, erosion protection, navigation, storm and flood protection, and wetlands protection. The language also includes a category of "other" purposes as required. For this reason, this study commenced with the initial goal of determining any and all problems with which the Corps of Engineers may be able to help, as well as a goal of identifying problems over which the Corps does not have jurisdiction. These problems have been included in this report so that any other interested group may choose to participate in a solution.

## 1.4 PRIOR STUDIES, REPORTS, AND EXISTING PROJECTS

Smith Island has been studied several times in the past by the Corps of Engineers. The most recent time was in the late 1970's and early 1980's. The Flood Control, Shore Erosion Control and Navigation Smith Island, Maryland and Virginia feasibility report, dated June 1981, recommended construction of a channel from Tylerton to Rhodes Point and then to the Chesapeake Bay. The report also recommended that the channel entrance to the Bay be protected by jetties, and for the land mass of Hog Neck to be protected by a series of segmented breakwaters. The structural aspects of the recommendation, the jetty and the breakwaters, were never constructed due to a lack of local funding; however, the channel was constructed through Sheep Pen Gut.

Other Corps of Engineers projects constructed on Smith Island include (refer to Figure 1.2)

1. A channel, 7 feet deep and 60 feet wide, from Twitch Cove on Tangier Sound through Big Thorofare (authorized by the River and Harbor Act of 25 July 1912), thence to the canal at Ewell (authorized by the River and Harbor Act of 3 July 1930), thence through Levering Creek and Big Thorofare to the vicinity of Swan Point (now Swan Island), thence of the same depth and 100 feet wide through the offshore bar to deep water in the Chesapeake Bay, with twin jetties at the entrance (authorized by the River and Harbor Act of 20 June 1938).

2. An anchorage basin 7 feet deep, 100 feet wide, and 700 feet long connecting with the west side of the existing project channel at Ewell (authorized by the River and Harbor Act of 17 May 1950).

3. An extension of the existing project channel in Levering Creek, 6 feet deep, 60 feet wide and 1,000 feet long (authorized by the River and Harbor act of 17 May 1950).

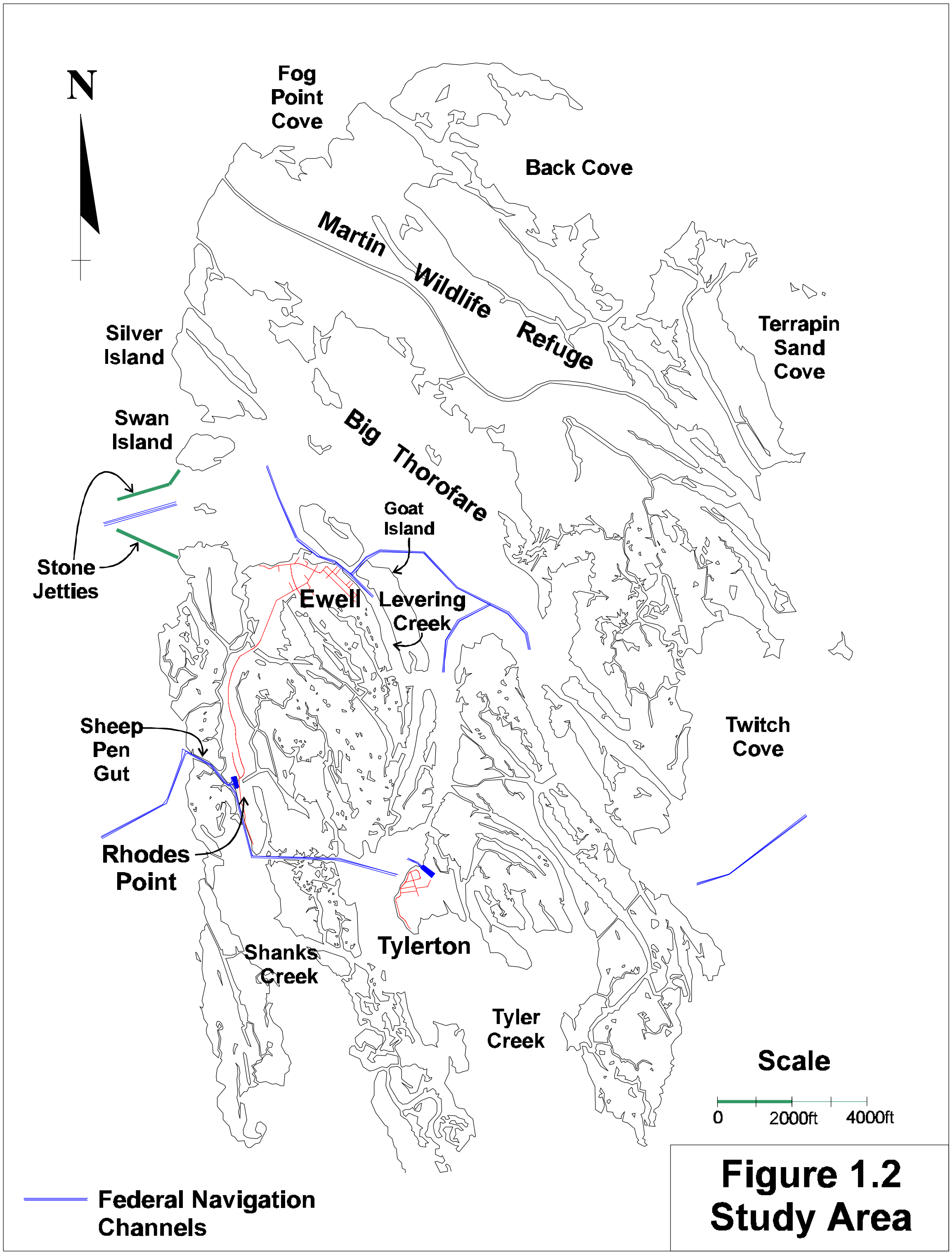



**Figure 1.2**
**Study Area**

4. A channel 50 feet wide and 6 feet deep from that depth in Tyler Creek to and including an anchorage basin of the same depth, 150 feet wide, and 400 feet long at Tylerton (authorized under the authority of Section 107 of the River and Harbor Act of 1960 on 1 August 1968).

5. A channel 50 feet wide and 6 feet deep from that depth in Shanks Creek to and including an anchorage basin of the same depth, 100 feet wide, and 400 feet long at Rhodes Point (authorized under the authority of Section 107 of the River and Harbor Act of 1960 on 1 August 1968).

6. A channel 6 feet deep and 50 feet wide from that depth in Big Thorofare River to Tylerton (authorized by the River and Harbor Act of 25 July 1912, modified by authority of Section 107 of the River and Harbor Act of 1960 on 1 August 1968).

7. A channel 6 feet deep and 50 feet wide from Rhodes Point to Tylerton (authorized by the River and Harbor Act of 1954 and modified under the authority of Section 107 of the River and Harbor Act of 1960 on 1 August 1968).

8. A channel 6 feet deep and 50 feet wide from the northern limit of the Rhodes Point to Tylerton Federal channel through Sheep Pen Gut to deep water in Chesapeake Bay (authorized 22 January 1982 under the continuing authority of Section 107 of the River and Harbor Act of 1960).

## 1.5 STUDY PROCESS

Planning by the Corps of Engineers for any Federal water resource project is normally accomplished in two phases: a reconnaissance phase and a feasibility phase. The reconnaissance phase is conducted at full Federal expense while the cost of the feasibility phase is shared equally between the Federal government and a non-Federal sponsor(s).

The objectives of the first, or reconnaissance, phase of the Smith Island Environmental Restoration and Protection Study were to investigate the need for improvements to the island within the scope of the study authority, to determine the Federal interest in continuing the study into the next phase, to identify a non-Federal sponsor in support of the potential solutions, and to negotiate and execute a feasibility cost-sharing agreement (FCSA) with the non-Federal sponsor. This report contains a summary of investigations, results, conclusions, and recommendations of the reconnaissance phase that was initiated in June 1996.

The second, or feasibility, phase would undertake a more detailed examination of the recommended improvements from the reconnaissance phase. The objectives of the feasibility phase would be to evaluate the specific effects of each alternative improvement, including a without-project alternative, to identify the optimum project(s) for Smith Island, and to recommend a project for construction, if justified and supported by the non-Federal sponsor(s). Assuming the identification of at least one justified project, the product of the feasibility phase would be a report, including appropriate environmental documentation, for submission to Congress for project authorization.

# Section 2

# Existing Conditions

In order to determine the benefits of any recommended project alternative, it is important to define the existing and future without-project conditions. After the project alternatives have been defined and analyzed, a future with-project condition can then be defined. The project benefit is then the net change between the future without-project and future with-project conditions. The existing condition definition presented in this section is based on previously published data and text, site visits, meetings and conversations with local residents and agencies, and other existing information.

## 2.1 BACKGROUND CONDITIONS AND GENERAL DESCRIPTION OF AREA

Smith Island is exposed to a long open-water fetch from the west, southwest, and northwest. The western shore of the island is 30 miles from the Virginia shoreline. Because of its exposed position, the entire island is subject to erosion and flooding. Although it once supported wooded areas, agricultural fields, and pastures, the island is currently a complex of salt marsh islands separated primarily by narrow tidal creeks and shallow water areas. Upland areas on the island are limited to the towns of Ewell, Tylerton, and Rhodes Point, several former dredged material disposal areas, and approximately a dozen isolated hammocks, dunes, and ridges. Vulnerability to the effects of erosion, flooding, and storms constitute an obvious problem for the three towns on the island, however, important natural resources are also threatened.

Because of the island's wetland habitats, its biological resources are exceptionally rich and diverse and it is one of the most productive areas for submerged aquatic vegetation (SAV) in the Chesapeake Bay. While the amount of SAV has declined in recent years, extensive SAV beds remain, especially within the protected interior shallow waters and along the shoreline facing Tangier Sound. The grass beds are important both ecologically and economically, providing cover and food for juvenile fishes, molting blue crabs and many other crustaceans and mollusks, and supporting in turn a locally based crab scrape fishery.

## 2.2 SOCIAL, CULTURAL, AND ECONOMIC SETTING

This discussion focuses on the communities on Smith Island itself. Refer to Appendix B for a full discussion of the regional economy and society.

### 2.2.1 Social and Cultural

The culture and society of Smith Island is deeply rooted in its ancestry (see Appendix F). The independent and pioneering spirit that brought the first settlers almost 350 years ago still prevails. Today's Smith Islanders are not completely isolated from modern society, but their way of life is so unique, and their traditions are so strong that they remain a world apart. Smith Island has no formal government. There are no police, and no need for them. There were no street names until recently. The church is the center of life on the island, and much of the social life on the island is organized around the church. The church, through annual tithes from the members and even non-members, handles such civic responsibilities as maintaining public areas. Water supply is handled by several independent "companies" formed by a few families joining together to dig a well.

Each town has a distinct character. There is pride within and rivalry among the three towns. Ewell, the unofficial "capital" city, is the most populated with over 200 residents and is considered the most metropolitan. Ewell is home to the new visitors center, restaurants, a gift shop, and bed and breakfast lodging facilities. Ewell is connected to Rhodes Point by road. Along the road between the two towns, there is an incinerator and a waste treatment facility that is shared by both towns. Rhodes Point is built along a single road. It is the second most populated town with approximately 100 people. Rhodes Point is the most endangered of the three towns due to its proximity to the open Bay. Rhodes Pointers are required to travel to Ewell for many of their amenities; however, the Marine Railway, a boat-building and repair facility is located at the southern end of Rhodes Point. Tylerton is the most isolated, being separated from the other communities and accessible only by boat. It is said that Tylerton may be the most devoutly religious of the towns. Cars are a rarity there, but bicycles, golf carts and cats are not. Mail is delivered by boat to the post offices at Ewell and Tylerton; mail for Rhodes Point is routed through the Ewell post office.

Each of the towns is indeed unique unto each other (although the casual visitor may not notice the extent of the differences), and undeniably unique compared to the rest of modern society. The life of an islander is filled with hard work. The men are up at 3 a.m. to get an early start on the water. The women pick crab meat, maintain the households, and help cultivate the soft shell crabs in the shanties. Most of the residents are direct descendants of the original settlers. The names Evans, Bradshaw, Marshall, Marsh, Laird, Corbin, and Tyler are common.

In recent years, the population has been shrinking at an accelerated pace. A major contributor to this trend is the feeling that the island and its towns will be uninhabitable 20 to 50 years from now due to erosion. The younger residents are moving away and the population is declining through the attrition of it elders. This irreplaceable culture is threatened with extinction. Like no place else in Maryland, the Smith Islanders live with nature. Life is dictated by the tides and winds and abundance of life in the water. As Tom Horton wrote in his book An Island Out of Time, "The islanders and their culture and heritage are as much an expression of marsh and water, of isolation and Chesapeake Bay, as are soft crabs and spartina grass."

### 2.2.2 Economic Setting

Most of Smith Island and all of its population is located in Somerset County, Maryland. A description of the economic setting of Somerset County is located in Appendix B. Nearly all of the permanent residents of Smith Island are dependent on the seafood industry for their livelihood. Seafood is harvested and either processed locally or packed for shipment. Although crabs dominate, oysters and clams are also harvested and shipped across Tangier Sound to Crisfield. The return trips yield supplies and petroleum. There are an estimated 150 commercially used boats on Smith Island. Fifty come from Tylerton, 30 from Rhodes Point, and 70 from Ewell. Sixty percent of the boats are "tongers" or oyster vessels and 40 percent are "scrapers" or crab boats. In practice, 80 percent of the boats are used for both oystering and crabbing. While there is no other industry on the island, there is a museum, restaurant, and gift shop which caters to the seasonal tourists disembarking from the tour boats from May to October. The three towns of Ewell, Rhodes Point, and Tylerton as well as the project areas delineated in this report are all within the jurisdiction of Somerset County.

The erosion at each town is causing economic hardships in the form of navigational delays, boat damages, and infrastructure problems such as road and dock damages. The loss of SAV and shallow water habitat is lowering the availability of soft-shell crabs and other species in the area. The islanders have traditionally depended on soft-shell crab harvests for income.

## 2.3 PHYSICAL SETTING

Smith Island is a low-lying complex of islands with an area of almost 8,000 acres. It is part of a string of marshy islands that separate Tangier Sound from the Chesapeake Bay. The average elevation of the island is 2 feet above mean sea level (MSL) and the maximum elevation is about 5 feet above mean sea level. Smith Island has few upland areas. The communities of Ewell, Tylerton, and Rhodes Point, as well as several isolated hammocks, dunes and former dredged material disposal areas provide the only high ground. The range of tide is about 1.6 feet. The northern half of the island is owned by the U.S. Fish and Wildlife Service (USFWS) and managed as the Martin Wildlife Refuge. Big Thorofare Channel separates the refuge from the settled areas of Smith Island and is the most important water access to Ewell. Each of the three communities has a work boat basin, dredged or constructed by the Corps of Engineers, and each harbor is fringed by rows of wooden work buildings or "crab shanties."

### 2.3.1 Ewell

A light but steady stream of boat traffic on Thorofare Channel moves into the small channel cut through Goat Island to reach the main island port at Ewell. The harbor area at Ewell, as at the Rhodes Point and Tylerton harbors, is bordered by "shanties," where crabs are kept in shallow pools until they shed their shells and the new soft-shell crabs are packed for market. A county dock, fuel dock and other boating supplies, restaurants, a gift shop, and tourist center are located at dockside. Within several blocks of the harbor are the Methodist Church and camp meeting ground, post office, elementary school, fire station, recreation center, grocery store, bed and breakfast, and other commercial and residential structures. The community is generally developed along the shoreline, with several residential lanes located inland from the shore and one road connecting Ewell, formerly called "North End," to Rhodes Point, approximately one mile to the south.

### 2.3.2 Rhodes Point

Rhodes Point is the most vulnerable to impending damage from wave energy and erosion. The location of the island's only boat repair facility, at the southern end of Marsh Road, bears the original name of the community: Rogue's Point. The community has a Methodist Church, post office, and a Community Building that houses the Senior Citizens Center.

### 2.3.3 Tylerton

The community of Tylerton must be reached by boat. The usual access is south from Big Thorofare Channel at Easter Point and through the Tyler Ditch. The community is compactly arranged, close to the harbor, and boasts the recently constructed Smith Island Crab Picking Cooperative. A Methodist church, post office, general store and restaurant, and bed and breakfast lodgings are located on the quiet residential lanes of the community. In 1995 the Tylerton school, Maryland's last one-room school house, was closed due to a lack of state funding.

### 2.3.4 Martin Wildlife Refuge

The northern part of Smith island was acquired by the U.S. Fish and Wildlife Service in 1954. and now constitutes the Martin National Wildlife Refuge. The refuge includes approximately 4,500 acres of undeveloped marshes, shores, and upland areas. The marsh areas are ecologically valuable as habitat for birds, invertebrates, fish, reptiles, and mammals and also for the detritus they produce and export. Most of the refuge is composed of estuarine emergent wetlands bisected by numerous tidal creeks. Of the 12 hammocks that contain important wading bird rookeries on the island, 3 are within the refuge boundaries. Several other wooded ridges, dunes, and former dredged material disposal sites in the refuge provide upland nesting sites for colonial waterbirds, waterfowl, and raptors. These sites also provide important resting and staging areas for migratory songbirds and are especially valuable because of the development, human disturbance, cultivation, and exposure to predation by domestic animals on nearby mainland areas. Nesting towers in the refuge are being used by two pairs of the Federally-listed endangered American peregrine falcon. The towers are two of several constructed in areas of the refuge with readily accessible food and without significant human disturbance.

Several coves and formerly enclosed areas are located on the north and east shorelines of the refuge. Although the landforms that enclose the coves are eroding, the remaining land buffers provide some protection for the quiescent areas preferred by many species. These areas include Fog Point Cove, Back Cove, Terrapin Sand Cove, and Twitch Cove. Along the northwest shoreline of the island, also located within the refuge, tidal guts allow Bay waters to enter the protected interior waterways. In recent years breaching and erosion at the heads of the tidal guts has allowed larger quantities of sediments from the open bay to accrete in the island's interior, changing the substrate type, and causing some loss of SAV.

The wealth of natural resources in the refuge have been and will continue to be impacted by the problems of erosion and flooding that threaten the three settled areas on the island.

## 2.4 ENVIRONMENTAL RESOURCES

Environmental resources in and around Smith Island are exceptionally rich and diverse. With the exception of the three towns, several old dredged material disposal sites, and small dune ridges and hammocks, the Smith Island complex is composed entirely of estuarine emergent wetlands bisected by numerous tidal creeks. The study area has the moderately salty water typical of the middle Bay (12 to 19 parts per thousand, about half the salinity of ocean water). Shallow waters within and surrounding the island support some of the most productive areas for SAV in the Chesapeake Bay. These wetlands and aquatic beds in turn provide habitat for developing and mature species of fish, invertebrates, waterfowl, wading birds, shorebirds, raptors, railbirds, aquatic furbearers, terrapins, and reptiles. Adjacent open waters support commercially important populations of crabs, oysters and clams, and commercially and recreationally important populations of finfish.

Wetlands on Smith Island are primarily composed of intertidal and subtidal estuarine wetlands. The intertidal wetlands are classed as emergent persistent; irregular tidal bar/beach; and regularly and irregularly exposed tidal flats. The subtidal wetlands on the island are classed as open water with unconsolidated and unknown bottoms; and aquatic grass beds.

Dominant wetland vegetation species is black needlerush, with lesser amounts of smooth cordgrass, saltmeadow hay, salt grass, marsh elder, groundsel bush, saltmarsh bulrush, waterhemp, and common reed (*Phragmites australis*). Common reed, an invasive wetland plant of relatively low wildlife value, is often associated with and dominates old dredged material disposal sites on Smith Island.

Marsh areas are ecologically valuable not only for the habitat they provide, but also for their production and export of detritus, which is a vital component of the aquatic food web. Wetland dependent species in the Smith Island area include menhaden, bluefish, sea trout, spot, croaker, and drum.

Smooth cordgrass, because of its position in the intertidal zone, is particularly valuable in terms of detrital export. The occurrence of smooth cordgrass on Smith Island is somewhat limited, however, a prominent stand, which should be protected, is located at the southern tip of Rhodes Point.

Vegetative communities found on the upland dune habitats are characterized by orache, Seaside goldenrod, saltmarsh fleabane, sea rocket, American beach grass, and switchgrass. Although these areas have less direct benefit to the aquatic resources of the estuary, they are valuable habitats for many species of birds, mammals, and reptiles, and also help buffer interior areas from erosion.

Upland forested hammocks on the island are important nesting sites for wading birds. Twelve hammocks on Smith Island currently contain wading bird rookeries. Generally these hammocks constitute isolated ridges surrounded by marsh and/or open waters, or are former dredged material disposal sites which are also adjacent to marsh and/or open water. Hammock vegetation is characterized by shrub and tree species such as wax myrtle, groundsel bush, black cherry, and hackberry. Understory vegetation is comprised of vine species such as Japanese honeysuckle, poison ivy and blackberry. Several of the old dredged material disposal sites on the island are covered with dense stands of common reed, rather than the community described above.

Smith Island remains one of the most productive areas for submerged aquatic vegetation (SAV) in the Chesapeake Bay. Although the island has experienced some decline in this important habitat type, extensive SAV beds remain, especially as compared to much of the Tangier Sound region. Almost all of the Smith Island SAV beds, or potential SAV habitat, are located within the protected interior shallow waters or along the shoreline facing Tangier sound. The 1995 distribution of SAV in and around Smith Island, as well as areas of SAV loss is shown in Figure 3.1. Eel grass (*Zostera marina*) and widgeon grass (*Ruppia maritima*) are the dominant species, with widgeon grass occurring in waters generally less than 3 feet deep MLLW and eel grass occurring in waters greater than 3 feet deep MLLW but still within the photic zone. These two grasses are among the most important for waterfowl in the Chesapeake Bay and the grass beds in the area are an important ecological component of the Smith Island complex. The beds provide cover and food for juvenile fishes, molting blue crabs (*Callinectes sapidus*) and many other crustaceans and mollusks, and are an important food for many species of waterfowl. It has been estimated that one square yard of SAV provides habitat for a minimum of 50 juvenile crabs. Assuming a 10% survival rate, each acre of SAV (4,840 square yards) would produce approximately 24,000 individuals, or 160 bushels of marketable crabs per year.

In addition to its value as crab habitat, SAV beds, as well as the island's emergent wetlands, contribute detritus in the form of dead and decaying leaves and other plant parts to the estuarine food web. This product of the wetlands and SAV provides food and cover for snails, fish, shrimps, worms, and many smaller creatures, which in turn provide food for the larger denizens of the shallow water areas. Beyond its direct value to fish and wildlife, SAV also helps to stabilize bottom sediments and improve water quality.

The peregrine falcon is the only Federally-listed or proposed endangered or threatened species known to exist on Smith Island. Transient individuals of species on the Federal list may make occasional visits to the island, including bald eagle, arctic peregrine falcon, red-cockaded woodpecker, shortnose sturgeon, leatherback turtle, hawksbill turtle, Atlantic Ridley turtle, loggerhead turtle, and Atlantic green turtle.

The Maryland Department of Natural Resources has records of nesting on Smith Island by the Northern Harrier, a State-listed rare species. The Black Skimmer, a State-listed threatened species, has been observed on the island.

## 2.5 AESTHETIC AND RECREATIONAL SETTING

### 2.5.1 Recreation and Tourism

Recreation opportunities on Smith Island are shaped by its history, its location in the Bay, and its environmental resources. "I was nine years old, and loved to go out in my rowboat to crab...," wrote a former resident of her childhood on Smith Island in the early decades of the 20th century. She described exploring the marshes in the boat with her dog, "I would sit quietly and watch the muskrats, ... spiders, and otters...You would see a ripple on the water leading to the bank...," she wrote, and the same quiet pleasures are cherished by residents and visitors today. The island's unique culture and relative isolation continue to be strong influences on the recreation activities of its residents. When not actually crabbing, oystering, or fishing, watermen and their families spend considerable time maintaining and preparing their boats and equipment. These tasks, such as making crab pots, require time and care that might otherwise be invested in more recreational crafts, such as wood working and carving wooden decoys.

Group recreation activities on the island are focused around family, community, church, and school. Each of the three Smith Island communities has a small complement of recreation facilities. Church buildings in each town provide space for club meetings, dinners, and similar organized indoor recreation activities. The Community Center in Ewell serves as a focus of other recreational functions and a new tourist center is also available for group activities. Both Ewell and Tylerton have ball fields and school playgrounds, and the Community Meeting Hall in Rhodes Point is used as a Senior Citizen Center, serving communal meals and sponsoring other activities. Several business locations also serve as regular informal gathering places. Watermen, teen-agers, housewives, and retirees relax and talk, shoot pool, and conduct business at the two grocery markets in Ewell (Charlie's Store) and Tylerton (Drum Point Market), and at Ruke's Store and Restaurant, near the county dock at Ewell.

In more solitary recreational pursuits, island residents watch television, phone friends, monitor their home weather stations, paint, and write poems, stories and historical sketches. Bicycle riding is a popular form of recreation as well as a practical way to get around on the island's narrow lanes. Island residents report that gardening and raising the rose bushes common in earlier times has been more difficult as the land has become wetter.

The necessity of boats to island life makes boating an easily accessible recreation activity. Seasonal residents, day tripping tourists, and transient boaters may be more likely to enjoy recreational boating, touring, bird-watching, and sport fishing in the island waters. However, both islanders and visitors find the marshes and waterways of the island a magnet for hunting, fishing, observing nature, and the kind of poking around that the locals call "proging".

Tourists arrive on the island by private boats or on the ferries that cross from the Eastern shore at Crisfield or Point Lookout State Park, Maryland, or from Reedville, Virginia, on the west shore of the Bay. There are limited transient docking facilities on the island, but lodging is available at two commercial bed and breakfasts (at Ewell and Tylerton) and at several private homes. Several restaurants, generally catering to group tours arriving on the ferries, are located near the harbor at Ewell. Most facilities for visitors, such as the bed and breakfasts and the tourist center at Ewell, are open during the summer tourist season or by prior arrangement. Ferry access to the island during the winter is limited by fewer scheduled trips and by weather conditions. In spite of the logistical constraints, approximately 40,000 tourists visit Smith Island each year (based on conversations with residents), drawn by its natural beauty and quiet charm.

The planning and tourism offices of Somerset County have plans to promote eco- and heritage tourism in the County, including Smith Island. The Crisfield and Smith Island Cultural Alliance was instrumental in the construction of the Smith Island Tourist Center at Ewell and has plans for additional development at the center.

### 2.5.2 Aesthetics

The charm and beauty of Smith Island are magnets for both natives and outsiders. A book written in 1861 described the island residents as being "much attached to their island homes," and the same is true today. The island is also attractive to writers, film makers, and artists, who are generous in their praise.  A recent book on Smith Island describes the island as:

> *"... a place of raw untamed beauty, a locale whose setting is limited only by the boundaries of nature. It is a private, beautiful world that is like no other in Maryland.  Isolated geographically from the rest of the state, Smith Island is actually a cluster of small islands with only a few acres of dry land.  A maze of waterways cuts through the marshy terrain to connect three separate communities whose yards and lanes are often awash in tidal waters.  There are no tall buildings here, no steep hills, and no patches of forest to break the winds that blow in from the Chesapeake Bay."*

The appreciative author paints a picture of the "homes built on ridges that are just a little higher than the surrounding marshland," and a rugged landscape that is "somehow softened by the light reflected by sky and water."  He describes marsh grasses that "ripple in the wind like fields of grain, taking their shadowy colors from the sky" (*Smith Island, Chesapeake Bay*, by Frances W. Dize).

Other writers recognize and praise the island's location in time and space and culture: its characteristic combination of land and water; old fashioned values and modern technology. The environmental writer, Tom Horton, has praised the richness of the island world and defined the charm of the island as "not so much about its abundance of nature; rather, its juxtaposition of the human and the natural; and even more to the point, the fact that it had achieved a *balance* between them."

Today's weathered crab shanties draped with brightly painted floats may not appear as pristine as descriptions in the 1967 book, Maryland's Right Tight Isle, however, the "pretty homes along the lanes," "lovely country store," and other picturesque features still have a strong appeal.

## 2.6  MOST PROBABLE FUTURE CONDITIONS

The following sections describe the likely future condition on the island assuming no new Federal projects.  Maintenance of existing Federal navigation projects is assumed to continue.

### 2.6.1  Social Setting

Smith Island, in its vulnerable location between the Chesapeake Bay on the west and Tangier Sound on the east, is continually exposed to the damaging forces of nature.  The west side of the island is particularly susceptible to erosion and inundation damage by wind-generated waves from the Chesapeake Bay.  A recent article in the  Journal of

Coastal Research, November 1995, "Historic and Future Land Loss for Upland and Marsh Islands in the Chesapeake Bay, Maryland, U.S.A.," by Wray, Leatherman and Nicholls delineates the precarious condition of the upland and marsh islands in the Bay, in particular Smith Island. The article notes that the Chesapeake Bay islands provide excellent case studies of land loss as written records of inhabitants and good historic maps clearly document their decline in area.

Since 1849, there has been a significant amount of perimeter erosion along the western shore and from the northeast corner of the island, reflecting exposure to the maximum fetch (see Figure 3.2). The continual loss of land on Smith Island is attributable to current, near-term and eventual damage scenarios on Smith Island. The towns of Rhodes Point and Tylerton are currently suffering the economic cost of continual erosion. These islanders face shoaling delays weekly, damages to their boats sporadically, and increased road, sewer, dock, ramp, and bulkhead maintenance costs annually. If current conditions persist without any relief, there is an imminent danger that the continual shoreline erosion on portions of Rhodes Point and Tylerton will result in major infrastructure damages to the roads, sewer pipes, water pipes, docks, ramps, houses, and marinas in these two towns. It is estimated that these major infrastructure costs could be incurred by year five in the current analysis. It is also possible that these major infrastructure damages are imminent, given the particular vulnerability to storm damage that the continual erosion has created. Whenever these major infrastructure damages do occur, many of the 288 structures on the island, the sewer pump station, and roads and utilities would be in immediate danger of tidal or storm flooding.

In addition, the continual breaching that has occurred in Swan Island and vicinity and the erosion in the Northeast Coves of the island have intensified the overall threat to the integrity of the island and the ability of the islanders to earn a living in the seafood industry. All of this erosion is related to the survival of the island and its historic culture and way of life. With erosion in check, the concomitant navigational problems with channel shoaling, eroding of the docks, ramps, and marinas, roads, and utilities, would be relieved. Finally, of great importance is the recovery of submerged aquatic vegetation surrounding the island and the re-establishment of wetlands on the shoreline of the island which can occur if the further erosion and breaching of the island is prevented. The following subsections present a summary of the expected future conditions for each of the study areas considered in this report. This discussion was derived from the Corps of Engineers report of June 1981 on Smith Island, existing information from other sources and agencies, observations, and interviews. The projections made in previous reports have been tested against the current condition and updated.

2.6.1.a Rhodes Point. The June 1981 report stated that by the year 2000, the erosion along Hog Neck would lead to a situation which would "allow waves to pass over or through the barrier islands more frequently." The report also said that some sort of protection would be provided to Hog Neck and the shoreline of Rhodes Point. Some protection has indeed been constructed along Hog Neck by the Corps in the form of geotextile tube placement and backfill. The shoreline of Rhodes Point itself has not yet been protected with new bulkheading or similar construction. The June 1981 report did not, however, anticipate the problem at Sheep Pen Gut.

The current projection for Rhodes Point is that the mouth of Sheep Pen Gut will continue to erode. This will allow increasing wave energy in the channel and result in more erosion to the Rhodes Point shoreline and increased damages during storm events. The June 1981 report projected that between 2000 and 2010 piers and outbuildings at the southern end of town will be lost. However, this projection has changed because of the erosion at Sheep Pen Gut and resulting accretion of sediment at the southern end of town. The parts of town that are now considered the most endangered are the northern and central sections of the Rhodes Point shoreline. In fact, it seems likely that the erosion rate in the central and north far exceeds the rate expected previously for the southern end. Therefore, although the June 1981 report predicts the loss of 11 structures in the southern end during 2010 to 2020 and the remaining 5 in 2020 to 2030, it now seems more likely that structures in the central section will be affected shortly after the turn of the century.

Left unchecked, this erosion will eventually cause the evacuation and abandonment of Rhodes Point. Prior to this occurring, it is expected that the state or county would step in and construct bulkheading along the affected shoreline.

2.6.1.b <u>Tylerton</u>. The June 1981 report states, "the only noticeable erosion problem affects about 1,100 feet of shoreline along the southern tip of Tylerton." The limited area of erosion was the result of bulkheading that protected the rest of the town. Further, the report predicts that during the years 1990 to 2000 the road and sanitary sewer in southern section of the shoreline would be lost. In fact, by 1996 the road was indeed being impacted. It is now predicted, based on cursory reconnaissance analysis, that the road and sewer are in imminent danger, that is, that they will be lost within 5 years. The June 1981 report predicted that in the decade from 2000 to 2010, Tylerton would sustain damage to the pumping station (although that station is already at near-term risk) and the first loss of a residence in the town would occur. The most probable future condition projection in the report included the construction of bulkheading.

Tylerton faces the same problems now as it did in 1981. The bulkheading has continued to degrade and provides only minimal protection. Without improvements that provide flood and erosion protection the town will become uninhabitable. The cultural loss would be impossible to quantify, because the fishing village culture at Tylerton is doubly isolated by its separation from the other island communities. The people of Tylerton are a tightly-knit community without formal government or police. The people walk, ride bicycles, or drive golf carts along the narrow lanes. To visit Tylerton is to go back in time to a small community of self-reliant, religious, and friendly people. It is the type of community that needs to survive; even if it is just so that we can say such a place still exists.

2.6.1.c Ewell, Martin Wildlife Refuge. The Martin Wildlife Refuge was not considered during the 1981 study because the Corps had not yet become active in environmental restoration projects. Conversations with USFWS officials and islanders indicated that the two major problems in the Refuge were the loss land forms that provide protective coves and the breaches which have formed and are worsening along the western shoreline. If the present rate of erosion continues, the breaches on the western shoreline will widen and allow even more wave energy and sediment into Big Thorofare. It is likely that SAV losses in the region will continue, navigation problems will mount, and Ewell will become increasingly endangered by the increased wave energy. It is unlikely that the state or county would act to protect the Federal channels or the Federally-owned environmental resources of Big Thorofare. If the problem became severe enough, the state or county would likely act to protect Ewell itself by constructing bulkheading. This would not improve the navigation or environmental problems in the area, however. The Corps might act to close off the breaches in the interest of decreasing the operations and maintenance cost of dredging the channel. In fact, the Corps is currently planning to restore the northern jetty at Swan Island in the interest of navigational improvements. Restoring the jetty may have the additional benefit of improving the habitat in the area.

The future condition of the refuge coves may be easier to project. It is fairly certain that without project construction the further degradation and eventual disappearance of the coves is very likely to occur. To restore the spits of land that formed the coves, or to construct breakwaters is purely an environmental enhancement, habitat creation action. If it is not undertaken by the Corps or the USFWS, it will not happen and the habitat will be lost. The most probable future condition is the loss of shallow water habitat and SAV beds in the areas of the coves. The resolution under which this study is authorized emphasizes providing improvements in the interest of environmental restoration. Rehabilitation of these coves has the potential for tremendous habitat creation benefit.

### 2.6.2 Economic Conditions

This section quantifies the economic implications of the future scenarios described in section 2.6.1. The economic impacts of continuation of the existing conditions, or damages, are used as the basis for calculating the benefits of any proposed project.

2.6.2.a Rhodes Point. The shoreline erosion and the shoaling of the navigation channel are the two major existing economic problems in the Rhodes Point through the Sheep Pen Gut vicinity. The current estimated damage categories in this vicinity are: navigational (time delay, additional fuel cost, and vessel damage); additional road and sewer repair; dock and ramp damage; and increased revetment maintenance. For years two through four these damage categories are escalated by 3% due to inflation and by 2% due to increased intensity of damages as erosion conditions on the western side shore of Rhodes Point worsen. In year five, major infrastructure damages will occur to portions of the road, sewer and water pipes, revetment, and dock if the situation continues where no remedial action is taken.

The existing and future without project economic evaluation for the Sheep Pen Gut vicinity is shown on Tables 1 through 1E in Appendix B. Each Table shows the potential benefits attributable to the specific damage category. The current year damages are calculated as follows. For the watermen's cost, time is lost by going around through Tylerton and up around Ewell thereby avoiding Sheep Pen Gut at times when the tide is low. The average time it takes to make the detour each way is 30 minutes. Thirty boats are impacted by the detour and average 5 gallons of fuel per hour. The watermen attest that they make 1,560 round trips per year with a value of their time estimated conservatively at $6 per hour. This equals 1,560 hours (1 hour = 1 round trip) times $6 per hour = $9,360 for the value of their time foregone. With fuel cost at $1.25 per gallon times 5 gallons per hour, the fuel cost expended equals $6.25 per extra hour on the water. Again for 1560 hours times $6.25 per hour in fuel cost = $9750 for the additional fuel expense incurred. Damages to the watermen's boats are estimated to be a modest $200 per year as most of the time their high navigational skill level avoids damages and they know when to avoid the channel through Sheep Pen Gut. Thirty boats times $200 = $6,000 for vessel damage.

The total cost for the three watermen damage categories is $25,110 for the current condition in 1997. The Somerset County roads Department estimates that it currently spends an additional $10,000 a year on the 2,500 feet of road and sewer pipe in Rhodes Point that is damaged due to the shoreline erosion and flooding and an additional $12,000 a year on the county dock and ramp. The current cost of repairing the 2,500 feet of revetment is currently $20,000.

By year 5, the threat of imminent danger of the western shoreline of Rhodes Point translates into a major infrastructure cost as 2,500 feet of road, sewer and water pipe, dock, and revetment are eroded away by the eroding condition of the shoreline. The costs in year 5 are conservatively estimated by Somerset County to total $2,275,000 for replacing the damaged infrastructure. The total cost is disaggregated as follows: $1,250,000 bulkhead or stone revetment ($500 per foot times 2,500 feet); sewer pipe $50,000 ($20 per foot times 2,500 feet); water pipe $25,000 ($10 per foot times 2,500 feet); county dock $200,000; county road $750,000 ($300 per foot times 2,500 feet).

Between 1990 and 1995, Rhodes Point was estimated to have lost 92% of its SAV. The most current estimate of SAV remaining is 27 acres (see Figure 3.1, Table 3.1).

2.6.2.b Tylerton. The shoreline erosion of the southern end of Tylerton and the shoaling of the navigation channel in the Sheep Pen Gut vicinity which is utilized by Tylerton watermen are the two major existing economic problems in the town of Tylerton. The current estimated damage categories in this vicinity are: navigational (time delay, additional fuel cost, and vessel damage); additional road and sewer repair; dock and ramp damage; and increased revetment maintenance. For years two through four these damage categories are escalated by 3% due to inflation and by 2% due to increased intensity of damages as erosion conditions on the western side shore of Tylerton worsen. In year five, major infrastructure damages will occur to portions of the road, sewer and water pipes, revetment, and dock if the situation continues where no remedial action is taken.

The existing and future without project economic evaluation for Tylerton is shown on Tables 1 through 1E in Appendix B-3. Each Table shows the potential benefits attributable to the specific damage category. The current year damages are calculated as follows. For the watermen cost, time is lost by going around up around Ewell thereby avoiding Sheep Pen Gut at times when the tide is low. The average time it takes to make the detour each way is 30 minutes. Fifty boats are impacted by the detour and average 5 gallons of fuel per hour. The watermen attest that they make 2,600 round trips per year with a value of their time estimated conservatively at $6 per hour. This equals 2,600 hours (1 hour = 1 round trip )times $6 per hour = $15,600 for the value of their time foregone. With fuel cost at $1.25 per gallon times 5 gallons per hour, the fuel cost expended equals $6.25 per extra hour on the water. Again for 2,600 hours times $6.25 per hour in fuel cost = $16,250 for the additional fuel expense incurred. Damages to the watermen's boats are estimated to be a modest $200 per year as most of the time their high navigational skill level avoids damages and they know when to avoid the channel through Sheep Pen Gut. Fifty boats times $200 = $10,000 for vessel damage.

The total cost for the three watermen damage categories is $41,850 for the current condition in 1997. The Somerset County roads Department estimates that it currently spends an additional $10,400 a year on the 2600 feet of road and sewer pipe in Rhodes Point that is damaged due to the shoreline erosion and an additional $12,480 a year on the county dock and ramp. The current cost of repairing the 2,600 feet of revetment is $20,800.

By year 5, the threat of imminent danger of the southern shoreline of Tylerton translates into a major infrastructure cost as 2,600 feet of road, sewer and water pipe, dock, and revetment are eroded away by the eroding condition of the shoreline. The costs in year 5 are conservatively estimated by Somerset County to total $2,658,000 for replacing the damaged infrastructure. The total cost is disaggregated as follows: $1,300,000 bulkhead or stone revetment ($500 per foot times 2600 feet); sewer pipe $52,000 ($20 per foot times 2600 feet); water pipe $26,000 ($10 per foot times 2600 feet); county dock, ramp, and marina $500,000; county road $780,000 ($300 per foot times 2,600 feet).

Between 1990 and 1995, Tylerton was estimated to have lost 78% of its SAV. The most current estimate of SAV remaining is 94 acres (see Figure 3.1 and Table 3.1).

2.6.2.c <u>Ewell</u>. The major existing problem in Swan Island is the breaching that is occurring between Swan Island and the barrier islands to the north. Stabilizing the shoreline of Swan Island and the northern barrier islands would provide a sheltering effect from storm waves in the Ewell area and decrease sedimentation in the channels which impedes navigation. The town of Ewell is becoming more vulnerable to damages from the northwest side of town as the encroachment of the shoreline depletes the wetlands and moves closer to the county road. Benefits have not been quantified for this area but perceived benefits would largely be environmental in terms of potential recovery of SAV.

Between 1990 and 1995, Big Thorofare, which is in the vicinity of Swan Island, is estimated to have lost 57% of its SAV. The most current estimate of acreage remaining is 610.

2.6.2.d <u>Martin Wildlife Refuge</u>. The major existing problem in the Martin Wildlife Refuge is the erosion of the shoreline and the general deepening of the three interior coves: Fog Point Cove, Back Cove, and Terrapin Sand Cove. This condition has contributed to the loss of the wetland areas as well as submerged aquatic vegetation. Benefits have not been quantified for this area but perceived benefits would largely be environmental in terms of potential recovery of wetland areas and submerged aquatic vegetation.

Between 1990 and 1995, Fog Point Cove, Back Cove, and Terrapin Sand Cove were estimated to have lost 49%, 40% and 34% of its submerged aquatic vegetation (see Figure 3.1 and Table 3.1). The most current estimate of acreage remaining is 42, 307, and 667 respectively.

### 2.6.3 Environmental Resources

In the future, the Smith Island complex is expected to continue experiencing serious water resources problems with erosion, flooding, and habitat loss. These problems threaten both human inhabitants residing in the three towns and the important natural resources of the island. If the current trend in loss of land, SAV, and other resources continues, an irreplaceable island culture, as well as the invaluable natural environment, will be lost. As large acreages of vegetated wetlands and SAV disappear decade by decade, it is expected that the western shore of the island will continue to lose an average of 8 feet annually; refuge coves and the SAV they protect will be lost as enclosing landforms are eroded; and greater quantities of sediment will be washed through widening breaches into interior waters, causing increased wave energy and sedimentation in the valuable SAV beds. The result will be a loss of existing landforms that protect island communities; imminent danger to and the eventual destruction of the community of Rhodes Point (and later of Tylerton and Ewell); changes in the types of habitat provided by the island; and a gradual reduction in and ultimate loss of the remarkable mix of cultural and natural resources that still survives.

In the recorded past, Smith Island has provided extensive shallow-water habitats, SAV beds, tidal mudflats, and miles of fringing low marsh habitats. If the current loss of land

and SAV beds continues into the future, the proportions of existing habitat types on the island would change. Though the shrinking island would still provide a home for a variety of species and continue to attract transient species, the long term result would be an island that is successively more “wet” than “land” and would eventually vanish into the bay.

Some interruption in the steady erosion of the island has been provided by the recent placement of geotextile tubes and dredged material shore protection at Hog’s Neck. Application of this technology in the future could buy time for several problem areas on the island; however, it is expected that the moderate amount of material dredged through routine channel maintenance would limit its effectiveness.

# Section 3

# Problem Identification

The process by which problems were identified was designed to be sensitive to the needs and desires of the island residents as well as to include the input of interested agencies and governments. A majority of the efforts during the first half of the study involved identifying the public values, concerns, ideas, and issues on the island. The study team visited the island frequently and made every effort to determine what is important to the residents. The results of these efforts, along with the coordination efforts with interested agencies and local governments, is summarized in this section.

## 3.1 PUBLIC INVOLVEMENT EFFORTS

Public involvement in the identification of problems on the island included the full range of groups and representatives who participated in the study. Preparatory actions by the study team included reading articles and a recently published book by a writer who had spent several years at the Chesapeake Bay Foundation (CBF) environmental education center at Tylerton, as well as a number of other books and documents. Following the literary introduction to the island and its problems, came preliminary conversations with island residents. Meetings were held in each town, notices were sent out with comment cards, residents were interviewed by phone and in person, old reports were read, and interested agencies and individuals were contacted. Public involvement was a major part of the study during every phase.

The following sections provide a brief overview of some of the primary public involvement efforts. A more detailed discussion of the public involvement for this study is contained in Appendix E.

### 3.1.1 Meetings with Citizens

The first study team contact with the islanders occurred during a site visit with Representative Gilchrest (MD-1) to Rhodes Point on 1 July 1996. The study was introduced and some preliminary problem identification was done. Based on the contacts made that day, and other contacts known to District staff, a meeting was held in Ewell on 31 July 1996. The team was able to have a long discussion with a group of islanders to identify the water resource problems on the island. The team was also able to attend an annual camp meeting and stay overnight on the island. On 13 August 1996, the team met with a group of representatives from Tylerton and later, with representatives of the U.S. Fish and Wildlife Service (USFWS).

After this first round of meetings and continued correspondence and phone conversations with the residents, a formal public meeting was held at the community center in Rhodes Point on 27 August 1996. The purpose of this meeting was to present to the islanders the problems that had been identified so far during the study, and to allow the islanders to make value judgments and to show the team what was truly important to them as individuals and as a community.

In October 1996, the team met with Mr. Dwight “Duke” Marshall, Jr. in Tylerton. Mr. Marshall explained that meetings and discussions among Tylerton residents had led to the formation of a community organization. The purpose of forming the group is to have a structured, if unofficial, group to represent the town. The group’s structure will provide a method of gathering and disseminating information and ideas, developing programs for the common good, and providing support for community improvement efforts, without the difficulties of establishing a government or regulatory body. One of the initial tasks identified for the new Tylerton Community Council is the development of an economic plan for the community, with the goal of maintaining its unique way of life. Other tasks include providing assistance in improving flood and erosion protection in the community, creating a web page to provide information on the island, developing a “Marsh Walk” to recreate the old boardwalk paths between different parts of the island, and generally rebuilding the community.

In early December 1996, the team visited Tangier Island and Smith Island during a two-day visit. This was the first opportunity that the design team had to experience the unique way of life on the island. By meeting island residents in their homes, discussing island problems and realities with watermen in the island’s two grocery markets, and enjoying the islanders hospitality, the team gained an invaluable perspective on the project opportunities and constraints.

In February 1997, the team members made a two-day trip to Smith Island for a public meeting. The Saturday meeting date was chosen in response to a request by the watermen and was held at the Rhodes Point Community Center. The purpose of the meeting was to clearly define the problems identified during the study, to discuss potential solutions, and to reach consensus on those topics. The meeting marked a successful completion of the alternatives development stage of the public involvement activities for the reconnaissance study.

### 3.1.2 Agency Coordination

Coordination efforts included meetings and discussions with, and presentations to USFWS, the Maryland Historical Trust, Maryland Department of Natural Resources (DNR), the Chesapeake Bay Foundation (CBF), Somerset County government, Maryland Department of the Environment, and others. A steering committee was formed and included representatives of the State Historic Preservation Office, Department of Natural Resources, US Fish and Wildlife Service, Maryland Department of the Environment, US Environmental Protection Agency, National Marine Fisheries Service, National Park

Service, and the Somerset County Commission. In addition, a staff member from Congressman Wayne Gilchrest's office and community leaders from each of the three towns on Smith Island were part of the committee. A steering committee meeting was held in September 1996 on the island. This meeting led to further discussions with interested agencies. Refer to Appendix E for more details.

### 3.1.3 Other Public Involvement Activities

Other activities included presentations at the Climate Institute's "Chesapeake Bay at the Crossroads" conference on sea-level rise in Chestertown, Maryland, and to the Living Resources Subcommittee of the Chesapeake Bay Program. Meetings were also held with representatives of the Crisfield and Smith Island Cultural Alliance and Somerset County. For more details refer to Appendix E.

## 3.2 PROBLEMS, NEEDS, AND OPPORTUNITIES

The people of Smith Island, like no other place in the State of Maryland, are reliant on and vulnerable to the Chesapeake Bay. The Bay provides their livelihood, protects their unique way of life through the isolation it provides, and poses the greatest threat to their continued survival on their island home. Time and time again the residents spoke of the need to protect their homes from the encroachment of the Bay. The erosion that threatens their towns also is causing environmental concerns. Valuable wetland, shallow water, and SAV habitat is being lost. The following provides a more detailed discussion of the problems and needs of the island along with opportunities for Federal or non-Federal projects to solve or aid in the solution to the problems.

### 3.2.1 Submerged Aquatic Vegetation (SAV)

Shallow waters within and around Smith Island support some of the most productive SAV in Chesapeake Bay. Extensive beds of eelgrass and widgeon grass in turn provide cover and food for juvenile fishes, molting blue crabs, and many other crustaceans and mollusks, and are a favorite food for many species of waterfowl. SAV beds contribute detritus to the estuarine food web, stabilize bottom sediments and help to improve water quality. They are an important ecological component of Chesapeake Bay (see Section 2.4, and Appendix A).

Recent mapping in the area of Smith Island shows that there has been a substantial loss of SAV in recent years (see Figure 3.1). Calculations made by the Chesapeake Bay Program show that between 1993 and 1995, there was a loss of over 2600 acres of SAV adjacent to Smith Island (including Tangier Island). The maps substantiate the opinions of local watermen and representatives of the USFWS that there have been major losses of SAV throughout the Smith Island complex, in both the interior protected waterways and shoreline areas on the perimeter of the island. Areas of loss and concern include Shank's Creek (which runs between Hog Neck and Rhodes Point), Big Thorofare (across the width of the island, from the jetties near Swan Island on the western side of Smith Island to Twitch Cove on Tangier Sound), and along the north and east shores of the Martin Wildlife Refuge, where historical coves are being lost to erosion.

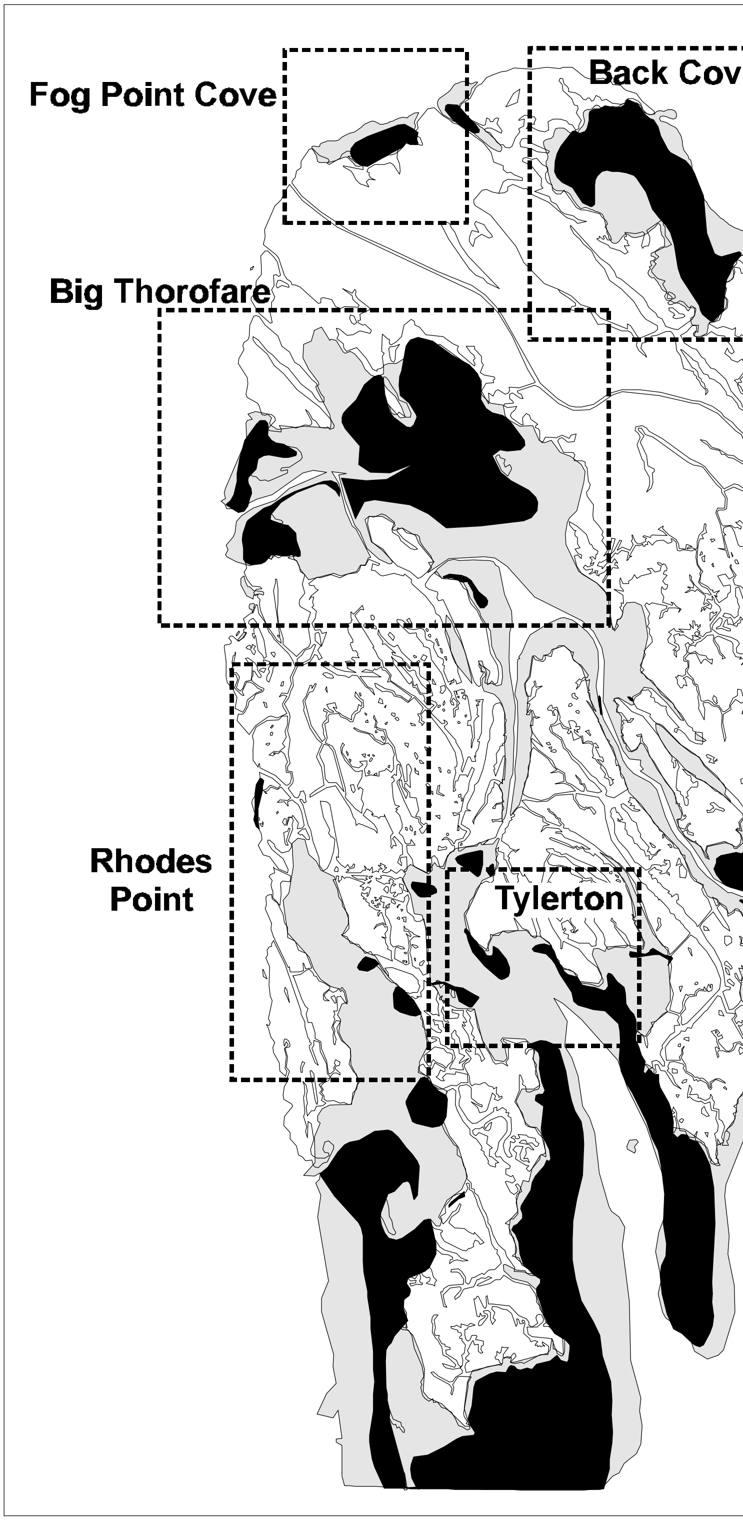



Figure 3.1
SAV Distribution

In order to flourish, SAV requires good quality water with low turbidity and a low energy wave/current environment. The loss of SAV in the Smith Island vicinity is likely caused by increased wave energy and high sediment load in the water column. This is a direct result of the loss of protective lands through erosion. Specific plans to halt erosion in a way that is productive to SAV growth will be discussed later in this section and throughout the report. Table 3.1 shows the loss in SAV for several years within selected regions of the study area.

Healthy SAV beds are important ecologically. They are also important economically and socially to the residents of Smith Island. Since the decimation of the oyster industry in recent decades, the watermen of Smith Island have become more dependent on the blue crab. SAV beds are necessary for crab reproduction, as well as other commercially important species of fish.

**Table 3.1**

**Smith Island and Vicinity**
**Submerged Aquatic Vegetation Acreage**

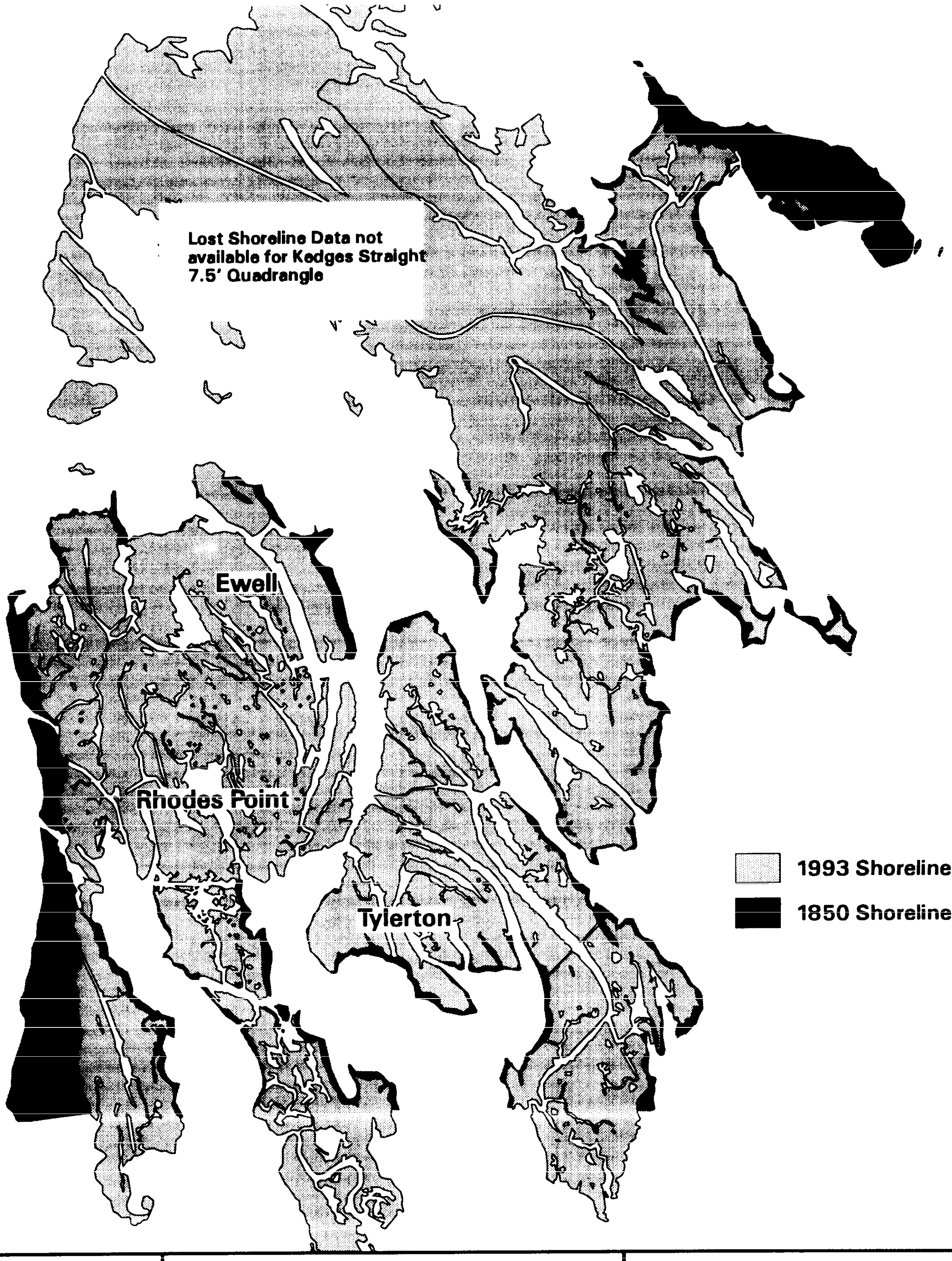
| | TIER1[1] | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | % Reduction |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | tier 1 to 1995 |
| **Back Cove[2]** | 508 | 469 | 474 | 480 | 444 | 351 | 307 | 40% |
| **Big Thorofare** | 1427 | 1223 | 1348 | 1355 | 1342 | 1193 | 610 | 57% |
| **Fog Point Cove** | 82 | 70 | 66 | 98 | 89 | 31 | 42 | 49% |
| **Rhodes Point** | 337 | 286 | 341 | 333 | 336 | 54 | 27 | 92% |
| **Terrapin Sand Cove** | 1013 | 841 | 854 | 846 | 791 | 659 | 667 | 34% |
| **Tylerton** | 422 | 338 | 404 | 409 | 320 | 101 | 94 | 78% |
| | | | | | | | | |
| **Total** | 3789 | 3227 | 3487 | 3521 | 3322 | 2389 | 1747 | 52% |

[1] Tier I Coverage covers a period from 1971 to 1990

[2] Note: Regions are defined by boxes shown in Figure 3.1

### 3.2.2 Wetlands

Other than the towns of Ewell, Rhodes Point, and Tylerton, formerly used upland dredged material placement sites, and small vegetated hammocks, the entire island is estuarine emergent wetlands. These marsh areas are ecologically valuable not only for the habitat they provide for fish, birds, mammals, reptiles, and invertebrates, but also for their production and export of detritus (which is a valuable component of the aquatic food chain). Approximately two-thirds of the fishes considered most important commercially in the United States depend on estuaries and saltmarshes for nursery and spawning grounds. It has been estimated that Smith Island has lost over 3,000 acres of land (mostly wetlands) since 1850 (see Figure 3.2). This rate of erosion is continuing if not accelerating (projections of future erosion vary). The western shoreline of Smith Island experiences the greatest rate of erosion; some areas have historically eroded over 8 feet per year.




US Army Corps of Engineers
Baltimore District

Scale 1:48000

0mi 1mi

0km 1km 2km

**Figure 3.2**
**Historic Shoreline**

The erosion of wetlands is fundamental to most of the problems experienced on the island. The loss of wetlands endangers the towns, removes the protection of the SAV beds, adds to the sediment load in the water column that smothers SAV, and shoals the navigation channels.

### 3.2.3 Erosion

The populated areas of Smith Island are becoming more vulnerable as time goes on. The loss of protective wetlands is bringing the Bay closer to the residents' homes. Section 3.2.5 discusses storm damages to the towns. Aside from storm events, the daily tides and wave action are causing growing concern to the island's three small communities. In Rhodes Point, the county dock is in jeopardy and the marsh in front of the roadway is being lost at a rapid pace. In Tylerton, the shoreline has receded all the way back to the roadway. In some areas, the roadway has been damaged and the sanitary sewer under the road is threatened.

The population of Smith Island has been steadily decreasing over the last several decades and is now approximately half of its historic high of 800. This exodus is endangering the last Chesapeake Bay island culture in Maryland. One of the primary reasons for people moving off the island is the belief that in 20 to 50 years, there will be no habitable land left. The residents fear that their island will become like Holland Island, which was abandoned earlier this century. One structure remains on Holland Island. The church, houses, post office, and grave stones of a once-proud community have all succumbed to the Bay. The erosion rate and increased flooding on Smith Island has led to fear and flight. If young people continue to leave Smith Island for a promise of a better future, they will be taking the culture, tradition, and history with them. But if the islanders believe that they will be protected and that there is a future to be had, it is likely that many more will stay and continue their traditions.

### 3.2.4 Navigation

There are a number of federally maintained channels in the Smith Island vicinity (as outlined in Section 1). Most of these channels become shoaled fairly quickly and are routinely maintained on a 3 to 5 year cycle. The Sheep Pen Gut channel that runs from Rhodes Point to deep water in the Chesapeake Bay shoals much more quickly than other channels in the area. Local users say that after dredging, the channel shoals within a few months. Once this happens, the watermen must travel south from Rhodes Point toward Tylerton, north through Tyler Ditch to Ewell, and then out to the Bay through the Big Thorofare jetties adding 30 minutes each way to the watermen's trip.

The channels around Ewell have also been shoaling more frequently in recent years. This is likely due to the breaches that have formed along the western shoreline of the Martin Wildlife Refuge and the degradation of the jetties. In recent years, the dredged material has been used in beneficial ways such as protecting Hog Neck. To handle material from future dredge cycles a placement strategy is required.

### 3.2.5 Storm Damages

All three of the towns on Smith Island are extremely low in elevation and are vulnerable to storm damages. Tylerton, at the southern end, experiences flooding during monthly high tides. Storm surge and wave action have caused damages to the foundations of structures and roads in Tylerton. Ewell and Rhodes Point have experienced similar damages during storms. Over time, these damages will become more severe, especially in Rhodes Point, where the rapid pace of erosion will exacerbate the vulnerability of the community to storm surges and wave attack.

Storm damages also occur to natural resources in the area. Much of the loss of approximately 3,000 acres of wetlands over the last century and a half has been caused by normal daily currents, wave action, and sea-level rise. Damaging storm events, however, have also contributed to the dramatic losses. The current hazards to interior SAV beds and population centers make the protective wetlands and their degrading condition a much more critical issue. In the summer of 1996, Hurricane Fran caused significant erosion on the southwest shoreline of Smith Island. Had this damage occurred on the shoreline north of Swan Island, it is likely that hundreds of acres of SAV would have been lost. If the storm had hit from the southeast, Tylerton could have sustained tremendous damage. The loss of wetlands, SAV, property, and (potentially) human life due to storm events helps to signify the importance of reinforcing sensitive shoreline areas.

## 3.3 PROBLEMS IDENTIFIED FOR FURTHER STUDY

During the reconnaissance study, four specific problem areas were chosen for further, more detailed study. These areas were chosen due to their need for improvement or potential for tremendous benefit. Other problems surfaced throughout the study and are mentioned in this report. Many of these problems will be reconsidered during further phases of study.

### 3.3.1 Rhodes Point

The Smith Island Feasibility Report of 1981 recommended construction of a jetty and off-shore breakwaters to protect Hog Neck, to the west of Rhodes Point. This project would have offered storm damage protection to the town and shoaling protection to the Sheep Pen Gut Channel; it also would have prevented worsening erosion in the area. Due to the lack of non-Federal funding, the project was not implemented. During maintenance dredging in 1995 and 1997, however, material removed from the entrance to the Sheep Pen Gut channel has been used with geotextile tubes to provide protection for Hog Neck and to create wetlands (see Figure 3.3). The results have been encouraging.

The geotextile tubes have been effective in preventing erosion along parts of Hog Neck. Although other parts of Hog Neck are still in need of protection, the entrance to Sheep Pen Gut is eroding rapidly and is in immediate need of protection. The erosion allows swift currents to pass through Sheep Pen Gut and erode the Rhodes Point shoreline (see Figure 3.3) thereby endangering the local church, road, utilities, bulkheads, county dock, and private piers. Further south along the Rhodes Point shoreline, deposition of this eroded material is a problem, with many boats no longer able to dock as close to shore as prior to sedimentation of the area. The rapid erosion at the mouth of Sheep Pen Gut also means loss of wetland habitat along the banks of the gut and higher wave energy in formerly calm waters south of Rhodes Point. This results in higher rates of sedimentation and SAV loss. In addition, the channel through Sheep Pen Gut shoals within 3 to 5 months after dredging. Protection of the entrance of the gut together with a jetty or jetties would provide substantial navigation benefits.

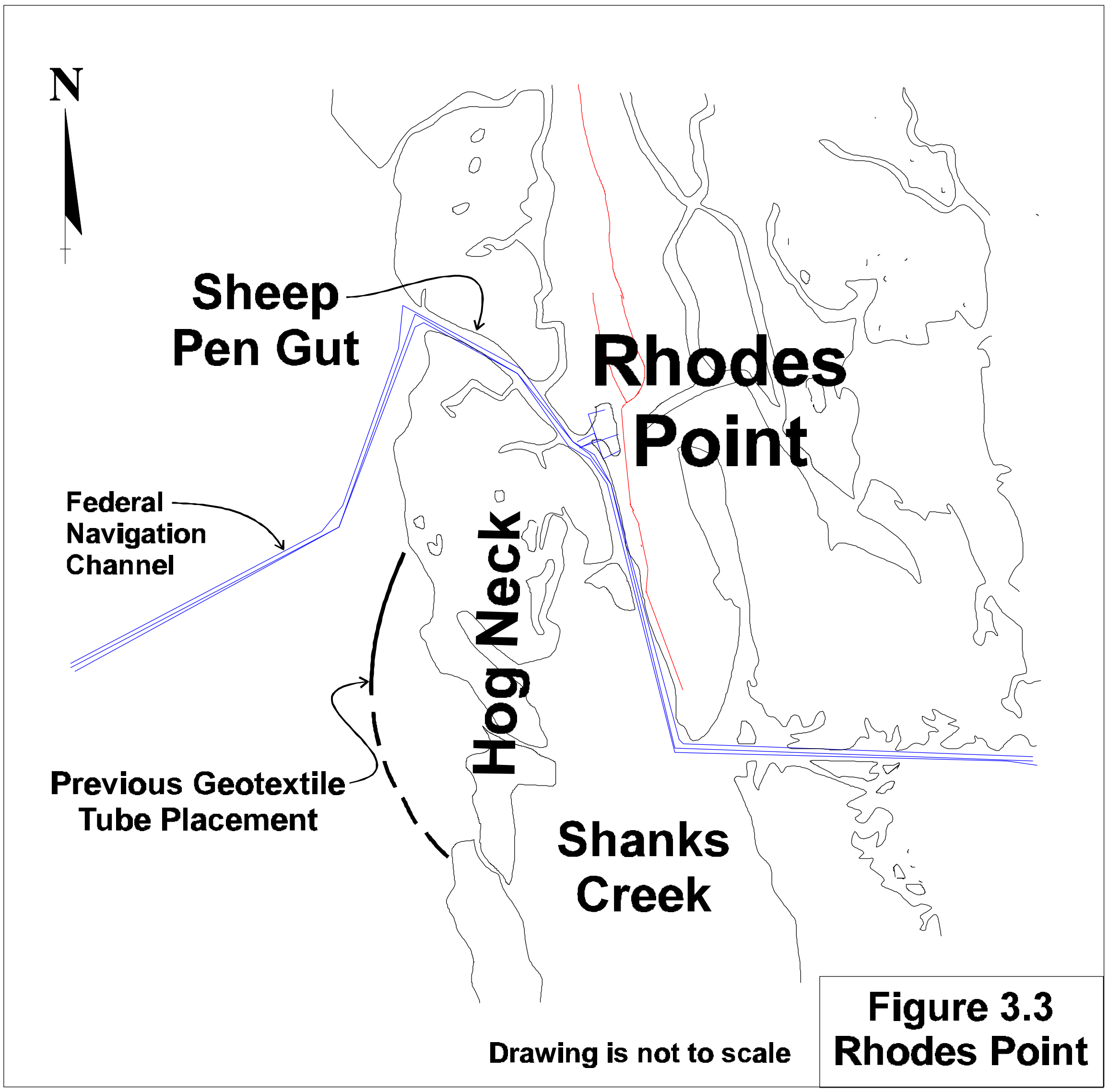



Figure 3.3
Rhodes Point

### 3.3.2 Tylerton

Tylerton experiences frequent flooding and damage from storm events. Due to the low elevation of the land, erosion of the shoreline, loss of protective islands to the south, and the degradation of the protective bulkheading, flooding problems are occurring with increasing frequency. The exposed areas of shoreline are subject to frequent storm wave attack. The western side of Tylerton is experiencing erosion problems that threaten the shoreline road, houses, and utilities, including the sanitary pumping station (see Figure 3.4). Likely solutions include bulkheading, a revetment, or geotextile tube protection. As part of a flooding and erosion protection project, construction of a breakwater at the south end of Tylerton would reduce wave energy and the resulting erosion and allow wetlands and SAV to become re-established in the area.

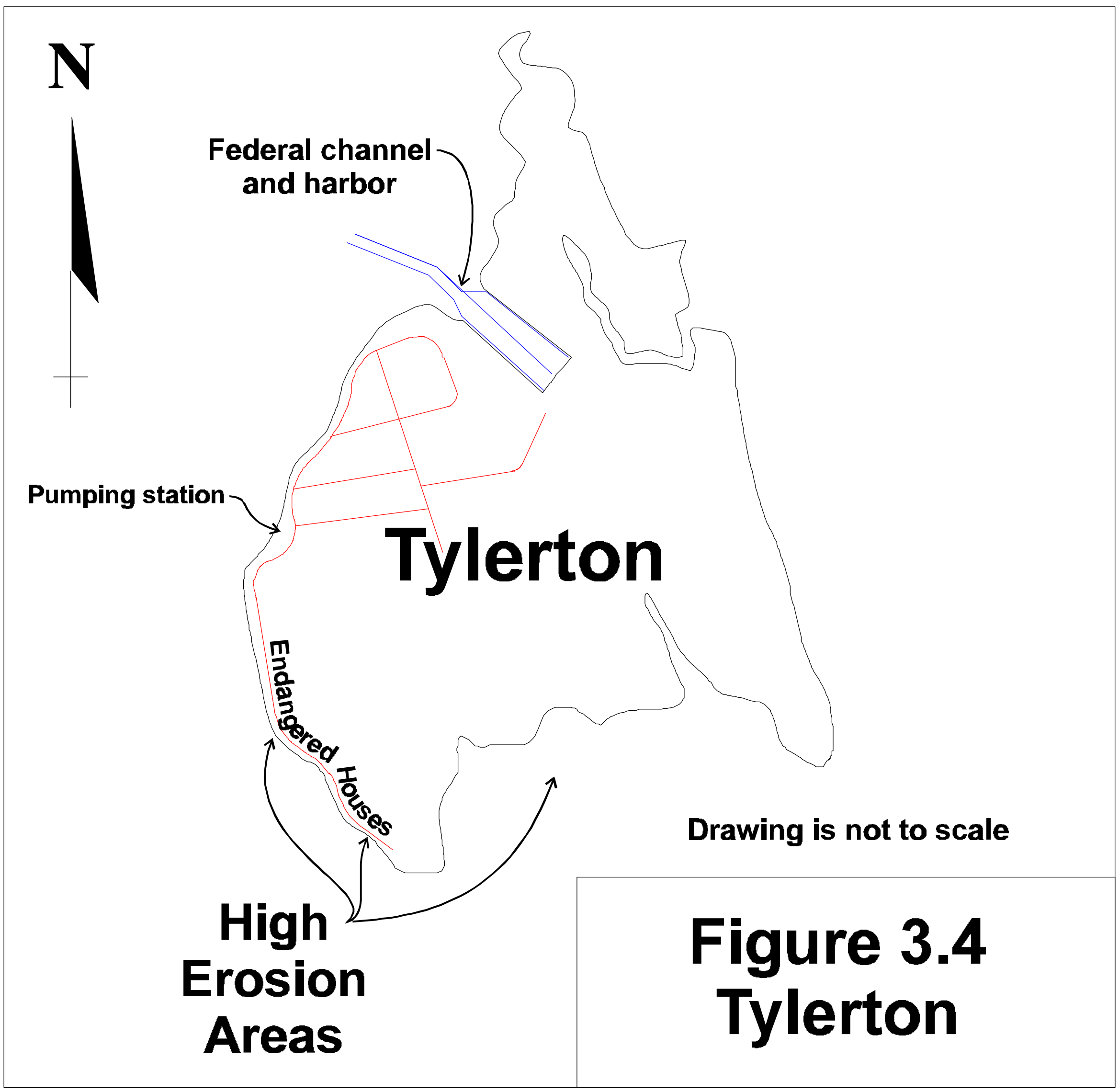



**Figure 3.4 Tylerton**

### 3.3.3 Environmental Restoration / Breach Repair - Ewell

Island residents are very concerned about the gap between Swan Island (formerly Swan Point) and the mainland of the Martin Wildlife Refuge, and about several other breaches along the western shoreline of the refuge (see Figure 3.5). These breaches allow sediment to pass into the low energy areas of Big Thorofare, smothering the SAV beds and causing shoaling in the Federal channel. The openings or gaps have also increased wave energy in the area, which also harms SAV beds and contributes to storm damage and erosion on the north shoreline of Ewell. These gaps could be closed by placing geotextile tubes or stone. In addition, the western shoreline landmass could be expanded to a historical footprint, to recreate lost wetlands or uplands, during future dredging cycles using dredged material. As part of this landmass re-establishment, or in lieu of it, and in the interest of a better, more permanent solution to the problem of the breaches, a breakwater or series of breakwaters could be placed to protect the western shoreline of the refuge.

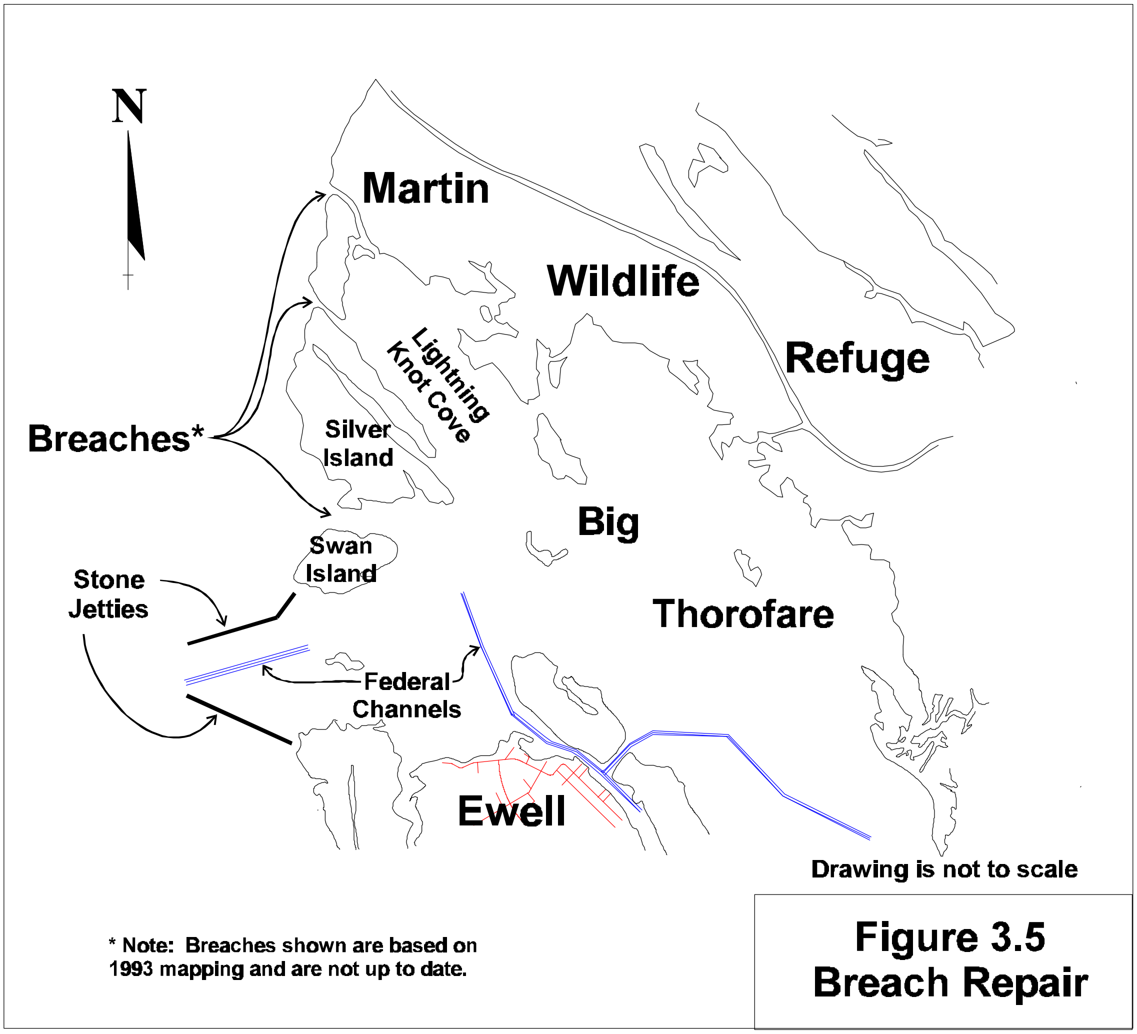



**Figure 3.5**
**Breach Repair**

### 3.3.4 Habitat Protection/Restoration - Coves

In recent years, there has been a noticeable decline in the amount of SAV in the study area (see Figure 3.1). SAV is extremely important to the environment and to the economy of the area since crabs and many species of fish use SAV beds for reproduction and habitat. Areas within Big Thorofare, Shanks Creek, Tyler Creek, and the Martin Wildlife Refuge have all experienced significant declines in SAV. Projects designed to address the problems (as discussed above for Tylerton and Rhodes Point) would likely help to reestablish SAV in Tyler Creek and Shanks Creek. There is also an opportunity to reestablish SAV in Big Thorofare. On the north and east shorelines of the island are several coves that have historically provided many acres of protected shallow water. The coves, located within the part of the island that is owned by the USFWS and managed as the Martin Wildlife Refuge, are in various states of degradation. These coves continue to provide good habitat, however, as the spit of land that protects each cove is eroded there has been a trend toward a reduction in the amount of SAV in the cove. It is likely that as the enclosed, quiescent water within the cove becomes high-energy open water, negative impacts to SAV will occur. Direct impacts include physical damage to the plant by the force of the wave energy, disruption of the sediment in which the plant is rooted, and movement of seeds to an area unfavorable to plant establishment. Indirect impacts that are not conducive to SAV growth may include the effects of resuspended sediments, such as reducing the amount of light the plants receive. It is envisioned that a breakwater structure could be used to protect or restore existing spits of land or to act as artificial ones.

## 3.4 EFFECTS OF PRIOR CORPS PROJECTS

Prior navigation projects have been constructed by the Corps in Smith Island waterways. As discussed in Section 1 and shown in Figure 1.2, there are a number of federal channels in the area as well as a work boat basin at each town. Jetties were constructed at the western entrance to Big Thorofare. Construction and maintenance of these projects necessitated upland placement of dredged material. This upland placement has converted 51 acres of wetland habitat to uplands. Construction of the work boat basins included dredging a total of approximately 3.5 more acres of wetlands. Mitigation should be considered as part of any future Corps project on Smith Island.

Construction of the navigation channels has also resulted in a loss of shallow water habitat. However, had the channels not been dredged, it is likely that enough boat traffic would still occur along the same general alignments as to cause similar impacts (by “prop dredging”). According to Smith Island residents, the alignment of the Sheep Pen Gut channel cuts through a natural shoal. This information is supported by old aerial photographs showing that the channel cuts through an area that was upland less than 40 years ago. The alignment of the dredged channel may be partially responsible for the rapid shoaling and the increased erosion at the mouth of Sheep Pen Gut. The erosion problems in the immediate vicinity of Swan Island and the southern jetty tie-in at Pitchcroft are likely exacerbated by the Thorofare channel jetties.

The Corps activities on Smith Island have, in fact, been of great benefit to navigation. The harbor areas and channels are heavily used. The jetties have been effective in the past and are scheduled for maintenance in the near future. Even the placement of dredged material on the wetlands has been of considerable benefit, providing vegetated upland sites which are heavily used as rookeries by many species of birds (see Section 2.4). There is an opportunity to further investigate maximizing the benefits of these uplands.

# Section 4

# Plan Formulation

This section documents the process by which the study team identified potential project alternatives. Once the alternatives were selected, the plans were presented to the Smith Island residents for their approval. The plans were then analyzed, costs were estimated and designs were prepared. The benefits of each project alternative were analyzed to determine Federal interest.

## 4.1 FEDERAL OBJECTIVE

The Federal objective of water and related land resources planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes and applicable executive orders, and to other Federal planning requirements. Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct benefits that accrue to the planning area and to the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and those that may not be marketed.

Because benefits of fish and wildlife habitat restoration and creation are not amenable to traditional NED benefits analyses, other criteria are used to define the Federal objective for such projects. The relevant criteria dictates that project outputs be primarily for the benefit of fish and wildlife habitat. Incremental analysis techniques should be used to optimize return on investment. The return defined in habitat outputs will be documented with qualitative and quantitative procedures such as the Habitat Evaluation Procedure (HEP).

In the particular case of Smith Island, the cultural and historical significance of the human population must be considered in all phases of study. Project alternatives must be appropriate to the island and the way of life. The lives of the island residents are so closely tied to the well-being of the Bay, its fish, and its wildlife, that it is imperative to consider all of those as an ecosystem.

Generally, several alternative plans are formulated to address a particular set of problems or opportunities. The goal of the reconnaissance phase was not to optimize the project alternatives, define the NED plan, or conduct a HEP analysis. The goal of the reconnaissance phase is to formulate plans which would contribute to these objectives.

Optimization for NED or other purposes will be accomplished during the subsequent feasibility phase.

## 4.2 STUDY OBJECTIVES

The study objectives as they pertain to the identification and formulation of project alternatives are defined in Sections 4.3 and 4.4. There are also a number of objectives particular to Smith Island and to the way in which this study was conducted. Due to the unique culture, the history of governmental dealings with the islanders, and the environmental interest in this study, the following objectives were defined:

The study process must- -

1. Be respectful of the environment. The island wetlands surrounded by the Bay and Tangier Sound compose a singular, watery world.

2. Maintain the quality and diversity of the natural and cultural environments.

3. Develop solutions that are appropriate to the scale of the island.

4. Respect the uniqueness of the island. It is important not to force the island into a "mainland mode."

5. Support the living culture of the island.

6. Aim to reestablish and maintain a healthy population of fish and wildlife, including oysters and crabs, and the natural resource based economy.

7. Foster cooperation among island residents and between islanders and government agencies.

8. Expand, rather than limit, natural resources available to the watermen.

9. Identify appropriate new economic opportunities.

## 4.3 PLANNING OBJECTIVES AND CONSTRAINTS

Planning objectives and constraints are expressions of public and professional concerns about the use of water and land resources in a particular study area. These planning objectives and constraints result from the analyses of existing and future conditions within the context of the physical, environmental, economic, and social characteristics of the study area. They are used to guide the formulation of alternative plans and to evaluate the effectiveness of those plans. Using these guidelines, with sensitivity to the special needs and circumstances of the island, and applying them to the House of Representatives resolution that authorized this study, the study team developed the following objectives and constraints:

1. Select alternatives that will help maintain the Smith Island way of life.

2. Maximize environmental restoration and habitat creation opportunities.

3. Provide safe and efficient navigation.

4. Be sensitive to local opinions and suggestions, select alternatives that are appropriate to the island.

5. Provide protection from erosion and storm damage to the populated areas of the island.

6. Provide opportunities for the beneficial use of dredged material.

## 4.4 PLAN FORMULATION RATIONALE AND CRITERIA

The formulation process used to develop and evaluate alternative plans is based on the consideration of measures with the potential for addressing the planning objectives and meeting technical, environmental, and socioeconomic criteria. Specific improvement plans were selected and analyzed based on the measure and scale most likely to demonstrate that a feasible plan of improvement exists.

The far-ranging problems identified on Smith Island present far-ranging opportunities as well. Within the purview of the authorization, this study allowed for analysis of navigation, flood control, erosion control, environmental restoration, wetlands protection, and other purposes. It was determined early on in the study process, that oftentimes projects that benefit the environment also directly benefited the Smith Island human population, and vice versa. It is this close interrelation of mankind and nature that adds confidence to the value of the recommended projects.

In addition to the environmental and cultural criteria that was the essence of this study, the following technical criteria were also employed:

1. Each alternative is designed as a complete and separable project. This criteria allows for better analysis of each alternative as to its individual

merits, and also allows for possible implementation of the projects at different times and under different construction authorities.

2. Analyses of benefits and costs will be conducted in accordance with Corps of Engineers procedures. Each plan must be complete, efficient, safe, and feasible in terms of current prices and economic or environmental benefit.

3. Designs and layout of alternatives will be coordinated with the residents of Smith Island and interested local, state, and Federal agencies, as well as select private groups.

4. Dredged material will be beneficially used wherever possible.

5. Projects will be designed to be appropriate in purpose and cost to the needs of the island and the desires of its citizens.

## 4.5 PUBLIC INPUT

Public input into the plan formulation process was extensive and critical. In fact, all of the problems addressed by the plan alternatives were identified by the public during the Corps' extensive public involvement process. This process included meetings with the Smith Island residents in each town on several occasions, meetings with interested agencies and with local and state governments, literature searches, and trips to the island. This extensive process is detailed in Appendix E - Public Involvement and Agency Coordination, and is also discussed in Section 3.1. Once the plans were identified, they were presented to the residents and to high-level state and Federal government representatives. The reactions from all interested publics were positive.

## 4.6 ALTERNATIVE PLANS

This section discusses project ideas and concepts for the major project areas. For a explanation of the different structures and engineering practices mentioned, please refer to Appendix C-1.

### 4.6.1 Rhodes Point

The Hog Neck barrier island to the west of Rhodes Point help shelter the community from the damaging effects of storms and on the Chesapeake Bay. The Bay shoreline of Hog Neck directly to the west of Rhodes Point is being stabilized with the use of geotextile tubes as part of an ongoing maintenance of the Sheep Pen Gut channel. The tubes seem to be providing adequate protection in the area. Analysis conducted during the study shows that the southern point of the mouth of Sheep Pen Gut and the shoreline south of the gut are eroding at a rate of 8 feet per year thereby allowing high energy wave climates and sediment to pass between Hog Neck and Rhodes Point. Stabilization of the southern shoreline should cut down on the sediment load that has been smothering the SAV south of Rhodes Point. In addition, stabilization of this shoreline will ensure that the Hog's Neck Barrier Island continues to afford protection to Rhodes Point, thereby reducing potential for future damage and creating more quiescent conditions in the SAV beds. In addition, the Federal channel from Rhodes Point through Sheep Pen Gut shoals rapidly after dredging. For these reasons, several plans were considered to protect the mouth of Sheep Pen Gut.

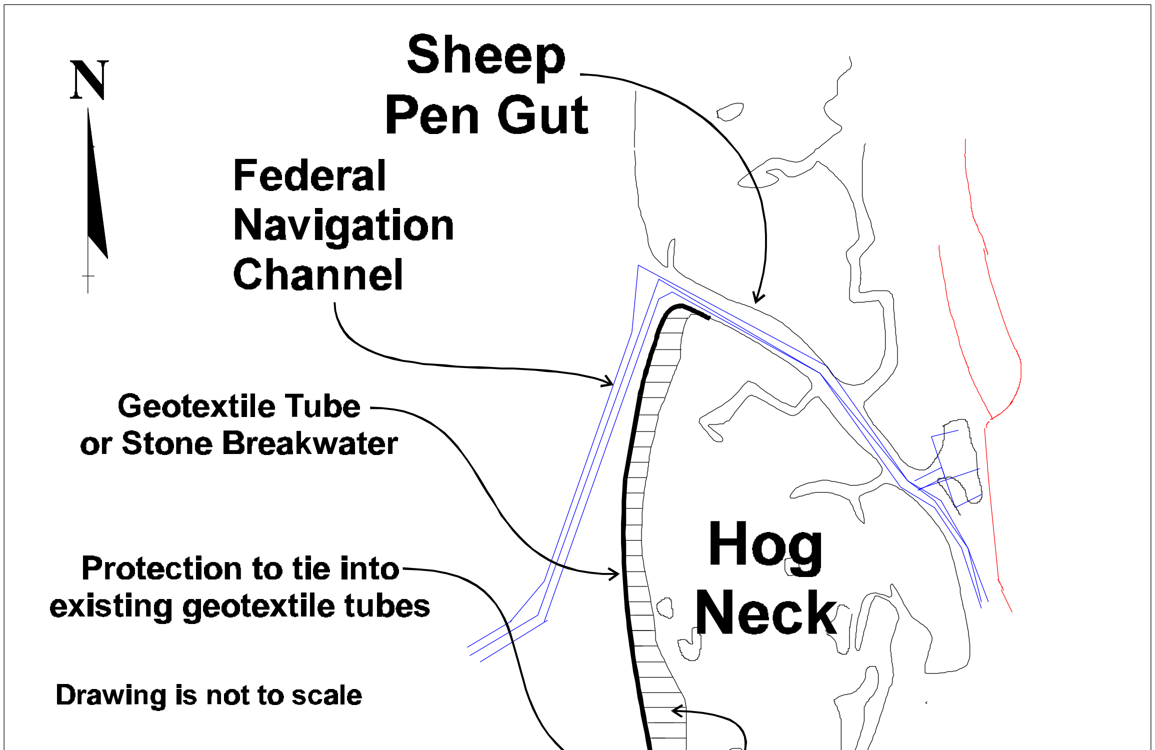
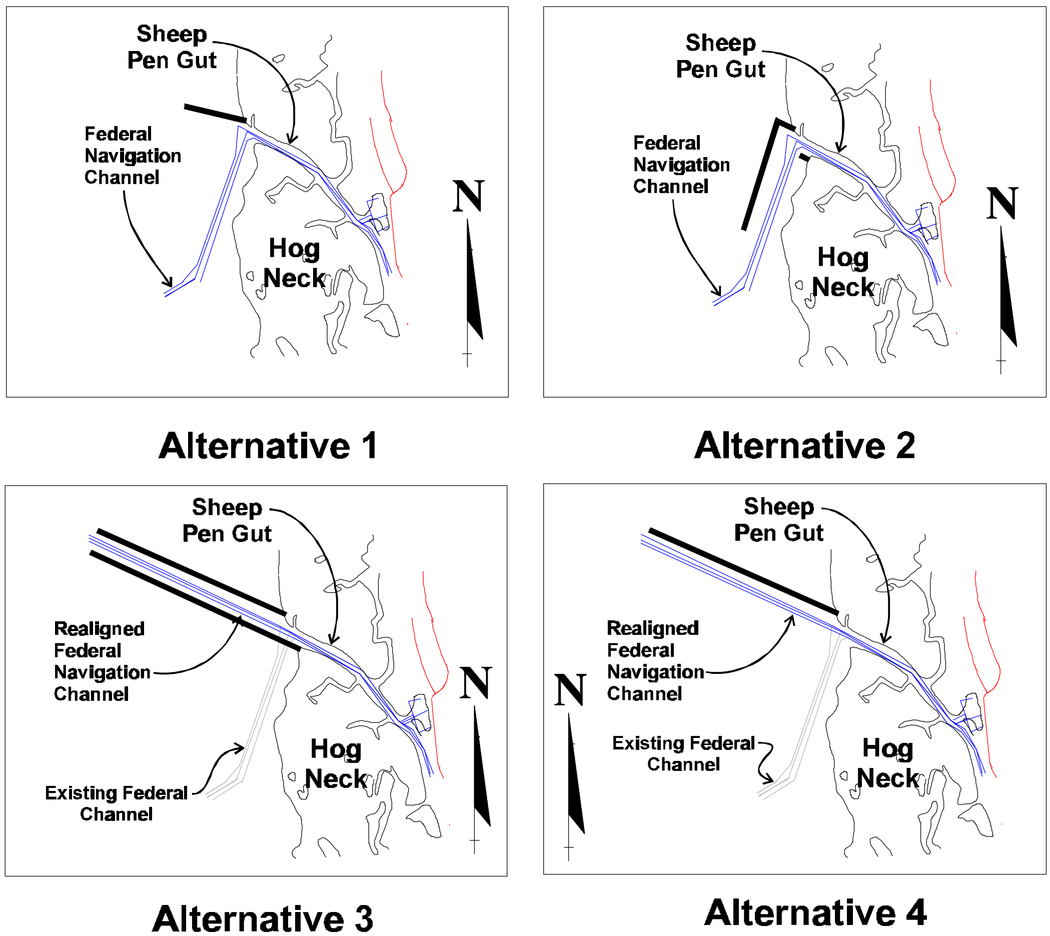



**Figure 4.1**
**Shoreline Stabilization**

4.6.1.a <u>Shoreline Stabilization</u>. Two plans have been developed to place a structure against the shoreline at the mouth of the gut. The first involves placing a continuous rubble mound structure with crest elevation +3 feet MLLW offshore. The area between the structure and MHW of the land would be filled to with dredged material and planted with wetland vegetation. The second shoreline armoring plan is to place continuous 45-foot circumference geotextile tubing offshore to attain a crest elevation of +3 feet MLLW. Again, the area between the tube and MHW of Hog Neck would be filled with dredged material and planted with wetland vegetation. Either of these plans would create 15 acres of wetlands, would stabilize the southern shoreline of Sheep Pen Gut, and tie into the existing tubes along Hog Neck (Figure 4.1). The reduced erosion afforded by either of these alternatives should cut down on the sediment load that has been smothering the SAV south of Rhodes Point. The decreased wave energy anticipated due to a reduced "funnel action" at the mouth would cut down on the damage to Rhodes Point and would help to create more quiescent conditions in the SAV beds.




**Drawings are not to scale**

**Figure 4.2
Jetty Alternatives
Rhodes Point**

4.6.1.b Single Jetty. A single stone jetty placed to the north of Sheep Pen Gut, in conjunction with one of the shoreline plans described above, would offer greater protection to the mouth of Sheep Pen Gut (see Figure 4.2, Alternatives 1 and 4). A jetty would also reduce the erosion rate north of the mouth, and would provide protection against shoaling in the Federal channel. Two single-jetty plans were formulated. The first includes a 600-foot jetty with a crest elevation of +3 feet MLLW protruding perpendicularly from the shoreline. The second plan consists of realigning the channel to extend from the mouth of Sheep Pen Gut directly to deep water, without the current bends. The jetty would be 3,000 feet in length and have a crest elevation of +3 feet MLLW.

4.6.1.c Twin Jetties. Two stone jetties, one placed north of the mouth and one south would provide even greater benefits than the previously discussed plans (see Figure 4.2, Alternatives 2 and 3). The two jetties would create a new mouth for the gut that would be narrow and non-erosive. The southern jetty would prevent shoaling from the south as well as offering protection from southerly storms. The first alternative includes a 400-foot southern jetty which goes from the shoreline to the bend in the channel, and a longer (1,400-foot) northern jetty that follows the path of the channel. The second alternative includes realigning the channel so that it goes straight from the mouth of the gut to deep water in the Bay. Two 3,000-foot jetties would protect the mouth and the channel from either side.

### 4.6.2 Tylerton

Previously calculated estimates indicate that the shoreline along the southern end of Tylerton is experiencing an erosion rate of about 1-foot per year. The shoreline along the southern part of Tylerton is at the road. Monthly high tides and storms cause flooding of the road. The remainder of the shoreline, to the west, is bulkheaded, and, therefore, it was not thought that erosion was a problem there. The bulkheading, however, is generally in disrepair and in need of replacement. Plans for protecting the shoreline areas of Tylerton were analyzed (Figure 4.3).

4.6.2.a Western Shoreline. This plan includes 2,200 feet of protection placed along the western shoreline of Tylerton. Revetment and wooden bulkheading were considered. Stone is usually preferred due to environmental and cost advantages over bulkheading. Bulkheading has only a slightly lower first cost of construction than stone revetment, yet its anticipated life is much shorter. In addition, bulkheading is detrimental to shallow water habitat due to scour caused by wave action against the structure. A plan for a geotextile tube placed along the shoreline was also considered but was eliminated due to the difficulty of placement given the number of piers and other obstructions, the potential for damage in a high-use area, and the inconvenience that such a large barrier would cause to the citizens of Tylerton.

4.6.2.b Southern Shoreline. The construction of a series of segmented breakwaters to the south was considered. The breakwaters would be 100 feet in length, would have a crest elevation of +3 feet MLLW, and would be separated by gaps of 100 feet. The breakwaters could be constructed of stone or geotextile tubes.

### 4.6.3 Ewell

Through public coordination efforts with the residents of Ewell, it was determined that the most pressing need in the area was to repair the breaches along the western shoreline of the Martin Wildlife Refuge (see Figure 4.4). Residents from Ewell and representatives from USFWS agree that these breaches are causing, or at least exacerbating, the loss of SAV in Big Thorofare and causing increased rates of shoaling in the Federal channels in the area. The increased wave action is becoming a hazard to navigation as well as causing increased rates of erosion to portions of Ewell.

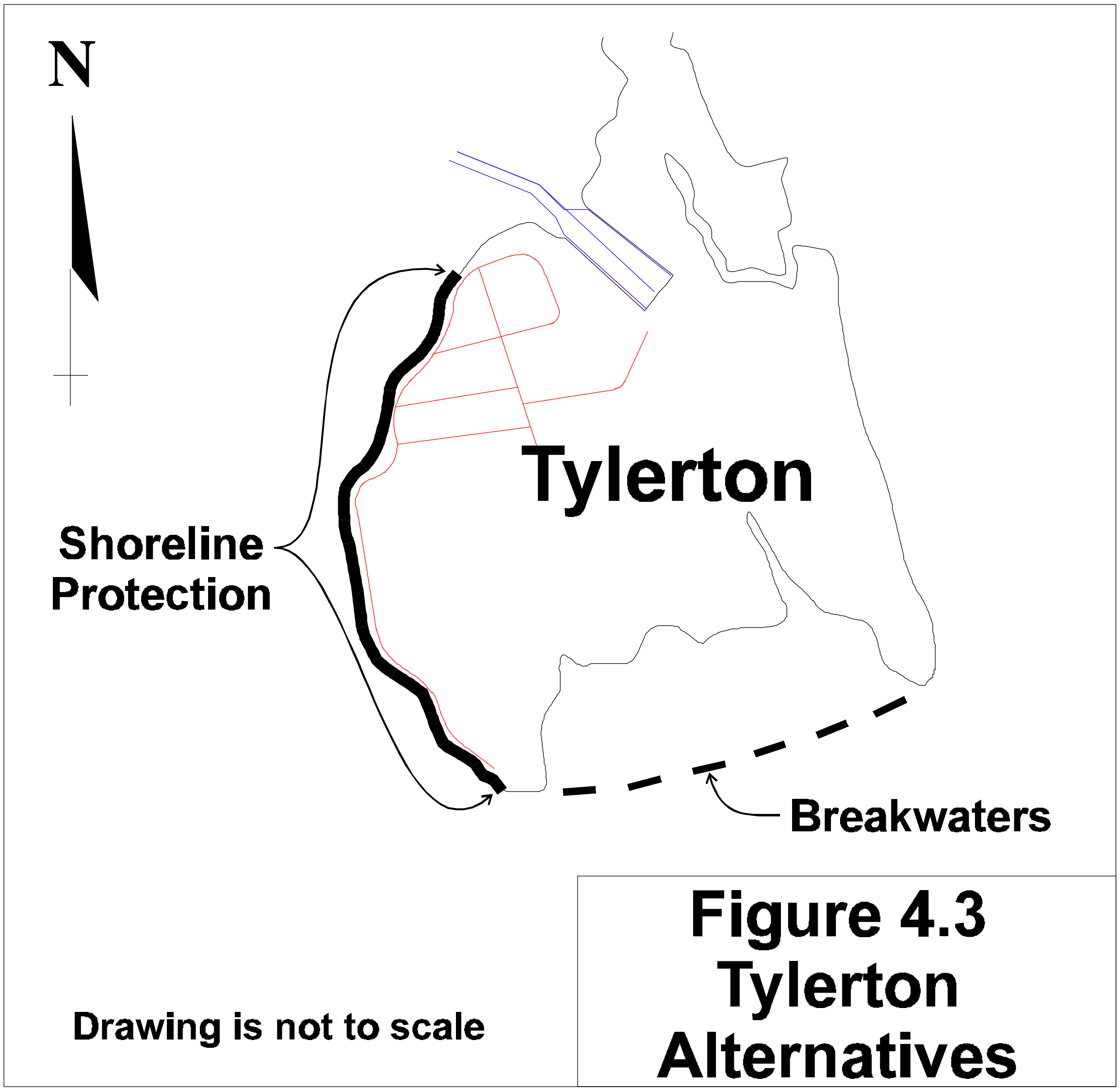



**Figure 4.3**
**Tylerton**
**Alternatives**

One alternative developed to repair the breaches includes placing geotextile tubes to the outside (Bayside) and inside (Big Thorofare side) of the breach and filling in between with dredged material. The created land would then be planted with wetland vegetation. Another plan involves the construction of offshore segmented breakwaters. These breakwaters would be made of stone or geotextile tubes. Alternative plans were considered to protect only the southern end of the peninsula and to protect the entire length of the peninsula. It is likely that the breach repair and segmented breakwaters will both be required to accrue the maximum benefits over the project life.

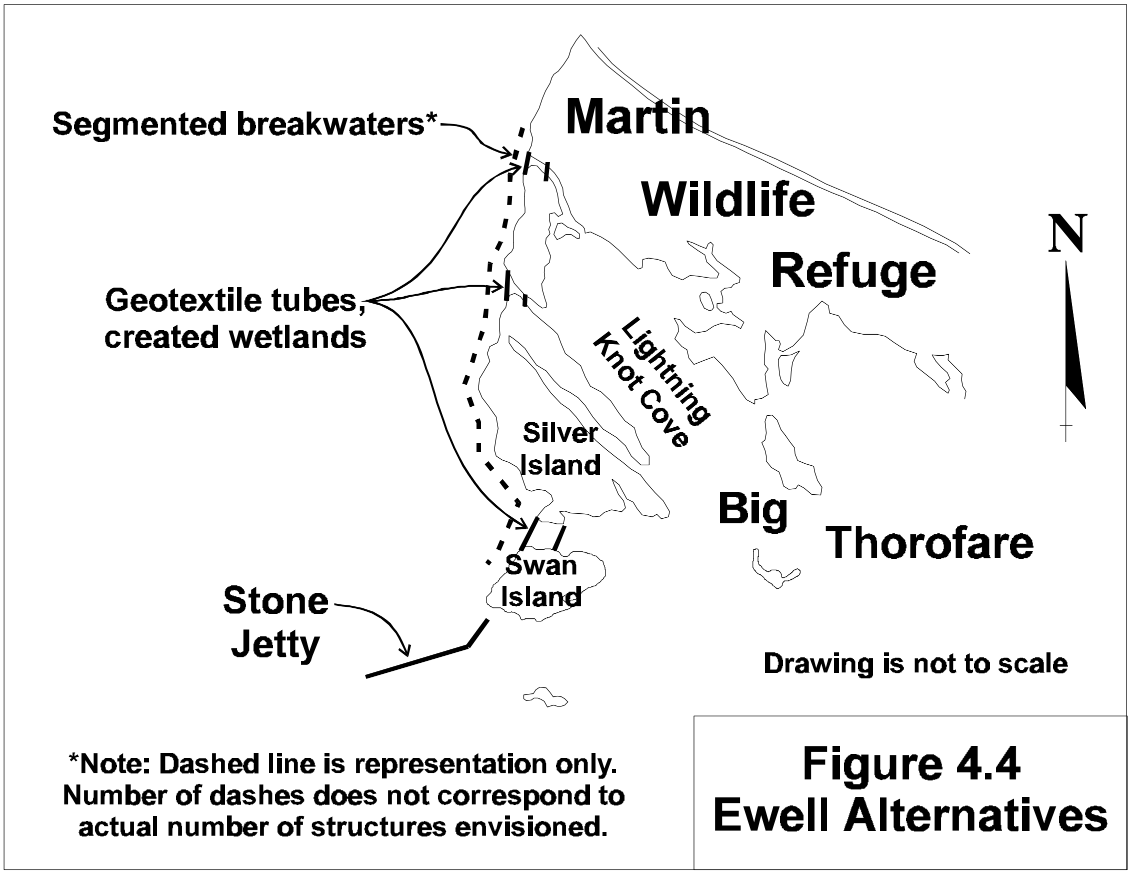
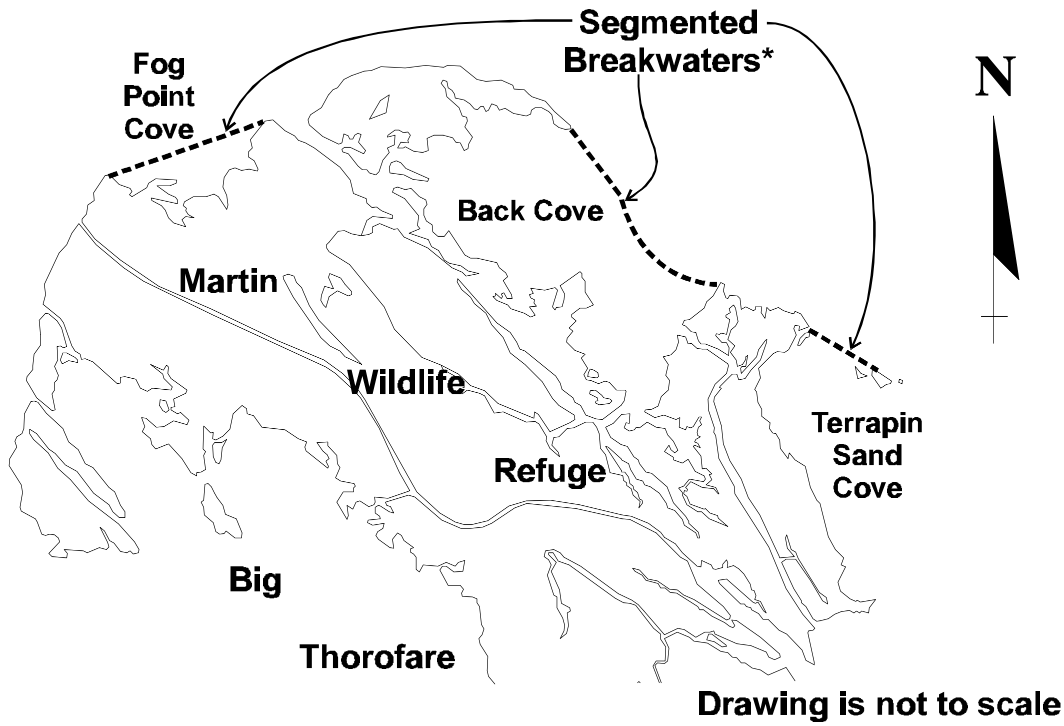



**Figure 4.4**
**Ewell Alternatives**

### 4.6.4 Martin Wildlife Refuge

As discussed in the previous section, the coves along the north and east shorelines of the Martin Wildlife Refuge are in various states of degradation. Although the coves are still very productive, they have lost habitat value recently and are in danger of further degradation. Fog Point Cove, Back Cove, and Terrapin Sand Cove have all shown a decrease in SAV since the early 1990’s. Although there are other coves that could potentially be repaired, these three have been chosen due to their continued ecological value and uncertain future. If the projects for these coves are successful, then other less productive, more degraded, coves could be formed along other shorelines in the area. The restoration of the three coves is considered as one plan. The coves would be reformed using armor stone breakwaters to protect them from the open water (see Figure 4.5). The breakwaters would be 100 feet in length and would be segmented with 100-foot gaps in between. The other alternative involves the same strategy using geotextile tubes.




*** Note: Dashed lines represent approximate position of breakwaters only. Number of dashes does not correlate to number of structures.**

**Figure 4.5 Cove Plans**

## 4.7 OTHER PROBLEMS AND OPPORTUNITIES

The following issues were brought to the attention of the study team but were not analyzed in depth during the reconnaissance study. Due to the scope of a reconnaissance study and the need to rely on available information, the larger, more immediate concerns were addressed more completely, and recommendations were made. These other issues not fully developed during the reconnaissance phase are potentially within Federal jurisdiction and in the Federal interest. Due to the lack of detailed study or background information, **the following are not recommendations**, rather, preliminary problem identification and discussion.

1. <u>Sanitary Sewerage</u> - Removing the sanitary facility in Tylerton due to extremely low flows has been discussed by local agencies. Nontraditional solutions could be considered and studied. The sludge from the sanitary facility that serves Rhodes Point and Ewell is dried and burned at the incinerator. It is then shipped to Crisfield and placed in an upland dump. Perhaps it would be more beneficial to use the sludge mixed with sand on the island.

2. Aquaculture - For the past few decades, oyster harvests have plummeted to all-time lows. Over-harvesting, pollution, and disease have resulted in near decimation of the oyster population in the Chesapeake Bay. For many years, oysters were not only the economic mainstay of the islanders, but also a tremendous benefit to the overall health of the Bay. The Corps has experienced some success in creating active oyster bars, and this activity could be expanded. Due to the scarcity of oysters, it may be wise for the islanders to become involved in a program of aquaculture, or oyster farming. Spat from the existing facility on Deal Island, or from a new facility that could be constructed on Smith Island, could be planted on local bars or raised in an upland facility. The juvenile oysters could then be raised to market-size in low-disease areas further north in the Bay or elsewhere. This type of aquaculture would be beneficial to the economy of Smith Island as well as to the health of the Bay. An unsuccessful attempt at aquaculture in the past should be reviewed to identify changes that could result in success. Aquaculture of other species should also be considered.

3. Spray on Marsh - Due to the threat of continuing erosion and sea-level rise, the future health of the island is contingent on the addition of land mass, not just its maintenance. A concept that is gaining popularity is marsh spraying. This action involves placing a thin layer of dredged material on top of wetlands. Placement in wetlands has rightly been taboo for many years, but a layer on the order of less than an inch would not harm the wetland ecosystem and would allow the wetlands to maintain an elevation above the rising MLLW.

4. Official DMMP - It will be an objective of the feasibility study to lay out a dredged material management plan (DMMP) for the future maintenance of the Federal channels. To lay out the future placement of dredged material will require a catalogue of possible placement sites. Identification of erosive areas and plan alternatives can be ranked for future maintenance cycles. The DMMP should consider uses such as oyster bar and SAV bed creation, and wetland spraying, as discussed above. For example, a prime DMMP project would be creation of artificial islands to protect the area south of Tylerton for SAV recolonization.

5. Creating and Improving Upland Areas - Material from maintenance dredging was at one time placed upland in contained facilities. There is some desire to restore these areas to wetlands and to use the material to construct additional wetlands, oyster bars, SAV beds, or other habitat. These new upland areas are also very popular with the local residents for recreation areas (such as the baseball field in Tylerton), and with migrating waterfowl as roosting areas. These areas may also be useful for construction of hatcheries or oyster farming establishments. Since upland is so rare on Smith Island, these former placement sites should be viewed as assets and studied to determine the best use for them. Representatives of USFWS have suggested a program of phragmites control and vegetation

planting that could be accomplished on these sites to improve their value as rookeries.

6. Further Definition of Erosive Areas - Since the reconnaissance study relied on existing information and anecdotal data, it can not be considered a comprehensive review of all of the island's erosion problems. This analysis would likely go hand-in-hand with the establishment of an official DMMP.

## 4.8 PROBLEMS AND OPPORTUNITIES FOR NON-FEDERAL INTERESTS

The following list is not meant to be comprehensive, nor has each item been studied to the point of making absolute recommendations. These problems and plans are presented to more fully document the concerns of the island residents and other interested parties. Some of these items may be revisited during further study; however, it is not likely that the Federal government could participate in the solutions, due to the nature of the problems. It is hoped that readers of this report who represent other public or private organizations may be able to aid in a solution to these problems, thereby affecting positive change to the island.

1. Tourism/Eco-Tourism - The residents of Tylerton are currently working on a plan to promote tourism in their town. Additional money will be required to fully implement their plan. Wildlife tours and birdwatching are promising alternatives if the USFWS would grant permission to the residents to guide tourists through the refuge. A state park with camping facilities could be established on the island. Bed and breakfasts are becoming more popular on the island. Another one is opening in Tylerton in May.

2. Schools - There is no high school or middle school on the island, and daily travel by school boat to Crisfield is sometimes difficult. Last year's closing of the Tylerton elementary school meant that the state's last one-room schoolhouse was closed and that the Tylerton students would have to travel to Ewell each day for class. The residents of Smith Island have had discussions with the county school district before these decisions were made. The islanders still cite the required travel to Crisfield as a major source of dissatisfaction. Some have moved to the mainland for this reason.

3. Ferry Service - If tourism is to flourish to the benefit of all of the island, the ferry service from Crisfield must be reliable and accessible. A schedule coordinated among the ferry captains serving the island could provide more frequent and reliable access. The local residents also cite the ferry service as a problem, and a major expense. Perhaps a system of special fares or monthly passes could be offered to the residents. Surely this is a supply and demand issue. If there were more tourism dollars available to the ferry operators, it is likely that they could, in turn, offer better rates or monthly passes to the residents of the island.

4. Business Possibilities - The recently opened crab-picking co-op in Tylerton represents a fledgling business with growth potential. The islanders could use help in marketing and distribution. Soft shell crabs, cakes, arts and crafts, and other hand-made items could be marketed not only to visitors to the island, but all over the state and beyond. Computer internet based business could flourish here. Agencies and businesses that study the Chesapeake Bay or sea life could set up offices on the island. Aquaculture, particularly of oysters, also holds promise.

5. Roadways - A recurring complaint of the islanders is the inadequacy of the roads. It is true that road work on the island is very costly, but it seems that many of the roads may not have been well constructed in the first place and, therefore, require constant maintenance. The roadways are not raised and frequently become impassable due to flooding. A raised roadway may also act as a levee and aid in flood control. During conversations with Somerset County government representatives, it became apparent that the lack of roadway funding within the county is to blame for the difficulty in maintaining the roadways.

6. Parking in Crisfield - The study team encountered this problem, and it was also identified by the islanders. When one wishes to visit Smith Island, parking in Crisfield is limited. Most areas are restricted to local business clientele. This is more than a slight inconvenience. Providing parking in Crisfield would also be a potential business opportunity.

7. Erosion at Entrance to Ewell - Traffic in the channel that leads through Goat Island from Big Thorofare to Ewell causes erosion on either side and allows more wave energy into Ewell. A structural solution is likely not in the Federal interest, but there should be a no wake zone in the area. Perhaps local effort could result in construction of a structural solution.

8. Limited Use Permission for the Martin Wildlife Refuge - Before Federal takeover of the refuge, the islanders used the area for hunting, “proging,” and fishing. The law now states that they are not allowed to use the land at all. Perhaps some sort of limited-use exemption could be allowed such as is granted to Native Americans throughout the country. The limited-use exemption could include guided tours as discussed in the Eco-tourism section above.

9. Mosquito Ditches in Tylerton - The residents of Tylerton have indicated that the mosquito ditches that were dug in the town are widening and becoming a threat to the houses. Apparently the ditches allow water to flood the town from the east. The problem has been worsening in recent years. During the course of the study, the study team identified state and county representatives with some jurisdiction over the ditches. It is hoped that these representatives along with the islanders can reach a solution amenable to both sides.

10. Emergency Helicopter Landing Pads - Since the only way for emergency medical care to reach the island is by helicopter, it is imperative that proper landing areas are available. Currently, the helicopters must oftentimes land on the roads, thereby blocking off all traffic. A raised area in each town should be constructed above flood levels for this necessary service.

# Section 5

# Plan Description and Evaluation

Alternative plans were formulated and evaluated for each of the major problem areas discussed in Section 4. The alternative plans considered in the reconnaissance study include the "Without Project" plan to determine the impact of not implementing any of the measures outlined in this study. Each plan can then be compared to the "Without Project" or "do nothing" plan to determine the plans benefits. For each area, plan and alternative considered, Table 5.1 presents the initial construction cost and the total implementation cost. The total implementation cost includes the initial construction plus the estimated design and construction management costs.

## 5.1 WITHOUT PROJECT PLAN

The without project plan represents the base from which all changes are measured. It is the most probable future condition without providing any of the alternative plans for environmental restoration and protection discussed later in this section. Much of the without project condition is obvious upon a cursory survey of the island. Thousands of years ago, Smith Island was part of a peninsula that encompassed Tangier Island to the south, South Marsh and Bloodsworth Islands to the north and formed the western shoreline of the Nanticoke River. Over time, as the water level rose and erosion continued, the peninsula turned into islands which in turn changed to wetlands and became uninhabitable. The majority of the land in the Smith Island complex is now marsh and is uninhabited outside of the three towns of Ewell, Rhodes Point and Tylerton.

It is expected that these trends will continue and could result in loss of the remaining Chesapeake Bay islands. Without some form of protective action, the future existence of Smith Island is questionable. The last remaining example of an early American fishing village culture in Maryland will be lost forever. In addition, the loss of land and shallow water habitat will be a significant environmental loss to the Chesapeake Bay.

### 5.1.1 Populated Areas, Social Setting

The towns of Ewell, Rhodes Point and Tylerton are protected to various degrees from erosion. Most of the protection is in the form of old, decaying bulkheading that is of limited value and erosion continues to threaten each town. Navigational problems such as the rapid shoaling of the Sheep Pen Gut channel, the channels in Big Thorofare and in Tyler Creek continue to worsen and the recent drop-off in SAV is of great concern. Navigation is extremely important to the islanders since the three communities currently utilize 150 fishing boats per work day in the vicinity of the island. Nearly 60 percent of the fleet are tong boats and 40 percent are scrapers or other crab boats; although 80 percent of the fleet is used for both purposes. It is likely that the island will continue to suffer from a loss of population that ultimately would lead to a loss of the Smith Island culture. A more detailed discussion of the anticipated future conditions is provided in Section 2.6.1.

### 5.1.2 Economic Conditions

The economic effects of the identified problems and needs on Smith Island were investigated and are quantified in Section 2.6.2. The immediate effects of shoreline erosion and channel shoaling are evidenced in the towns of Rhodes Point and Tylerton. These effects include increased time and fuel to navigate around the shoaled channels, vessel damage incurred during low tide, and the annual cost of increased maintenance on the roads, docks, ramps, utilities, and revetments attributable to the shoreline erosion and incremental breaching of Smith Island. These effects were quantified for current conditions in a three year timeframe. In addition, major effects resulting from continuous shoreline erosion were estimated for the five year time horizon. While the existing quantification of damages and potential benefits focuses on the parts of Rhodes Point and Tylerton most vulnerable in the near term, the entire island is susceptible to damages from shoreline erosion, tidal flooding and storm damages. Quantifying existing condition damages after year 5 is not projected. After year 5, if nothing is implemented to prevent the continued erosion, the island's economic, cultural, and physical viability will be threatened in the near term. Consequently, the inhabitants entire way of life may no longer be sustainable. Therefore, after year 5, catastrophic damages would most likely begin to occur. This report takes a conservative approach to existing condition damages and does not attempt to quantify the enormity of the expected damages that will begin to accrue after year 5. Longer term economic damages will be addressed in the next phase of study. Of equal importance is the concomitant loss of submerged aquatic vegetation and wetlands largely resulting from the continuous erosion of the island's shoreline and increased sedimentation in the channels. The existing condition damages for the four potential project areas are summarized in Section 2.6.2.

### 5.1.3 Environmental Resources

Under the without project conditions, the Smith Island complex is expected to continue to erode and to experience increasing problems of flooding and habitat loss. These problems will result in prolonging the current trends in loss of environmental resources including land, SAV, and the living resources they support. Erosion of the western shore of the island will result in the erosion of vegetated wetlands and beaches south of the Thorofare Channel. The shoreline north of the jetties will also continue to erode, resulting in a loss of wildlife habitat as wetlands and small vegetated upland areas along the shore are lost. As the existing breaches between the Bay and the protected interior waters continue to widen, increasing wave energy and sediment from the Bay will move into formerly quiescent areas, resulting in further loss of SAV. On the north and east shores of the Martin Refuge, the continued erosion of the spits of land that form the coves will result in a loss of the protected interior waters that provide valuable aquatic habitat, including SAV beds. These SAV beds help to support the livelihood of the islanders. The without project condition of the island's environmental resources will be a gradual change in the types of habitat and a reduction in the rich mix of habitats currently provided by the island. Over time, it is expected that there will be a near total loss of the valuable environmental resources that exist today on Smith Island.

## 5.2 RHODES POINT

As discussed in Section 4, The main water resources problem identified in the Rhodes Point vicinity involved the erosion at the mouth of Sheep Pen Gut. The following alternatives were considered: Plan 1 - stabilization of the shoreline at the mouth of the gut, Alternative 1 utilized geotextile tubes, and Alternative 2 utilized stone; Plan 2 - various jetty alternatives, Alternative 1 included a single 600-foot jetty, Alternative 2 included twin jetties, one to either side of the existing channel, Alternative 3 included a single jetty along the north side of a realigned channel, and Alternative 4 included twin jetties protecting a realigned channel. Further discussion of the alternatives is contained in Section 4, Appendix C, and Appendix B-3. Detailed discussion of the economic analyses of the alternatives, and calculations of annual benefits and costs are presented in Appendix B-3. The results of the justification exercises, and the recommended alternatives follows.

In comparison, for Plan 1 at Sheep Pen Gut, Alternative 1 ($64,831) costs 27 percent less than Alternative 2 ($89,350) on a total annual cost basis. By initial construction cost comparison, Alternative 1 ($575,000) is 55 percent less costly than Alternative 2 ($1,040,000). Therefore, in terms of cost effectiveness, Alternative 1 is the preferred alternative given both alternatives perform the same function of protecting Rhodes Point from further shoreline erosion and in essence, preserving the town. The annual cost of the preferred Alternative 1 is $64,831 which would equal less than half of the potential annual benefits claimed ($139,358) in the Sheep Pen Gut vicinity. Of environmental significance, Alternative 1 creates 75 acres of SAV. The total implementation cost of $678,500 results in an average cost of $9,047 per acre of created SAV habitat.

For Sheep Pen Gut, Plan 2, the initial construction costs are: Alternative 1 ($595,000); Alternative 2 ($1,800,000); Alternative 3 ($5,600,000); and Alternative 4 ($2,900,000). In comparison, for Sheep Pen Gut, Plan 2, total annual costs are: Alternative 1 ($51,118); Alternative 2 ($154,644); Alternative 3 ($443,115); and Alternative 4 ($249,149). Given that the four alternatives do not perform the same function, an analysis based on relative costs and anticipated project benefits from each alternative is warranted.

Alternative 3 is eliminated since it cost nearly three times and much as Alternative 2 on an annual basis and has limited additional benefits based on this analysis. Alternative 4 is also eliminated since it costs 1.6 times as much as Alternative 2 on an annual basis and does not provide protection to the channel from the southern approach. Although Alternative 2 costs three times more than Alternative 1, Alternative 2 functions to completely stabilize the Sheep Pen Gut shoreline from both the north and south, provides substantial navigational benefits, and provides substantial erosion protection in the Rhodes Point vicinity. Exact navigational benefits have not yet been calculated. Such an activity requires models and/or sediment budget analyses, and will be conducted in the feasibility phase. It can be assumed that the current situation of the channel being shoaled within months of maintenance and dredging every 3 to 5 years will be vastly improved upon. Given the costs to watermen of the shoaled channel (see Section 2.6.1) and the cost of dredging and dredged material placement (approximately $900,000 for 1997 maintenance, although this contract included other areas as well), navigational benefits could be tremendous. More notably, Alternative 2 adds 75 more acres of SAV to the vicinity of Rhodes Point compared to 25 acres for Alternative 1. The total implementation cost of $2,124,000 for Alternative 2 results in an average cost of $28,320 per acre of SAV habitat. Although plan preferences are discussed in this section, all alternatives will be reformulated and re-evaluated in the next phase of study.

## 5.3 TYLERTON

The erosion and flooding problems being experienced at Tylerton were discussed in Section 4. Two plans have been considered with two alternatives defined per plan. Plan 1 addressed the erosion of the western shoreline. Alternative 1 is a wooden bulkhead and Alternative 2 is a stone revetment. South of Tylerton, Plan 2 allows for the construction of a breakwater to help protect the shoreline, aid in SAV growth, and to help reduce flooding. Alternative 1 included a geotextile tube breakwater, and Alternative 2 includes a stone breakwater. The following paragraphs summarize the results of the plan selection analysis. For more detail, see Appendix C and B-3.

For Plan 1, the stone revetment (Alternative 2) is preferred to the wooden bulkhead (Alternative 1) in terms of annual cost and environmental preference for protecting the west side of Tylerton. Alternative 2 with an annual cost of $121,138 functions strictly as shoreline protection encompassing storm damages, flood protection, and erosion protection for Tylerton and also decreases sedimentation in the water currents. The annual cost of the preferred Alternative 2 is $121,138 which would equal nearly 75 percent of the potential annual benefits claimed ($164, 767) in the Tylerton vicinity.

For Plan 2, Alternative 1 and Alternative 2 are both segmented breakwaters south of Tylerton and perform equally well. Alternative 1, the geotextile tube is 75 percent of the cost of the Alternative 2 on an annual cost basis and is likely the preferred alternative. The annual cost of Alternative 1 is $29,315 and functions to stop further erosion on the southern edge of Tylerton which will also help to reduce storm damages and flood damages from the south. This alternative serves to preserve the town and prevent further loss of wetlands. Alternative 1 would create 12 acres of SAV. The total implementation cost of $306,800 results in an average cost of $25,567 per acre of created SAV habitat.

## 5.4 EWELL - BREACHES

As discussed in Section 4, the focus of plan formulation in the Ewell area was on the breaches along the western shoreline of the Martin Wildlife Refuge from Swan Island to the mainland. Plan 1 for this area included using geotextile tubes and fill to repair the breaches. Plan 2 involved four alternatives for segmented breakwaters including the breach repair of Plan 1 to protect the repaired sections and the rest of the area from future breaches. Alternatives 1 and 2 used geotextile tubes to create the segmented breakwaters off-shore. Alternative 1 included repairing the breaches as well as protecting the southern end of the peninsula with breakwaters while Alternative 2 repaired the breaches and protected the entire length of the peninsula. Alternatives 3 and 4 mirrored 1 and 2 except that they were constructed of stone. A detailed description of these alternatives is in Appendix C. Detailed analyses of the recommendations that follow are presented in Appendix B-3.

Plan 1 is an attractive plan because, at a relatively low initial cost, the three breaches will be filled in by geotextile tubes and will create 270 acres of SAV. In addition, 5 acres of wetlands will be created. The total project implementation cost of $967,600 divided by 270 acres results in an average cost of $3,584 per acre of created SAV habitat. This does not include the additional benefit of the 5 newly created acres of wetlands. In addition, shoaling will decrease in the navigational channel used by all the island watermen and recreational visitors. Plan 1 would rectify the immediate need along the western shoreline; however, it would not prevent new breaches from forming, and the repairs may be subject to flanking. For these reasons, Plan 2 was developed to give alternatives for a more complete project.

For Plan 2, Alternatives 1 and 3 are not preferred alternatives since they both protect only the lower portion of the northwest coastline and would therefore allow future breaches in the northern shoreline by not protecting the function of the geotextile tubes over time. Alternatives 2 and 4 protect both the north and south portions of the northwest coastline in addition to the geotextile tube breach repair. Although the additional benefits of the breakwaters are difficult to quantify, the breakwaters are necessary to maintain the benefits of the geotextile tube breach repair. Alternative 2, the geotextile tube breakwaters, has an initial cost of $1,230,000 while Alternative 4, the stone breakwaters, has an initial cost of $2,540,000. Stone structures are generally preferred in high energy wave climates, such as the Swan Island vicinity, where they have successfully functioned in the past; therefore, the islanders and contractors are more comfortable with them. Due to this accepted preference of stone structures and the required replacement of the geotextile tubes in 25 years, Alternative 4 would likely be recommended. A more detailed analysis of these alternatives will be conducted during further study.

## 5.5 MARTIN WILDLIFE REFUGE - COVES

As discussed in Section 4, geotextile tubes or stone would also be placed to restore the protective function of the three eroding coves on the north and east shorelines of the refuge. Construction of the barriers, as segmented breakwaters, would protect hundreds of acres of formerly quiescent waters. The continuing erosion of the enclosing landforms has opened extensive areas within the coves to the increased wave action that can damage SAV. As the coves have eroded the amount of SAV in the coves has declined, see Figure 3.1 and Table 3.1

Coves, Plan 1, Alternative 1, is Geotextile Tube Breakwaters for three coves in the Martin Wildlife Refuge -- Fog Point Cove, Back Cove, and Terrapin Sand Cove. Coves, Plan 1, Alternative 2, is Armor Stone Breakwaters for three coves in the Martin Wildlife Refuge -- Fog Point Cove, Back Cove, and Terrapin Sand Cove. A detailed analysis of these alternatives is in Appendix B-3.

Alternatives 1 and 2 perform the same shoreline protection function. Both would prevent further loss of wetlands and create 421 acres of SAV. Alternative 1 is a preferred plan because it has a relatively low initial cost of $755,000. Shoreline protection for three northeast coves will be provided by a series of segmented geotextile tube breakwaters. The total implementation cost of this alternative is $890,900 (see Table 5.1) resulting in a cost of just $2,116 per acre of created SAV habitat. This does not include the value of threatened habitat that will be spared as a result of this project. The alternatives will be re-evaluated in the next phase of study.

## 5.6 SUMMARY OF ALTERNATIVES

The recommended plan for Smith Island was not determined during the course of this study; however, this report indicates that projects exist at each of the four main identified problem areas that are in the Federal interest and warrant further study. At Rhodes Point, protection of the mouth of Sheep Pen Gut using geotextile tubes along the southern shoreline, and constructing twin jetties aligned along the current channel, or some other means, is warranted. At Tylerton, it is warranted for the western shoreline to be protected by a stone revetment and the southern end of town to be protected with a geotextile tube segmented breakwater. At Ewell, repairing the breaches along the western shoreline of the Martin Wildlife Refuge is warranted. A justified plan includes repairing the breaches with geotextile tubes and then constructing a series of stone segmented breakwaters to protect the western shoreline from further breaches. Finally, the coves along the north and northeast sides of the Refuge should be reconstructed and protected using geotextile tube segmented breakwaters. It is the conclusion of this study that these alternatives are in the Federal interest, warrant further study, and will be of great social and economic benefit to the people and to the environmental resources of the island.

## 5.7 PUBLIC REACTION

Reaction to the alternatives by the various publics involved in the planning process have been strongly supportive. Preliminary alternative solutions were developed based on the values and concerns expressed by island residents, with input from other interested parties and participating agencies. The alternatives were screened to eliminate those that were technically unfeasible or unacceptable to the publics that participated in the study, and as more detailed plans for the recommended alternatives were prepared, they were again reviewed by the participating publics. This conservative approach to public involvement - checking and re-checking the acceptability of the study products with the customer - resulted in a consistently high degree of communication, no surprises, and strong endorsement of the project alternatives by all of the participating publics. The Smith Island watermen have shown a preference for stone structures over geotextile tubes. This opinion is understandable since their familiarity with the tubes is low. The islanders are unanimous in the opinion that either method is acceptable as long as the structures accomplish their goal.

## 5.8 ESTIMATE OF FIRST COSTS

Quantities and cost estimates were developed for the alternative plans with suitable assumptions and modifications as necessary for cost estimating at the reconnaissance level. The estimate of construction costs are awardable contract amounts based on a February 1997 price level. The estimates were based on readily available cost data, experience on similar jobs (including the past two geotextile tube placements at Hog Neck), and standard cost estimating guidelines. Contingencies varied based on the type of construction recommended. The cost for pre-construction engineering and design (PED) and construction management (CM) were not included for the purposes of plan selection.

An allowance of 12 percent for PED is included here along with a 6 percent allowance for CM in order to give realistic project implementation costs. Table 5.1 gives a breakdown of the implementation costs by alternative. These costs make the assumption that the alternatives will be more fully studied during a feasibility phase first. Any project that is constructed through a different authority would likely have different design costs associated with it. If the bolded selections in Table 5.1 were constructed, it is anticipated that 853 acres of SAV would be restored. At a total first cost of $8,661,200, the cost per acre would be $10,189. This, of course, would not include any derived economic benefits (of which there are many).

## 5.9 IMPACTS

This section describes the anticipated impacts of construction of the recommended plan.

| Table 5.1 | | | | | |
|---|---|---|---|---|---|
| **Implementation Costs by Project Alternative** | | | | | |
| (February 1997 price levels) | | | | | |
| | | | | | |
| | | PED Costs | Constr. Mgt. | Construction | Total |
| **Rhodes Point** | | | | | |
| Plan 1 | **Goetextile tube** | **$69,000** | **$34,500** | **$575,000** | **$678,500** |
| | Stone protection | $124,800 | $62,400 | $1,040,000 | $1,227,200 |
| Plan 2 | Single jetty | $71,400 | $35,700 | $595,000 | $702,100 |
| | **Twin jetties** | **$216,000** | **$108,000** | **$1,800,000** | **$2,124,000** |
| | Two jetties/realign | $672,000 | $336,000 | $5,600,000 | $6,608,000 |
| | Jetty/realign channel | $348,000 | $174,000 | $2,900,000 | $3,422,000 |
| | | | | | |
| **Tylerton** | | | | | |
| Plan 1 | Bulkheading | $136,800 | $68,400 | $1,140,000 | $1,345,200 |
| | **Stone revetment** | **$169,200** | **$84,600** | **$1,410,000** | **$1,663,800** |
| Plan 2 | **Tube breakwaters** | **$31,200** | **$15,600** | **$260,000** | **$306,800** |
| | Stone breakwaters | $55,200 | $27,600 | $460,000 | $542,800 |
| | | | | | |
| **Ewell - Breaches** | | | | | |
| Plan 1 | Repair Breaches | $98,400 | $49,200 | $820,000 | $967,600 |
| Plan 2 | Tubes, south protect | $123,600 | $61,800 | $1,030,000 | $1,215,400 |
| | Tubes, full Protect | $147,600 | $73,800 | $1,230,000 | $1,451,400 |
| | Stone, south protect | $204,000 | $102,000 | $1,700,000 | $2,006,000 |
| | **Stone, full protect** | **$304,800** | **$152,400** | **$2,540,000** | **$2,997,200** |
| | | | | | |
| **Martin Wildlife Refuge** | | | | | |
| | **Geotextile tubes** | **$90,600** | **$45,300** | **$755,000** | **$890,900** |
| | Stone breakwaters | $279,600 | $139,800 | $2,330,000 | $2,749,400 |
| | | | | | |
| **Total of bolded alternatives*** | | **$880,800** | **$440,400** | **$7,340,000** | **$8,661,200** |
| | | | | | |
| *Note: Based on current cost estimates and environmental considerations, these alternatives are preferred. | | | | | |

### 5.9.1 Social, Cultural

5.9.1.a Social. Social and cultural impacts of the project are expected to be predominantly beneficial. As documented throughout this report, Smith Island survives as a remnant of a colonial fishing village culture which was not uncommon 200 years ago, but which no longer exists anywhere else in the Chesapeake Bay region. Part of the importance of the Smith Island culture is that it is still thriving, if not quite as dynamic as several decades ago. The fact that it is a living culture, as contrasted with an artificially preserved settlement such as the colonial agrarian culture of Williamsburg, Virginia, makes it even more worthy of protection.

The mores and ideals of the Smith Island community today are based on rugged individualism, socio-religious development in Methodism, the stress of a dependency on ever-changing aquatic environments, and the characteristics of the farming and plantation society that existed on the island prior to the early 1800s. In those days homes and small settlements were scattered across the island. However, as rising ground water levels made the homes and fields untenable, the predominant island economy shifted to water-based industries and island residents relocated onto the several remaining high areas, forming the three harbor communities that survive today. Preservation of the social characteristics of the early days on the island has resulted from the protection from outside influences provided by the island's physical isolation and the clear preference of island residents for their un-governed but community-centered traditions.

The social impacts of the project should be positive. Erosion protection and environmental restoration would result in increased security for island residents. The restored SAV beds and navigation improvements would result in larger local crab populations and more efficient boat travel. Flood and storm protection provided by the project would relieve much of the nuisance flooding that regularly occurs, fostering development that now seems impractical, and creating more livable communities. It is anticipated that the project will slow the migration of the younger generation who now fear a limited future and encourage former residents to return to a more secure and flourishing island.

5.9.1.b Cultural. The alternatives developed during the reconnaissance study have only a minor potential to affect the historical and archeological sites scattered across the island. Traditionally recognized "historic properties" are scant on Smith Island. In fact, the Maryland Historic Trust records that the sunken wreck of the Island Belle, a mail boat constructed in 1917 and in use for 60 years, is the only recorded property listed on the National Register of Historic Places. Architectural investigations on the island have documented that the structures, in spite of their charm, have suffered sufficient loss of integrity to disqualify them for listing on the National Register. However, because of the rapid abandonment of most of the inland farms and small settlements during the time of environmental and economic changes during the 1800s, it is likely that partially or completely submerged archeological resources dating to the 18th century remain intact throughout the island. Due to the fact that the integrity of many of these sites may be threatened by erosion, an examination of the existing sites should be completed during the

Feasibility Phase. Information gathered during this survey would ensure avoidance of potentially significant sites, as well as contribute information to the history of the island.

### 5.9.2 Environmental

Environmental impacts of the project to the three communities and the Martin Refuge would be predominantly beneficial, however, some temporary and localized negative impacts would occur. Existing benthos at the project sites would be impacted both temporarily and permanently, depending on their location relative to the construction. At each project site, benthic organisms would be destroyed during the construction process. This destruction would be permanent within the project footprint, that is, where placement of a structure would permanently displace the existing habitat. Benthic organisms could also be destroyed by construction activities in the general project area. However, it is expected that outside of the project footprint the organisms would become reestablished after construction, so the impact would be temporary.

Rhodes Point - Beneficial impacts resulting from the placement of geotextile tube buffers at the mouth of Sheep Pen Gut would provide critical protection from the wave energy that is now funneled in from the Bay and causes shoreline erosion, storm and flood damage to the community of Rhodes Point, and sedimentation in the Shanks Creek SAV beds. Negative impacts at Rhodes Point would include the destruction of benthic organisms in the construction area, displacement of finfish, temporary and localized turbidity caused by the dredging process, noise from construction equipment, and temporary inconvenience to watermen who may not be able to navigate in the construction area. Future construction of jetties at Sheep Pen Gut would result in similar impacts. Since stone jetties would require a longer construction period, it is expected that the construction impacts would be somewhat greater, although still temporary and localized. Additional beneficial impacts of the construction of stone jetties would include improved habitat for fish and other organisms that would find cover in the interstices of the stone jetties.

Tylerton - Environmental impacts of the construction of a stone revetment and geotextile tube segmented breakwater along the harbor shoreline and offshore of the southern end of Tylerton would also be predominantly beneficial. Permanent destruction of benthos within the project footprint would occur, however. Temporary and localized negative impacts similar to those at Rhodes Point would also occur, including destruction of benthos in the construction area; displacement of free swimming organisms; turbidity, and noise. In addition, construction of the stone revetment along the Tylerton harbor would result in inconvenience to watermen as docking, crab shedding operations, and other tasks that are carried out in the harbor were displaced during the construction period. The environmental benefits of a stone revetment at Tylerton include protection for human and other inhabitants of the island and an increase in subtidal habitat provided by the interstices of the stone structure. Placement of a geotextile tube breakwater south of the community would provide protection to the island inhabitants and restore more quiescent conditions to the water between the structure and the shoreline. Breakwater protection for the cove would stop the loss of land to erosion and create quiescent conditions between the breakwater and the shoreline. It is expected that creating quiescent conditions could result in the restoration of SAV or other wetland vegetation, such as marsh grass, depending on the amount of sediment captured as the structure was overwashed.

Ewell, Martin Refuge - Constructing breakwaters and placing geotextile tubes and dredged material to close the widening guts and restore and protect the integrity of the refuge shoreline north of the Thorofare channel would have beneficial environmental impacts in the project area as well as in Lighting Knot Cove, in areas near Swan Island and Channel Point Gut, and at Ewell. Negative environmental impacts would be localized and temporary and include impacts similar to those resulting from the construction at Rhodes Point and Tylerton. Negative impacts would include the permanent destruction of benthos within the construction footprint and temporarily in the general construction area, temporary dislocation of motile organisms, turbidity, and noise that may be disruptive to wildlife. The construction would be scheduled during a time of year that minimized impacts to SAV, crabbing operations, and refuge wildlife. It is not expected that construction noise would impact residents of Ewell, located over a mile from the construction area, or that navigation would be impeded. Beneficial impacts include protecting island inhabitants at Ewell by reducing wave energy and erosion near the community and reducing damage to SAV beds by restoring quiescent conditions and decreasing sedimentation. It is anticipated that restoration of quiescent conditions would support the recovery of SAV in the Swan Island, Channel Point Gut, and Lighting Knot Cove areas.

Restoration of the eroded coves on the north and east shorelines of the Martin Refuge would enclose approximately the same area of quiescent water that was protected by the formerly existing landforms. The environmental impacts of restoring the protected area within the coves are highly beneficial and offer the potential to regain hundreds of acres of SAV that have been lost since 1990. Negative impacts would include the destruction of benthos and temporary dislocation of motile organisms in the construction areas. Construction would be scheduled to minimize negative impacts to wildlife caused by temporary and localized turbidity, noise, and construction activity. Because the project location is within the refuge and several miles from the nearest human settlement, construction noise would not be a negative impact to humans. Construction may cause some disruption to the fishing activity that typically occurs outside the coves, however, it would be temporary and localized.

### 5.9.3 Navigation, Employment

The employment of the islanders is almost entirely based on the seafood industry. Therefore, navigation is of paramount importance to the livelihood of the islanders. The proposed actions would be of tremendous benefit to navigation and to SAV which in turn leads to more abundant wildlife, including crabs. As discussed in Section 2.4, an acre of SAV is estimated to yield 160 bushels of marketable crabs every year. Since crabs are the mainstay of the Smith Island economy, saving and creating SAV in the vicinity preserves the livelihood, economic stability, and, therefore, the culture of the island. In the next phase of study, hydraulic modeling and/or sediment budgets will be conducted to quantify the benefits of decreased shoaling rates. As discussed previously, the cost of dredging and dredged material placement on Smith Island is quite high. The costs of detours necessitated by shoaled channels is also high. The estimated dredging costs avoided will be addressed in further study for each alternative.

## 5.10 NON-FEDERAL SPONSORSHIP

The potential non-Federal study sponsor in the Maryland Department of Natural Resources. They are fully aware of their responsibility and have submitted a letter of intent to that effect, which is contained in Annex A. The MdDNR has entered into cost sharing agreements with the Baltimore District in the past.

## 5.11 IMPLEMENTATION SCHEDULE

Project implementation is dependent upon a variety of factors including the availability of funds for the cost-sharing partners, the use of various authorities (see Section 6), and the timing of Federal versus state fiscal years. A preliminary implementation schedule has been developed to describe the sequence of events that must occur under the typical Corps of Engineers process. The time duration discussed below are estimated based on the size and scope of the proposed projects. The estimated durations assume no lengthy delays or problems which could slow progress. In the next section, other authorities will be discussed that would lead to expedited project implementations for some of the study recommendations.

A feasibility phase follows the reconnaissance phase, and is generally started within 3 to 6 months after completion of the reconnaissance report. During the 3 to 6 month interval after submission of the report, a feasibility cost-sharing agreement (FCSA) is negotiated between the Federal Government and non-Federal sponsor. The objective of the feasibility phase is to identify the recommended plan in detail including the engineering, environmental, and economic documentation which is necessary for project authorization. The feasibility study usually requires 2 to 3 years to complete.

The Pre-construction, Engineering and Design phase (PED) is initiated soon after the feasibility study is completed, while awaiting project authorization by the U.S. Congress and after the execution of the PED agreement with the non-Federal sponsor. The objective of the PED phase is to prepare a detailed design and cost estimate for the project which was recommended at the completion of the feasibility phase. The PED phase also includes preparation of plans and specifications for the first construction contract, and usually takes 18 to 24 months, including necessary reviews.

# Section 6

# Additional Project Considerations

At the outset of the reconnaissance phase, the Smith Island study was perceived as a multi-purpose project which would seek to identify problems and aid in any and all areas within the authority of the Corps of Engineers. Due to the scope of the study and the limitations of a reconnaissance report, study efforts were focused on problem identification and plan formulation of the major identified problems. Many other problems and opportunities have presented themselves through the course of the study. Some of these problems and opportunities could be researched further during continued study in the feasibility phase. Other items are not within the authority of the Corps, but are mentioned in the report so that other interested agencies or groups can be made aware of the opportunities to aid in the survival of Smith Island, its inhabitants, and the unique culture of its people.

This section provides a discussion of additional problems and recommendations identified during the study, as well as avenues for implementation of the projects discussed within this report.

## 6.1 FEASIBILITY STUDY

During the feasibility phase, the study team will more fully evaluate and analyze the recommendations of the reconnaissance report (see Appendix G). In addition, further problem identification efforts will be conducted, and long range plans will be scoped. For example; the Corps of Engineers has the responsibility to maintain all of the Federal navigation channels in the area of Smith Island. Normally the channels are dredged every 3 to 5 years. In the past, the dredged material has been placed in upland containment sites. More recently, the beneficial use of this material has been recognized as evidenced by the placement of geotextile tubes and creation of wetlands along Hog Neck in the past few years. During the feasibility phase, a long-range dredged material management plan (DMMP) will be identified so that material dredged during future maintenance activities can be placed beneficially. Future beneficial uses include, but are not limited to, the construction of an island south of Tylerton to protect the community and Tyler Creek from wave energy and to aid in the re-establishment of SAV in the area, continued landmass accumulation at the mouth of Sheep Pen Gut and along Silver Island on the west side of the Martin Wildlife Refuge; and creation of SAV beds and oyster bars. Corps of Engineers funding is in the proposed Federal budget for commencement of the feasibility phase in Fiscal Year 1998.

## 6.2 AVENUES FOR IMPLEMENTATION

Due to the imminent danger of flood and storm damage to the residents of Smith Island, and the small scale of recommended projects (i.e. costs of less than several million dollars), alternative avenues of project implementation have been investigated. Some of these potential avenues are discussed below. All of the options include local cost sharing and, therefore, would be undertaken only with the support of a non-Federal sponsor. Any implementation scenario would require full compliance with the NEPA process.

### 6.2.1 Section 14 of the Flood Control Act of 1946

Section 14 of the Flood Control Act of 1946, as amended, provides authority for the Corps of Engineers to develop and construct or repair streambank and shoreline protection projects to protect endangered roadways, bridge approaches, public works facilities such as water and sewer lines, public and private non-profit schools and hospitals, and other public facilities. Each project is limited to a Federal cost of $1,000,000, which includes project implementation costs for developing the plans and specifications and construction. The sponsor is required to contribute 35 percent of the total project costs.

Section 14 is a viable alternative for protection of the western shoreline of Tylerton and requires the award of a construction contract within 12 months of study initiation.

### 6.2.2 Section 204 of WRDA 1992

Section 204 of the Water Resources Development Act of 1992, as amended, provides authority for the Corps of Engineers to implement projects for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with construction, operation, or maintenance dredging of an authorized Federal navigation project. Although there is no per-project limit, the maximum annual Federal appropriation limit for this authority is $15 million.

The non-Federal sponsor is required to contribute 35 percent of the total incremental project costs. The incremental cost is the cost that exceeds the base construction, operation, or maintenance dredging plan.

This authority could be used wherever geotextile tubes have been recommended. Projects could be constructed in the area of the breaches northwest of Ewell, for example. This authority could be used as an ongoing program of shoreline protection and wetlands expansion through the use of geotextile tubes and backfill.

### 6.2.3 Section 1135 of WRDA 1986

Section 1135 (b) of the Water Resources Development Act of 1986, as amended, provides authority for the Corps of Engineers to investigate, study, modify, and construct projects for the restoration of fish and wildlife habitats where degradation is attributable to water resource projects previously constructed by the Corps of Engineers. Project modifications are limited to a Federal cost of $5 million per project. The non-Federal sponsor is required to contribute 25 percent of the total project costs.

Since, as it was previously discussed, prior Corps projects have led to the conversion of over 55 acres of wetlands to uplands or open water, there is an opportunity for the Corps to construct a project under Section 1135. A likely project for this authority would be Plan 2 for Tylerton as discussed in Section 5. A series of segmented breakwaters to the south of Tylerton would allow for the growth of SAV, the cessation of wetlands erosion, and over time the accumulation of new wetlands.

### 6.2.4 Section 538 of WRDA 1996

Section 538 of the Water Resources Development Act of 1996 authorizes a project in the interest of emergency erosion protection for Rhodes Point at a Federal cost of $450,000. The project would include design (including all appropriate NEPA documentation) and construction with a 65/35 cost share with a non-Federal sponsor. The non-Federal share would be $242,000. If the Federal money is included in the Fiscal Year 1998 budget, and if a non-Federal sponsor steps forward, design of the Sheep Pen Gut improvement project to protect Rhodes Point could be initiated as early as October 1997. Reconnaissance-level cost estimates show that Plan 1, Alternative 1 for Rhodes Point (as discussed in Section 5) could be constructed within the funding limits of this authority.

### 6.2.5 Section 510 of WRDA 1996

Section 510 of the Water Resources Development Act of 1996 authorizes up to $10 million Federal cost, with a 75/25 cost share with a non-Federal sponsor, to be used for the design and construction of projects in the interest of environmental restoration, erosion control, wetlands creation and protection, cultural resources, and other purposes. This authority could be used to expedite implementation for projects to protect Tylerton, create coves in the Martin Wildlife Refuge, and to repair the breaches northwest of Ewell.

## 6.3 PUBLIC SUPPORT

The public expressed strong support for the recommended alternatives. Preliminary alternatives were reviewed by island residents, other interested parties, and participating agencies and technically unfeasible or unacceptable alternatives were eliminated. As detailed plans for the recommended alternatives were prepared, they were again reviewed by all participants in the planning process. The intensive public involvement program employed frequent, extensive and candid communications among all participants and resulted in a strong endorsement of the recommended plan.

During the February 1997 public meeting on Smith Island (see Section 3.1.1 and Appendix E) the project alternatives were presented. Although there was discussion as to which solutions were best, there was unanimous support for the solutions to the identified projects as presented. Island residents have invariably expressed satisfaction with the recommendations of this report and have written numerous letters of support for the study findings to their state and Federal representatives.

There is also widespread agency support for the recommendations of this report. The Maryland Department of Natural Resources is in general agreement with the findings of this report and has provided a letter of intent to become the cost-sharing non-Federal sponsor for future project activities. Representatives of the Chesapeake Bay Foundation, US Fish and Wildlife Service, and other participating agencies, have provided consistent encouragement and support for the project. There is tremendous interest from each of the many study participants in expediting the implementation of the study recommendations.

# Section 7

# Findings, Conclusions, and Recommendations

## 7.1 FINDINGS AND CONCLUSIONS

Findings of the reconnaissance phase for the Smith Island Environmental Restoration and Protection study include the following:

1. The rich culture of Smith Island and its symbiotic relationship with the Chesapeake Bay is unique in Maryland and extremely rare in modern America. Projects designed to aid in the continuation of this way of life are in the Federal interest.

2. Erosion is the primary threat to the island and the most pressing concern of the residents of Smith Island. Erosion is also a threat to the environmental resources of the Smith Island complex.

3. The recommended projects in the Federal interest are:
   a) Emergency protection is needed at the mouth of Sheep Pen Gut to prevent further erosion, loss of SAV in Shanks Creek, and damages to Rhodes Point. This protection would stabilize and narrow the mouth of Sheep Pen Gut and would consist of geotextile tubes and backfill. Twin jetties along the current alignment of the charnel are also justified.
   b) The town of Tylerton is in need of shoreline protection. Construction of a stone revetment along the western shoreline and segmented geotextile breakwaters to the south of the town would provide the necessary protection.
   c) The breaches along the western shoreline of Martin Wildlife Refuge should be repaired in the interest of SAV, navigation and storm protection. The repairs may include geotextile tubes and the placement of dredged material in conjunction with stone off-shore segmented breakwaters.
   d) There is a tremendous opportunity to protect and restore shallow water habitat along the northern and eastern shoreline of the Martin Wildlife Refuge through the restoration of coves. Geotextile tubes can be placed where there once were land spits and other areas to create the quiescent environment required for SAV growth and productive shallow water habitat.

4. Further study by the Corps or other interested agency or group is warranted in the interest of sewage treatment in Tylerton, aquiculture, environmental education for island residents, mitigating for sea-level rise, improving existing upland areas formed at previously used dredge placement sites, wetlands creation, establishment of an official dredged material management plan for the Federal charnels in the area, land planning and town design, eco- and cultural tourism, ferry service, roadway improvements, and other business possibilities.

5. There is strong support from non-Federal agencies to proceed with projects to save Smith Island and to improve fish and wildlife habitat.

## 7.2 RECOMMENDATION

In view of the findings during the reconnaissance phase of study, I recommend that further studies of potential environmental restoration, erosion, navigation and storm protection improvements for Smith Island be conducted and a feasibility report be prepared. A more detailed discussion and overview of the feasibility phase is contained in Appendix B-2. I also recommend that other available project authorities be considered for the most cost and time effective means for project implementation.

RANDALL R. INOUYE, P.E.
Colonel, Corps f Engineers
Commander and District Engineer

# SMITH ISLAND ENVIRONMENTAL RESTORATION AND PROTECTION, MARYLAND

**RECONNAISSANCE REPORT**

**MAY 1997**

# APPENDIX A

**PLANNING AID REPORT**
**PREPARED BY USFWS**

# ENVIRONMENTAL RESTORATION AND PROTECTION OPPORTUNITIES ON SMITH ISLAND IN MARYLAND AND VIRGINIA

PLANNING AID REPORT

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## Introduction

The Baltimore District, U.S. Army Corps of Engineers is conducting a Reconnaissance Study to investigate the advisability of providing improvements on Smith Island, Somerset County, Maryland and Accomack County, Virginia, in the interest of navigation, flood control, erosion control, environmental restoration, wetlands protection, and other purposes. Smith Island is a complex of salt marsh islands separated primarily by narrow tidal creeks and shallow water areas. Smith Island is located in the Chesapeake Bay, approximately 12 miles west of Crisfield, Maryland and 95 miles south of Baltimore; it constitutes some of the most productive fish and wildlife habitat in the Chesapeake Bay.

This Planning Aid Report was prepared by the U.S. Fish and Wildlife Service to assist the Baltimore District in its assessment of natural resource issues for Smith Island. The report provides information on existing biological conditions, distribution of sensitive resources, potential environmental restoration opportunities, and recommendations for further study. It is submitted in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq*.) and the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.).

## Study Area Description

Smith Island is located between Tangier Sound and the Chesapeake Bay (Figure 1). The western shore of the island is exposed to an open water fetch of 30 miles from the west, southwest, and northwest. Because of this exposed position, the overriding water resource related problems in the study area are flooding and erosion, which are further exacerbated by island subsidence. Although erosion, flooding, and subsidence constitute an obvious problem for people inhabiting the three towns on the island (Ewell, Rhodes Point, and Tylerton), important natural resources are also threatened.

The Hog Neck marsh peninsula is an example of the magnitude of the problem. Hog Neck emergent wetlands protect submerged aquatic vegetation beds occurring in Shanks Creek. Almost all the SAV beds at Smith Island are located within protected interior shallow waters or along the shoreline facing Tangier Sound. The western shoreline of the peninsula receded 2,000 feet between 1849 and 1968 (Maryland Geological Survey, 1975). Large acreages of vegetated wetlands and SAV are lost throughout Smith Island every decade (Harrison, pers. com.). Although the eastern shore of the island faces the more protected waters of Tangier Sound, erosion and sedimentation are still a problem in certain areas.

Biological resources in and around Smith Island are exceptionally rich and diverse. For this reason the northern half of Smith Island (encompassing approximately 4,000 acres) was acquired by the U.S. Fish and Wildlife Service, and now constitutes the Martin National Wildlife Refuge. With the exception of the three towns, several old dredged material disposal sites, and small dune hammocks, Smith Island is composed entirely of estuarine emergent wetlands bisected by numerous tidal creeks. The study area has a salinity range of 12 to 19 parts per thousand (Lippson, 1973), and a mean tidal range of 1.6 feet (Reed, 1997). Shallow waters within and surrounding the island support some of the most productive areas for SAV in Chesapeake Bay. These wetlands and aquatic beds in turn provide habitat for developing and mature species of fish, invertebrates, waterfowl, wading birds, shorebirds, raptors, railbirds, aquatic furbearers, terrapins, etc. Adjacent open waters support commercially important populations of crabs, oysters and clams, and commercially and recreationally important populations of finfish. The extent of these resources is examined in more detail below.

## Habitat Types/Restoration Opportunities

### Wetlands

Smith Island is primarily composed of estuarine wetlands of the following wetland classifications (Cowardin, *et al*. 1979):

- Estuarine, Intertidal, Emergent, Persistent
- Estuarine, Intertidal, Bar/Beach, Irregular Tidal
- Estuarine, Intertidal, Flat, Irregularly Exposed
- Estuarine, Intertidal, Flat, Regular Tidal
- Estuarine, Subtidal, Open Water (unknown bottom)
- Estuarine, Subtidal, Unconsolidated Bottom
- Estuarine, Subtidal, Aquatic Bed, Vascular

The dominant wetland species is black needlerush (*Juncus roemerianus*), with lesser amounts of smooth cordgrass (*Spartina alterniflora*), saltmeadow hay (*Spartina patens*), salt grass (*Distichlis spicata)*, marsh elder (*Iva frutescens*), groundsel bush (*Baccharis halimifolia*), saltmarsh bulrush (*Scirpus robustus*), waterhemp (*Amaranthus cannabinus*), and common reed (*Phragmites australis*). Common reed, an invasive wetland plant of relatively low wildlife value, is often associated with and dominates several old dredged material disposal sites on Smith Island.

Marsh areas are ecologically valuable not only for the habitat they provide for fish, birds, mammals, reptiles, and invertebrates, but also for their production and export of detritus. Detritus is a vital component of the aquatic food web, and estuarine energetics are associated with the linkage between wetland produced detritus and detritivores. Approximately two-thirds of the major U.S. commercially important fishes depend on estuaries and saltmarshes for nursery and spawning grounds (McHugh, 1966). Such wetland dependant species include menhaden (*Brevoortia tyrannus*), bluefish (*Pomatomus salatrix*), sea trout (*Cynoscion nebulosus*) spot (*Leiostomus xanthurus*), croaker (*Roncador stearnsi*), and drum (*Pogonias cromis*).

Smooth cordgrass, because of its position in the intertidal zone, is particularly valuable in terms of detrital export. Its occurrence on Smith Island is somewhat limited, and impacts to this vegetative community should be avoided. Of particular importance is a prominent stand of smooth cordgrass which lies immediately west of the southern tip of Rhodes Point. Wetland restoration efforts should prioritize this species. Because marshes are effective in deterring erosion, wetland restoration can also be used to protect fish, wildlife, and human habitats.

**Uplands**

The only upland areas are at the towns of Ewell, Tylerton, and Rhodes Point, and a few other isolated hammocks, dunes and former dredged material disposal areas. Vegetative communities found on the dune habitats are characterized by orache (*Atriplex patula*), Seaside goldenrod (*Solidago sempivirens*), saltmarsh fleabane (*Pluchea purpurascens*), sea rocket (*Cakile edunata*), American beach grass (*Ammophila breviligulata*), and switchgrass (*Panicum virgatum*). Although these areas have less direct benefit to the aquatic resources of the estuary, they are valuable habitats for avian, mammalian, and reptilian species, and also help buffer interior areas from erosion. Specific recommendations for protecting and promoting beach habitats can be found in the proceeding sections of this report.

Upland forested hammocks are important nesting sites for wading birds. Twelve hammocks on Smith Island currently contain wading bird rookeries. Generally these hammocks constitute isolated ridges surrounded by marsh and/or open waters, or are former dredged material disposal sites which are also adjacent to marsh and/or open water. Hammock vegetation is characterized by shrub and tree species such as wax myrtle (*Myrica cerifera*), groundsel bush, black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), and hackberry (*Celtis occidentalis*). Understory vegetation is comprised of vine species such as Japanese honeysuckle (*Lonicera japonica*), poison ivy (*Toxicodendron radicans*) and blackberry (*Ribes* spp.). An exception to the community described above are some of the old dredged material disposal sites. Several of these hammocks are primarily monotypic common reed. Restoration recommendations targeting the upland habitats are found in the Colonial Waterbird Section of this report.

**Submerged Aquatic Vegetation**

Smith Island remains one of the most productive areas for submerged aquatic vegetation in the Chesapeake Bay. Although the island has experienced some decline in this important habitat type, as shown in Figure 3.1 of the main report, Smith Island continues to exhibit extensive SAV beds compared to much of the Tangier Sound region (VIMS, 1994). Eel grass (*Zostera marina*) and widgeon grass (*Ruppia maritima*) are the dominant species, with widgeon grass occurring in waters generally less than 3 ft. deep MLW and eel grass occurring in waters greater than 3 ft. deep MLW but still within the photic zone. These grass beds are an important ecological component of the estuary. They provide cover and food for juvenile fishes, molting blue crabs (*Callinectes sapidus*) and many other crustaceans and mollusks, and are an important food for many species of waterfowl. The beds also support a locally based crab scrape fishery. As with the emergent wetlands, SAV beds contribute detritus to the estuarine food web. In addition to its direct value to fish and wildlife, SAV helps to stabilize bottom sediments and improve water quality. Almost all of the Smith Island SAV beds, or potential SAV habitat, are located within the protected interior shallow waters or along the shoreline facing Tangier sound.

The multi-agency Chesapeake Bay Program has produced a guidance document for protecting SAV (EPA, 1995). The document recommends the following:

- o Protect SAV and potential SAV habitat from physical disruption.
- o Avoid dredging, filling, or construction activities that create additional turbidity sufficient to impact nearby SAV beds during the SAV growing season (April 1 - October 31).
- o Establish an appropriate undisturbed buffer around SAV beds to minimize direct and indirect impacts on SAV from activities that significantly increase turbidity (500 yard buffer during the growing season).
- o Preserve natural shorelines. Stabilize shorelines, when needed, with marsh plantings as a first alternative. Use structures that cause the smallest increase in refracted wave energy where planting vegetation is not feasible (e.g. offshore breakwaters).
- o Educate the public about the potential negative effects of recreational and commercial boating on SAV, and how to avoid or reduce them.

Any Corps projects which result in improved water quality for the waters within and surrounding Smith Island will benefit SAV. Restoration and creation of SAV beds are not usually recommended to mitigate the loss of SAV through project impacts, as the technology to create or restore SAV beds generally has not proven successful over the long term. Outside the realm of compensatory mitigation, there may be opportunities to construct demonstration/experimental SAV restoration projects. Such an opportunity exists at Drum Point Island, northeast of the eastern approach to the Big Thorofare River.

A shoal occurring north of Drum Point Island provides wave protection to a large SAV bed north of Twitch Cove. Past winter storms have caused this shoal to migrate to the west; decreasing the amount of shallow water protected and covering portions of the existing SAV bed (Mike Harrison, pers. comm.). As an alternative to the previously used Twitch Cove open water placement site, dredged material from the Federal Navigation channel at Twitch Cove could be used to stabilize this shoal movement and restore addition acreage of SAV. Dredged-filled geotextile tubes or rirap breakwaters could be placed channelward of, and parallel to, the existing shoal. Dredged material capacity would dictate how far channelward of the existing shoal the tubes or breakwaters are deployed. After tube or breakwater placement, dredged material could be deposited between the existing shoal and tube or breakwater to an elevation which will support SAV.

Another possible cause for SAV declines in the interior reaches of Smith Island is the breaching of the heads of several tidal guts (Mike Harrison, pers. comm.). These breaches have allowed sediments from the open bay to accrete in the islands interior. The subsequent change in substrate type may be responsible for some SAV loss. These breaches are exacerbating island erosion. Projects aimed at closing the breaches would combat erosion, and might have a positive effect on SAV recolonization. In particular, the following areas should be targeted:

- Eroding shoreline north of Channel Point.
- Tidal gut parallel to Lighting Knot Cove.
- Tidal guts along Noah Ridge.
- Breaches around the jetties at the western approach to the Big Thorofare River.

If either the Drum Point Shoal or any of the breach closing projects are undertaken, a monitoring study to determine project success/failure should be developed. Monitoring data on SAV restoration is requisite to developing and improving techniques aimed at increasing this valuable Chesapeake Bay resource.

## Fish and Wildlife Resources: Description and Restoration Opportunities

### Endangered Species

Smith Island supports the Federally-listed endangered American peregrine falcon (*Falco peregrinus anatum*). Two nesting pairs occupy the Martin National Wildlife Refuge portion of the island, with both nests occurring on towers constructed for that purpose. One nest occurs on the north shore of Sawney Cove, and the other on the south shore of Joe's Ridge Creek. Nesting peregrines require tall nesting platforms in areas without significant human disturbance, and a readily accessible food source. Smith Island peregrines prey primarily on shorebirds and passerines. Habitat restoration projects benefiting these two bird guilds will also benefit the peregrine falcon.

Except for the peregrine falcon, and with the exception of occasional transient individuals, no other Federally-listed or proposed endangered or threatened species are known to exist on Smith Island. This relates only to endangered species under the jurisdiction of the U.S. Fish and Wildlife Service, and does not include State-listed species. Smith Island is within the range of several Federally-listed endangered species which could be transient visitors. Such species include the following:

| Species | Status |
|---|---|
| bald eagle (*Haliaeetus leucocephalus leucocephalus*) | Threatened |
| arctic peregrine falcon (*Falco peregrinus tundrius*) | Endangered |
| red-cockaded woodpecker (*Picoides borealis*) | “ |
| shortnose sturgeon (*Acipenser brevirostrum)* | “ |
| leatherback turtle (*Dermochelys coriacea coriacea*) | “ |
| hawksbill turtle (*Eretomochelys imbricata imbricata*) | “ |
| Atlantic Ridley turtle (*Lepidochelys kempi*) | “ |
| loggerhead turtle (*Caretta caretta caretta*) | Threatened |
| Atlantic green turtle *(Chelonia mydas mydas)* | “ |

Sea turtles feed on a variety of mollusks and crustaceans; for loggerheads the preferred prey is the horseshoe crab (*Limulus polyphemus*). Habitat restoration which improves mollusk and crustacean habitat may benefit transient sea turtles.

### Invertebrates

The distribution of SAV is indicative of the value of the bottoms for benthic invertebrates. Although shallow water unvegetated substrate provides important habitat for many nekton species, this habitat has often been found to be relatively depauperate of benthic oriented epifauna as compared to vegetated shallow water habitat (Heck and Thoman, 1984; Fonseca *et al.*, 1996). The protected interior shallow waters are likely to support a productive community of invertebrate species. Although some invertebrates have importance because of their commercial value, the ecological significance of most invertebrate communities lie in their contributions to the food web. They are a food source for fish, birds, reptiles, and mammals.

The aquatic habitat along the west shoreline of Smith Island is very different from the protected, stable interior areas. Bottoms along the west shoreline are exposed to heavy wave action due to the severe fetch. As the bottom is shallow (<4 ft.), storm events probably result in significant bottom scouring. Composition of bottom sediments is hard clay overlain with sand, which in not likely to support a diverse benthic infaunal community. Epibenthic and pelagic species would be expected to be more common.

The officially designated crabbing bottoms are displayed in Figure A-1. They correlate well with the areas which presently or historically supported SAV. As previously discussed, the submerged vegetation provides cover which is especially attractive to molting blue crabs. In addition, Tangier Sound is particularly important as a migratory route for juvenile blue crabs moving northward from spawning grounds in the lower Chesapeake Bay. The commercial harvest of blue crabs is a major source of income for the island residents. Smith Island is one of the most important soft-crab and peeler-crab producing areas in the Chesapeake Bay.

The general Smith Island/Tangier Sound area also support other commercial shellfish operations; including the harvest of oysters and clams. As with the rest of the Chesapeake Bay, oyster populations in the vicinity of Smith Island have been decimated by the oyster diseases MSX and Dermo. The nearest charted oyster bar, Church Creek, is located approximately 1.5 miles west of Rhodes Point. Restoration projects benefiting SAV, wetlands, and water quality in the Smith Island vicinity would also benefit commercially and ecologically important invertebrate resources, such as blue crab, clam and oyster.

### Fish

The marshes of Smith Island are permeated with tidal creeks which provide spawning, nursery, and/or feeding habitat for an abundance of finfish. The contiguous waters of Chesapeake Bay and Tangier Sound also support extensive fishery stocks.

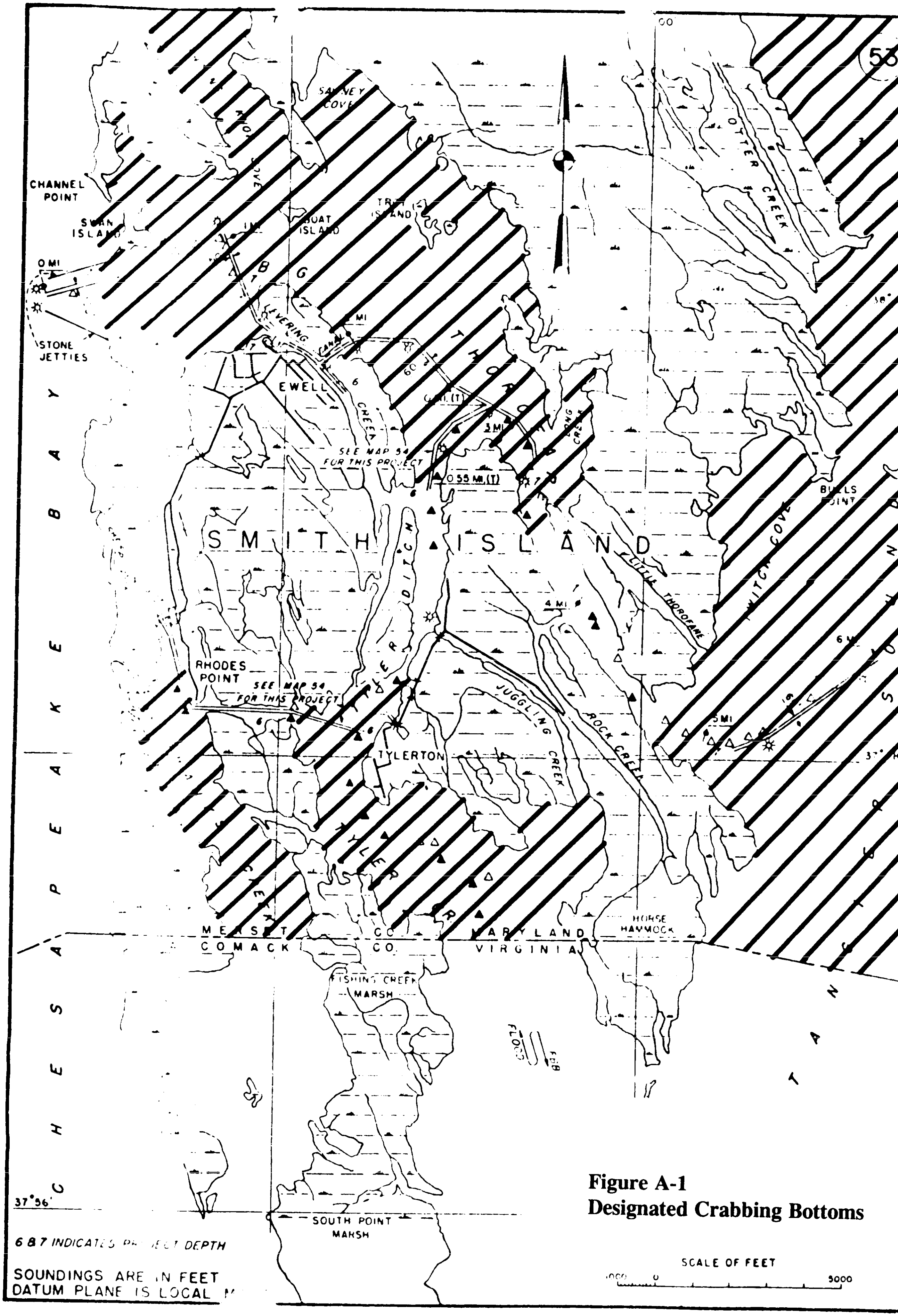



**Figure A-1**
**Designated Crabbing Bottoms**

Reported commercial fishery landings in Tangier Sound for 1992-1995, tabulated by the Maryland Department of Natural Resources, are provided in Table A-1. General location of the geographic area covered is shown in Figure A-2. It should be emphasized that these numbers only reflect commercially sought after species, and in no way reflects the recreational fishery. The Smith Island/Tangier Sound area does have a significant recreational fishery with sea trout, croaker, spot, bluefish, striped bass (*Morone saxatilis*), and summer flounder (*Paralichthys dentatus*) being commonly taken. In addition, this data base does not cover the interior waters of Smith Island, or the large diverse assemblage of forage species and shallow water species such as minnows, killifish, and silversides which are important prey items for the larger predatory species like the striped bass. As with the invertebrates, restoration projects benefiting SAV, wetlands, and water quality should also benefit the fishery resources within and around Smith Island.

**Reptiles**

*Habitats/Threats*

The diamondback terrapin (*Malaclemys terrapin*) inhabits salt and brackish waters of the Eastern United States, from Cape Cod south to the Gulf coast of Texas. In the Chesapeake Bay, terrapins utilize multiple habitats during the course of their life cycle. In late summer, the adult diamondback terrapin generally inhabits the deep portions of creeks and tributaries, avoiding nearshore waters. Juvenile terrapins inhabit shallow creeks and coves adjacent to salt marshes as nursery areas. During June and July, female terrapins cross the intertidal zone and seek nest sites in open sandy areas (Roosenburg 1991). Diamondback terrapins inhabit the tidal marshes and creeks of Smith Island, and are harvested by Smith Island inhabitants. The turtles have been observed nesting on the isolated upland hammocks of the Island complex.[1]

The diamondback terrapin is not listed as a Federal endangered species. It is a fishery resource in Maryland, and other states along the East coast. However, characteristics of terrapin life history render this species especially vulnerable to overfishing and habitat loss. These characteristics include: low reproductive rates, low survivorship, limited population movements, and nest site philopatry. This important Chesapeake Bay species utilizes several coastal habitat types that exist on Smith Island, which provides reasonable opportunities to protect and restore diamondback terrapin habitats through benficial use of dredged material.

Waterfront development has been demonstrated to directly reduce reproductive success in diamondback terrapins (Roosenburg 1991). Shoreline stabilization practices associated with near-shore development, such as wooden bulkheads, gabions, or rip-rap, prevent terrapins from reaching sites above the intertidal zone, the only viable terrapin nesting habitat. Because terrapins are philopatric (exhibiting a high degree of site fidelity) to nesting sites (Roosenburg 1992); “hard” shoreline stabilization practices may eliminate entire breeding colonies. Terrapins have

[1] D.Jorde, PhD. Personal Communication, 1996, Patuxent Wildlife Research Center, USGS, Biological Resources Division, Laurel, MD.

## 1992-95 FINFISH LANDINGS IN TANGIER SOUND AND THE SOUTHERN CHESAPEAKE BAY

**NOAACODE=092 SPECNAME=BLUEFISH, UNCLASSIFIED**

| OBS | YEAR | POUNDS |
|---|---|---|
| 74 | 92 | 650 |
| 75 | 93 | 720 |
| 76 | 94 | 2083 |
| 77 | 95 | 4059 |

**NOAACODE=092 SPECNAME=BUTTERFISH,UNCLASSIFIED**

| OBS | YEAR | POUNDS |
|---|---|---|
| 78 | 92 | 202 |
| 79 | 93 | 40 |
| 80 | 94 | 3 |
| 81 | 95 | 47 |

**NOAACODE=092 SPECNAME=CARP**

| OBS | YEAR | POUNDS |
|---|---|---|
| 82 | 93 | 200 |
| 83 | 95 | 105 |

**NOAACODE=092 SPECNAME=CATFISH**

| OBS | YEAR | POUNDS |
|---|---|---|
| 84 | 92 | 115 |
| 85 | 93 | 98 |
| 86 | 94 | 436 |
| 87 | 95 | 3054 |

**NOAACODE=092 SPECNAME=CRAPPIE**

| OBS | YEAR | POUNDS |
|---|---|---|
| 88 | 93 | 412 |

**NOAACODE=092 SPECNAME=CROAKER**

| OBS | YEAR | POUNDS |
|---|---|---|
| 89 | 92 | 4308 |
| 90 | 93 | 29718 |
| 91 | 94 | 34359 |
| 92 | 95 | 176980 |

**NOAACODE=092 SPECNAME=LINGOD**

| OBS | YEAR | POUNDS |
|---|---|---|
| 110 | 94 | 16 |

**NOAACODE=092 SPECNAME=MENHADEN, AT & GF**

| OBS | YEAR | POUNDS |
|---|---|---|
| 111 | 95 | 48170 |

**NOAACODE=092 SPECNAME=MULLET, BLACK OR SILVER**

| OBS | YEAR | POUNDS |
|---|---|---|
| 112 | 95 | 35 |

**NOAACODE=092 SPECNAME=PORGY, UNCLASSIFIED**

| OBS | YEAR | POUNDS |
|---|---|---|
| 113 | 93 | 1445 |
| 114 | 94 | 75 |

**NOAACODE=092 SPECNAME=SEA BASS, BLACK, UNCLASS**

| OBS | YEAR | POUNDS |
|---|---|---|
| 115 | 92 | 147 |
| 116 | 93 | 757 |
| 117 | 94 | 66 |
| 118 | 95 | 92 |

**NOAACOD =092 SPECNAME=SEA TROUT, GRAY, UNCLASS**

| OBS | YEAR | POUNDS |
|---|---|---|
| 119 | 92 | 6630 |
| 120 | 93 | 14311 |
| 121 | 94 | 16473 |
| 122 | 95 | 5216 |

**NOAACODE=092 SPECNAME=SPOT**

| OBS | YEAR | POUNDS |
|---|---|---|
| 123 | 92 | 30145 |
| 124 | 93 | 41368 |
| 125 | 94 | 53388 |
| 126 | 95 | 48711 |

**Table A-1**

**NOAACODE=092 SPECNAME=DRUM, BLACK**

| OBS | YEAR | POUNDS |
|---|---|---|
| 93 | 92 | 60 |
| 94 | 94 | 62 |
| 95 | 95 | 132 |

**NOAACODE=092 SPECNAME=DRUM, RED**

| OBS | YEAR | POUNDS |
|---|---|---|
| 96 | 92 | 115 |
| 97 | 95 | 6 |

**NOAACODE=092 SPECNAME=EEL, COMMON**

| OBS | YEAR | POUNDS |
|---|---|---|
| 98 | 92 | 23819 |
| 99 | 93 | 13400 |
| 100 | 94 | 13175 |
| 101 | 95 | 8161 |

**NOAACODE=092 SPECNAME=FLOUNDER, SUMMER**

| OBS | YEAR | POUNDS |
|---|---|---|
| 102 | 92 | 696 |
| 103 | 93 | 1581 |
| 104 | 94 | 519 |
| 105 | 95 | 361 |

**NOAACODE=092 SPECNAME=FLOUNDER,WINTER**

| OBS | YEAR | POUNDS |
|---|---|---|
| 106 | 93 | 13 |

**NOAACODE=092 SPECNAME=HALIBUT, UNCLASSIFIED**

| OBS | YEAR | POUNDS |
|---|---|---|
| 107 | 92 | 80 |

**NOAACODE=092 SPECNAME=HERRING**

| OBS | YEAR | POUNDS |
|---|---|---|
| 108 | 93 | 225 |
| 109 | 95 | 10 |

**NOAACODE=092 SPECNAME STRIPED BASS**

| OBS | YEAR | POUNDS |
|---|---|---|
| 127 | 92 | 490 |
| 128 | 93 | 540 |
| 129 | 94 | 2608 |
| 130 | 95 | 2480 |

**NOAACODE=092 SPECNAME=STRIPED BASS, RELEASED**

| OBS | YEAR | POUNDS |
|---|---|---|
| 131 | 92 | 963 |
| 132 | 93 | 254 |
| 133 | 94 | 1217 |
| 134 | 95 | 958 |

**NOAACODE=092 SPECNAME=SWELLFISH**

| OBS | YEAR | POUNDS |
|---|---|---|
| 135 | 95 | 138 |

**NOAACODE=092 SPECNAME=TAUTOG**

| OBS | YEAR | POUNDS |
|---|---|---|
| 136 | 92 | 101 |

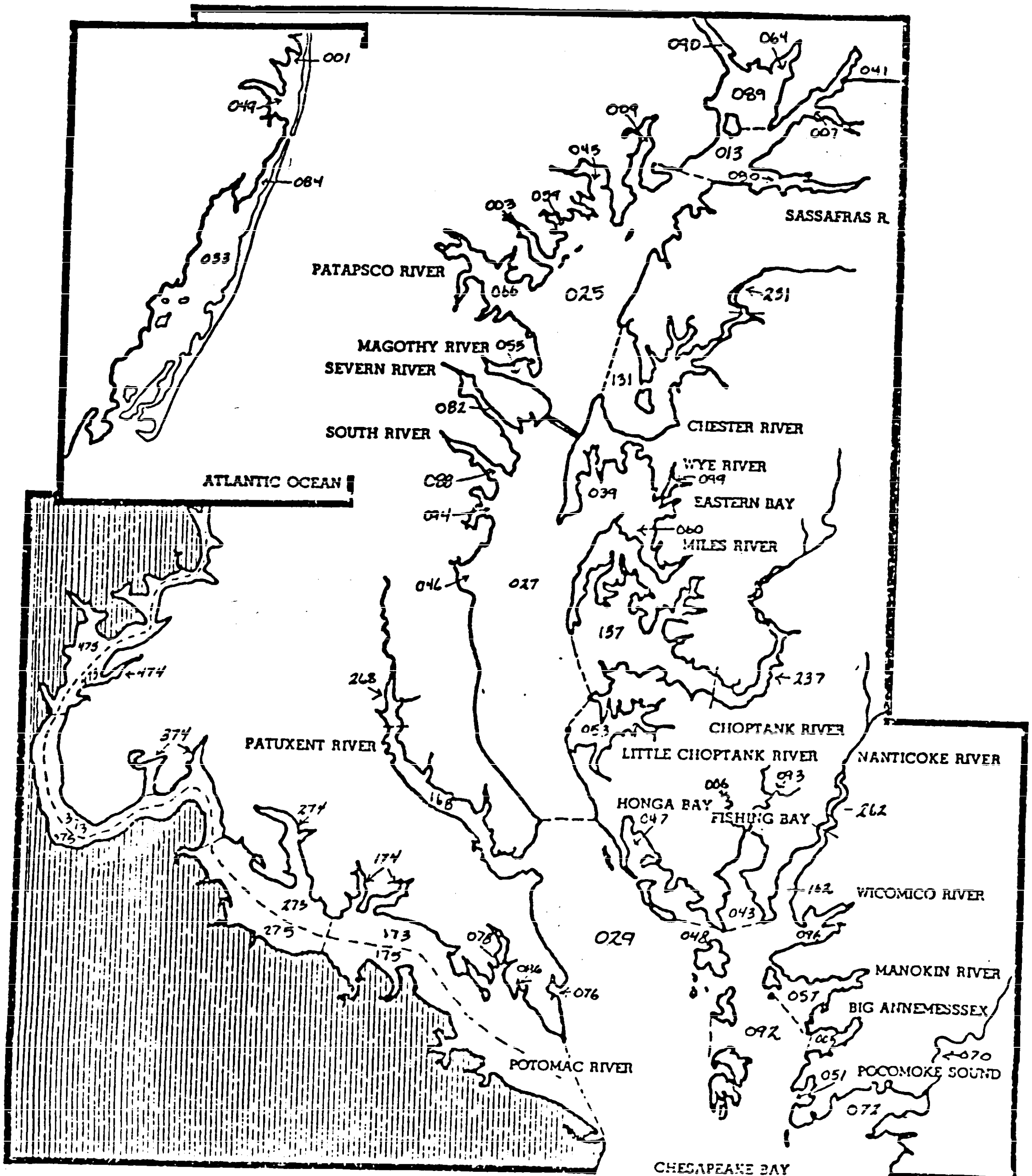
**NOAACODE=092 SPECNAME=WHITE PERCH**

| OBS | YEAR | POUNDS |
|---|---|---|
| 137 | 92 | 13130 |
| 138 | 93 | 15167 |
| 139 | 94 | 13258 |
| 140 | 95 | 20107 |

**NOAACODE=092 SPECNAME=WHITING, UNCLASSIFIED**

| OBS | YEAR | POUNDS |
|---|---|---|
| 141 | 92 | 58 |
| 142 | 93 | 22 |

**Table A-1 (con't)**




MD. CHESAPEAKE BAY NUMBERED COMMERCIAL FISHING AREAS—NOAA CODES

**Figure A-2**

assignments at a field office and at district headquarters been observed laying eggs in the sandy intertidal zone seaward of bulkhead structures - nests that are subsequently destroyed by high tides. Shoreline stabilization may also crowd nesting terrapins into smaller remaining habitats. Reduced numbers of viable breeding sites render terrapin populations more vulnerable to massive environmental disturbances, e.g. coastal flooding or disease. Crowding may also seriously decrease terrapin populations because predation rates are higher on nesting areas with higher nesting densities (Roosenburg 1990).

Other shoreline stabilization practices, e.g. beach grass planting, have been shown to destroy terrapin nests. Roosenburg (1991) documented that rhizomes of planted beach grass frequently penetrate terrapin eggs, killing the embryos. Lazell and Auger (1981) and Stegmann et al. (1988) found roots of these grasses surrounding nests, using the eggs as a source of nutrients and killing the embryos, or entangling hatchlings, which subsequently die underground. In addition, as beach grasses colonize more beach foredune area, less open sandy area is available for terrapin nests.

Raccoons are a primary predator of terrapin eggs (Roosenburg 1991). Red fox also are significant predators.[2] Shoreline development may contribute to increased numbers of raccoons and foxes that are well-adapted to human encroachment. Increases in these species likely places greater demands upon prey items, such as turtle eggs.

The recreational and commercial crab fishery in the Chesapeake Bay presents a serious threat to the diamondback terrapin. The traditional 2ft.x2ft.x2 ft. wire crab pot used in the Bay captures terrapins (Bishop 1983; Roosenburg 1992). Juvenile and male terrapins, by virtue of their smaller size, are the most frequently caught. Because the pots are deployed in the subtidal zone for extended periods of time, the captured terrapins drown.

The commercial diamondback terrapin fishery in the Chesapeake Bay also presents a significant, potential threat to the species. Studies on terrapins in the Potomac River have shown the species to have low reproductive rates (est. 39 eggs/yr.) and low survivorship (1% to 3% of eggs to hatchlings; hatchling to adult - unknown) (Roosenburg 1992). Current terrapin harvest regulations in Maryland restrict harvest to individuals of a minimum plastron length of 6 inches. This size restriction targets reproductive females, placing diamondback terrapin recruitment at greater risk.

*Restoration/Protection Opportunities*

Sandy substrates are important dianmondback terrapin breeding areas, compared to other habitat types. For example, terrapin eggs taken from an eroding clay bank, abutting a sandy intertidal substrate, were found to be inviable because clay particles clog pores in the eggs, and inhibit gas exchange (Roosenburg 1994). Nests are generally above the reach of normal high

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**[2]G.M. Haramis and D. Jorde, Personal Communication, 1996, Patuxent Wildlife Research Center, USGS, Biological Resources Division, Laurel, MD.**

tides, such as on elevated sand dunes (Siegel 1984; Auger and Giovannone 1979) or on the high, foredune area. Typically, nesting areas are closely associated with extensive salt marsh and lagoon systems, which provide habitats for adult terrapins (Roosenburg 1994). On the Patuxent River, Roosenburg found that terrapin nesting density was higher on open, sparsely vegetated beaches that were isolated from the mainland by saltmarsh. Although infrequent, wind-driven high tides occasionally flooded the nests, Roosenburg reported that the embryos could frequently survive intermittent inundation depending upon the stage of incubation and duration of flooding. Lovich et. al. (1991) discovered that artificially incubated, released terrapin juveniles avoid open water, and instead seek out and burrow into tidal wrack habitat. Burger (1977) reported that hatchlings move toward the closest terrestrial vegetation, and Pitler (1985) observed juveniles hiding under accumulated surface debris and matted *Spartina* sp. Lovich et. al. (1991) proposed that young terrapins utilize wrack for cover, moist conditions, cooler temperatures, and small invertebrate foods, such as small crabs, amphipods, and insects.

Base on these studies, creating potential diamondback terrapin nesting habitat through beneficial use of dredged material on Smith Island is feasible. Terrapin habitat projects could be dove-tailed with creation of breeding habitat for terns, skimmers and oystercatchers (see colonial waterbird section of this report). Sandy material should be placed along shorelines at highly isolated points around the island complex, and mounded into high dune areas or elevated marsh ridges. Placement sites should be at elevations 6-8m above the high tides, and should be protected from erosion using geotextile tubes or other erosion barriers, to assure long-term availablity of breeding habitat. Sites should not be planted with native dune grasses, which will reduce the potential as breeding habitat for terrapins, and terns and skimmers. Any shoreline placement sites on Smith Island should be adjacent to saltmarsh and shallow estuarine waters to provide habitat for terrapin adults.

Studies suggest that diamondback terrapins exhibit limited movements, and that populations are restricted to small, discrete areas within the Bay (Roosenburg 1992). This factor, combined with the philopatric tendencies of the species, may indicate that it will take a long period of time for populations to establish nesting areas on newly-created sites. However, sandy substrates above the reach of high tides are rare on Smith Island, and many of these areas are eroding. Created beach habitats may provide a limited and declining nesting substrate.

U.S. Fish and Wildife Service personnel and biologists from the Patuxent Wildlife Research Center[3] have observed female diamondback terrapins aggregating on the upland hammocks on Smith Island during the breeding season. Because unvegetated, high sandy substrates are limited at Smith, the biologists conclude that it is likely that terrapins use these marsh islands as nesting sites. No studies on the productivity of terrapins on these islands have

[3] **D.Jorde, PhD. Personal Communication, 1996, Patuxent Wildlife Research Center, USGS, Biological Resources Division, Laurel, MD.**

been conducted. However, the likelihood of use of these hammocks by diamondback terrapins, coupled with the value of these sites as breeding areas for colonial waterbirds and waterfowl, and staging areas for migrating neotropical landbirds, underscores the need to permanently protect them.

Other reptile species occurring on Smith Island include: box turtle (*Terrapene carolina carolina*), northern water snake (*Natrix sipedon*), and rough green snake (*Opheodrys aestivus*). These species are not currently perceived as threatened or declining in Maryland.

**Colonial Waterbirds - Waders**

*Populations/Habitats*

The coastal plain is the most important physiographic region in Maryland for breeding colonial waterbirds. Chesapeake Bay islands within this region provide particularly important habitats for bird colonies. According to state surveys, in 1995, Somerset County contained 20% of the state's total colonial waterbird colonies and 23% of the total breeding pairs (Brinker et al. 1996). Smith Island has one of the highest numbers of colonial waterbird colonies-per-area in the state; twelve active breeding colonies for wading birds were recorded there in 1995. Five species of heron, three species of egret, and glossy ibis breed at Smith Island according to state surveys (see Table A-2). This census does not include green herons, which have also been recorded as breeding on Smith Island (Armistead 1974).

Brinker et al. (1996) reported that four of the nine species of wading birds that breed at Smith Island have shown significant declines in Maryland between 1985 and 1995 (snowy egret, tricolored heron, black-crowned night heron, and glossy ibis). Declines for these species may be the result of a variety of factors, including habitat disturbance or loss, altered prey bases, increases in competing species, increases in predators, or exposure to contaminants. Because colonial waterbirds concentrate reproductive efforts at a few, discrete locations, these populations are particularly sensitive to habitat disturbance or loss. The Maryland population of glossy ibis has declined by approximately 50% since 1985 - primarily attributable to a major disturbance at the Point Comfort colony on Smith Island. The Maryland Department of Natural Resources, Wildlife and Heritage Division has placed a high priority upon protection from human disturbance and erosion for colonial waterbird rookeries (Brinker et al. 1996).

Rookeries at Smith Island are located on isolated ridges surrounded by marsh (*hammocks)*, vegetated primarily with woody shrubs, i.e. wax myrtle (*Myrica cerifera*), groundsel tree (*Baccharis halimifolia*), and marsh elder (*Iva frutescens*), trees, i.e. black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), and hackberry (*Celtis occidentalis*), and vines, i.e. japanese honeysuckle (*Lonicera japonica*), poison ivy (*Toxicodendron radicans*), and blackberry (*Ribes* spp). Hammocks are generally small sites (1-20 acres), isolated from larger land masses by extensive tracts of black needlerush (*Juncus roemerianus*) marsh and tidal creeks. Some hammocks are topographic high points in the landscape that have become isolated due to land subsidence and sea level rise; others are dredged material disposal areas that were originally, in part, tidal marsh.

There are approximately 12 hammocks on Smith Island that currently contain important wading bird rookeries. Three of these areas, Cherry Island, Wellridge Creek, and Lookout Tower are part of Martin National Wildlife Refuge. The other areas are privately owned wooded islands scattered across the southern half of Smith Island, south of the Big Thoroughfare navigation channel.

Table A-2. Colonial waterbirds breeding at Smith Island according to Brinker et al. (1996) and the Maryland Department of Natural Resources, Division of Forestry, Wildlife and Heritage.[4]

| Species Common Name | Scientific Name | Status |
|---|---|---|
| **Glossy Ibis** | ***Plegadis falcinellus*** | tracked as rare by MDNR; declining trend 1985-1995 |
| **Great-blue Heron** | ***Ardea herodias*** | |
| **Great Egret** | ***Casmerodius albus*** | |
| **Snowy Egret** | ***Egretta thula*** | declining trend 1985-1995 |
| **Tricolored Heron** | ***Hydranassa tricolor*** | declining trend 1985-1995 |
| **Little Blue Heron** | ***Egretta caerulea*** | tracked as rare by MDNR |
| **Cattle Egret** | ***Bubulcus ibis*** | |
| **Black-crowned Night-heron** | ***Nycticorax nycticorax*** | declining trend 1985-1995 |
| **Yellow-crowned Night-heron** | ***Nyctanassa violacea*** | |

*Threats*

Wooded island habitats in the Chesapeake Bay, exposed to little disturbance by humans or mammalian predators, provide important breeding sites for migratory birds such as colonial waterbirds (Erwin and Spendelow 1991), waterfowl and certain raptors. These sites also provide important resting and staging areas for migratory songbirds. Habitats for many of these species have been severely limited on the mainland surrounding the bay because of development, human disturbance, cultivation, and exposure to predation by domestic animals.

Recent studies have demonstrated that erosional loss of Chesapeake Bay island habitats has accelerated during the last century, due to sea-level rise and land subsidence (Wray et al. 1995, Kearney and Stevenson 1991). Recent studies on three wooded islands in the Chesapeake Bay - Barren, James, and Poplar Islands - suggest that these habitats are eroding along western shorelines at an average rate of 4.96 m/yr ±0.12 (Wray et al. 1995). Erosion on eastern shore islands in the middle portion of the Bay (Galenter 1990) has reduced nesting habitats, which has a

**4 J.McKnight, Personal Communication, 1996, Maryland Department of Natural Resources, Division of Forestry, Wildlife and Heritage, Heritage and Biodiversity Conservation Resource Management Team, Annapolis, Maryland.**

negative impact on colonial waterbirds, waterfowl, and migratory songbirds. Habitat loss for wading birds breeding in the bay region increases risks of predation, disease, and natural disasters (storm events, oil spills, etc.) (Erwin and Spendelow 1991). Waterfowl researchers have correlated the loss of isolated islands, along with increased shoreline development, with the decline of black ducks in the Chesapeake Bay (Krementz et al. 1991).

Erosion poses the greatest threat for waterbird colonies on Smith Island. For example, one hammock, currently used by black-crowned and yellow-crowned night herons, is threatened by erosion near Rhodes Point. Erosion has been slowed by placing dredged material and geotextile tubes along the shoreline adjacent to this shrub community. However, the shoreline is still eroding, especially at the north end of the geotextile tubes (Mitchell and Gill [a] 1996).

The Maryland Department of Natural Resources (MDDNR) Program Open Space, evaluated the privately owned hammocks on Smith Island in 1990 (McKnight 1990). MDDNR recognized that these islands represent important rookery habitat, varying in quality according to size, vegetation, and proximity to human disturbance. The state also noted that a significant percentage of homes on Smith had recently been purchased as recreational/ vacation homes by off-islanders, and that several of the privately owned forested hammocks were for sale. Program Open Space concluded that development poses a potential threat for these habitats. Any disturbance to or alteration of the vegetation on these hammocks, such as construction of hunting facilities, could reduce their value as rookery habitats. As an example, the release of goats on the Pt. Comfort hammock on Smith, during 1993-1994, created a disturbance that reduced the (formerly) numerous nesting pairs of colonial waterbirds on that ridge by 93% in 1995 (Brinker et al. 1996).

Some of the rookery sites are associated with dredged material disposal sites. Several of these sites also contain the invasive plant *Phragmites australis*, likely because the plant readily colonizes bare, brackish or nutrient-poor substrates, such as dredged material. *Phragmites* sp. is a highly competitive plant that provides lower quality habitat than the heterogenous plant communities normally populating hammocks (Marks et al 1994). *Phragmites* sp. creates dense stands, with little vertical diversity - mammalian and avian population densities in *Phragmites* are generally low (Jones and Lehman 1987). *Phragmites* sp. may spread and outcompete woody species on the islands, rendering them less suitable for bird use. Or *Phragmites* sp. may spread to new islands, especially if the woody vegetation on these islands undergoes a disturbance, such as drought or fire.

In addition, there are red fox (*Vulpes vulpes*) populations on the island. While fox generally do not pose a threat to wading birds nesting high in trees,[5] they may currently limit the ability of these birds to breed in shrub communities on the hammocks.

**[5] G.Therres, Personal Communication, 1996, Maryland Department of Natural Resources, Division of Forestry, Wildlife and Heritage, Annapolis, MD.**

*Restoration/Protection Opportunities*

Because the threat of development for many of the marsh islands haboring colonial waterbirds is real, USFWS recommends acquisition of the privately owned parcels, where possible, and transfer to a wildlife management or conservation organization, such as USFWS, MD-DNR, the Nature Conservancy, or the Chesapeake Bay Foundation (see Table A-3). Alternatively, USFWS recommends acquisition of conservation easements on these lands, with specific preservation/management agreements.

Eradication of *Phragmites* from the vegetative community at many of these marsh islands would enhance these habitats for colonial waterbirds. Sites should be spot-treated with an herbicide approved for use in aquatic systems, late in the growing season (which would also minimize disturbance to breeding birds). These areas could then be planted with native shrub and tree species, to provide additional rookery habitat. The dredge material disposal site at Easter Point, currently infested with *Phragmites* sp., holds great potential for conversion to important wading bird habitat. Eradication of *Phragmites* sp. and establishment of a coastal woody plant community on this site would create up to 20 acres of potential colonial waterbird habitat.

Erosion control presents another protection opportunity, especially for the rookery at Rhodes Point Gut. This particular island habitat is small, degraded by *Phragmites*, and populated with herring gulls, but it serves as breeding area for black-crowned night heron and yellow-crowned night heron. Further protection by beneficial placement of dredged material, eradication of *Phragmites* sp., and plantings of native tree and shrub species, would discourage gulls and enhance this area as colonial waterbird breeding habitat.

Finally, dredged material could be used to create new, isolated island habitats. Establishment of coastal woody plant communities on these islands, and diligent control of *Phragmites* sp. during the initial phases of vegetative development would be key to creating viable wading bird breeding habitats from dredged material. Such newly-created islands should be placed far from other marsh areas or uplands on Smith Island, to achieve isolation from mammal predators. These wooded communities may also serve as nesting sites for waterfowl such as American black duck and gadwall, especially if a vine groundcover develops.

TABLE A-3. Species composition of colonial waterbird colonies on Smith Island complex, 1995, with USFWS restoration/protection comments (species information from Brinker et al. 1996). Colonies listed below in bold type are located within the refuge.

| Site Number | Site Name | Breeding Pairs in 1995 | Restoration/Protection Notes |
|---|---|---|---|
| Som002 | **Cherry Island** | GTBH, GREG, SNEG, CAEG, LBHE, TRHE, BCNH, YCNH, GLIB | Protected as part of Martin NWR, not threatened by erosion, 8 species, 297 pairs |
| Som013 | Rhodes Point South | GREG, SNEG, CAEG, LBHE, TRHE, BCNH, YCNH, GLIB | Privately owned, 8 species, 539 pairs, 2 state-rare species, close to existing beneficial use/erosion control project |
| Som015 | Hog Neck | GTBH, GREG, SNEG, LBHE, TRHE, BCNH, YCNH, GLIB | Privately owned, 8 species, 111 pairs, 2 state-rare species |
| Som017 | Point Comfort | GREG, SNEG, CAEG, LBHE, TRHE, BCNH, YCNH, GLIB | Privately owned, 8 species, 299 pairs, 2 state-rare species |
| Som018 | Ewell | GTBH, GREG, LBHE, TRHE, BCNH, YCNH, GLIB | Privately owned, 7 species, 121 pairs, 2 state-rare species |
| Som019 | Rhodes Pt. Road | GREG, YCNH, GLIB | Privately owned, eroding, 3 species, 11 pairs, 1 state-rare species |
| Som020 | Pines Hammock | GREG, SNEG, CAEG, LBHE, TRHE, BCNH, YCNH, GLIB | Privately owned, 8 species, 139 pairs, 2 state-rare species |
| Som021 | Ireland Hammock | GTBH, GREG, SNEG, LBHE, TRHE, BCNH, YCNH, GLIB | Privately owned, 8 species, 69 pairs, 2 state-rare species |
| Som025 | **Wellridge Creek** | GTBH, GREG, SNEG, CAEG, LBHE, TRHE, BCNH, YCNH, GLIB | Protected as part of Martin NWR, potential erosion threat, 9 species, 124 pairs, 2 state-rare species |
| Som027 | Rhodes Pt. Gut | BCNH, YCNH, GBBG, HERG | Privately owned, 4 species, 4 pairs not including gulls, herring and great black-backed gulls present |

| | | | |
|---|---|---|---|
| Som028 | Jean's Gut | SNEG, CAEG, LBHE, TRHE, BCNH, YCNH, GLIB, HERG | Privately owned, 8 species present, 109 pairs not including gulls, 2 state-rare species, herring gulls present |
| Som030 | **Sawney Cove** | GBBG, HERG | Protected as part of Martin NWR, only herring gulls and great black-backed gulls present |
| Som038 | Levering Creek | GBBG, HERG | Privately owned, only herring gulls and great black-backed gulls present |
| Som039 | South Ewell | HERG | Privately owned, only herring gulls present |
| Som041 | **Lookout Tower** | GREG, SNEG, CAEG, LBHE, TRHE, YCNH, GLIB | Protected as part of Martin NWR, not threatened by erosion, 7 species, 688 pairs, 2 state-rare species |
| Som044 | **Terrapin Sand Pt** | GBBG, HERG | Protected as part of Martin NWR, potential erosion threat, only herring gulls and great black-backed gulls present |
| Som047 | North Great Pond | HERG | Privately owned, only herring gulls present |
| Som048 | Drum Pt Island | GBBG, HERG | Only herring and great black-backed gulls present |

Key to Species Abbreviations

BCNH - black-crowned night heron
YCNH - yellow-crowned night heron
TRHE - tri-colored heron
GTBH - great-blue heron
CAEG - cattle egret
SNEG - snowy egret
GBBG - great black-backed gull
GLIB - glossy ibis
GREG - great egret
HERG - herring gull
LBHE - little blue heron

**Terns, Skimmers, Pelicans and Gulls**

*Population/Habitats/Threats*

Colonial waterbird species, other than wading birds, are generally characterized as terns, skimmers, gulls and pelicans (see Table A-4). In studies along the mid-Atlantic barrier islands of Virginia, Watts (1994) described three major categories of nesting habitat for these species: 1) sandy or shell substrate, 2) dune grasslands and 3) isolated ridges surrounded by marsh. Although Smith Island is not a barrier-lagoon system, it contains several habitats similar to those in Virginia, including sandy beaches, small dune grasslands, and isolated marsh ridges.

Generally, the largest and most stable, productive colonies of terns and skimmers occur on upper foredune areas of isolated sandy beaches, usually on small islands that are not likely to be overwashed during spring or small storm tides (Watts 1994). In addition, piles of shell and sand on ridges isolated by tidal marsh are also significant nesting areas for gull-billed tern, black skimmer, common tern (*Sterna hirudo*) and least tern (*Sterna albifrons*). Forster's tern also breed on isolated ridges, and on wrack deposits in tidal marsh (Watts 1994). Since 1985, populations of common tern and Forster's tern in Maryland have declined significantly (Brinker et al. 1996)and the Maryland population of least tern and black skimmer, while currently stable, are listed as threatened (McKnight, pers comm).

Brown pelicans traditionally bred in the coastal zone of the southeastern United States, including the Atlantic Coast from North Carolina to Florida, and the Gulf Coast from Florida to Texas (Hamel 1992). However, recent improvements in coastal water quality and protection of important nesting areas have contributed to an apparent northward expansion of the breeding range into the mid-Atlantic coast and Chesapeake Bay. The Atlantic coast population of brown pelican has recovered and was removed from the Federal list of endangered species in 1985. Although the eleven-year trend for brown pelicans in Maryland is stable, their numbers declined in 1994-1995 (Brinker et al. 1996). Preferred nesting habitat are dune grasslands in coastal areas, especially on small islands (Watts 1994).

Herring gulls and great black-backed gulls primarily nest in dune grassland and elevated, vegetated marsh ridge habitats (Watts 1994). Herring gulls were the second most abundant breeding waterbird in 1995, with 2,410 pairs counted in Maryland, and their population trend has been stable since 1985 (Brinker et al. 1996). In Maryland, great black-backed gulls have increased in population since 1977, and they generally associate with nesting herring gulls (Erwin 1979). These two gull species are significant predators upon terns and skimmers, and are not a priority species for restoration efforts.

Species in the tern, skimmer, pelican and gull groups, which have been recorded as nesting in Maryland, are listed on Table A-4. The 1995 comprehensive census of colonial waterbirds nesting in Maryland did not record the presence of breeding pairs of any of these species, except herring and great black-backed gulls at Smith Island. However, the Maryland Department of Natural Resources, Heritage and Biodiversity Conservation Resource Management Team reported the historical presence of two of these species at Smith Island: least tern (threatened), and black skimmer (threatened).

The 1995 census did record breeding activity for two tern species (common and Forster's) and black skimmer along the western shore of South Marsh Island Wildlife Management Area, less than 8 miles north of the Smith Island. In 1996, USFWS personnel observed an active brown pelican colony (previously observed on Shank's Island) at Cheeseman Island, on the south end of the Smith Island in Virginia (Mitchell and Gill 1995).

Degradation and loss of habitat has likely contributed to declines in tern and skimmer populations in Maryland. Erosion has significantly impacted the isolated offshore habitats used extensively by these species; over 10,500 acres of these island habitats have been lost in the middle eastern portion of the Chesapeake Bay in the last 100 to 150 years (Galenter 1990). In addition, waterfront development and shoreline stabilization have been extensive in the Chesapeake Bay and Maryland coastal bay regions, including privately-owned island waterfront beaches. As evidence of limited available breeding habitat in the Chesapeake Bay region, 10 of the 15 active least tern colonies (or 63%) in Maryland in 1995 were on gravel rooftops, instead of shoreline habitat.

Predators of ground-nesting waterbirds include Raccoon (*Procyon lotor*), red fox, gulls and crows (*Corvus ossifragus*) (Amos and Amos 1989). The presence of predators on large Chesapeake Bay Islands, such as Smith Island, poses a threat to any potential tern and skimmer colony. In Virginia, the Nature Conservancy Virginia Coast Reserve has documented the disappearance of waterbird colonies from Smith, Metompkin, and Parramore Islands as raccoon and fox populations increased (Stolzenburg 1995). Red fox, herring, and great black-backed gull populations exist on Smith Island.

*Restoration/Protection Opportunities*

Restoration initiatives for breeding habitats for terns and skimmers are limited on Smith Island. These species require sandy foredunes and unvegetated ridges within marshes, well isolated from mammalian predators, to establish successful breeding colonies. The Patuxent Wildife Research Center is currently conducting a pilot study of red fox populations on Smith Island. Preliminary information indicates that red fox are able to use all of Smith Island and readily swim across major tidal creeks to reach isolated ridges and sandy beaches.[6]

Any beneficial use projects that include breeding terns and skimmers should focus on creating sandy foredunes and elevated marsh ridges at isolated points around the island complex, i.e. the small islands between Smith and Tangier Islands. These sandbars and/or marsh ridges should be created at elevations 6-8m above the highest tides, and should be protected from erosion with geotextile tubes or other erosion barriers to assure long-term availablity of breeding habitat. However, if sites succeed to native dune grass communities, they may become unsuitable for tern and skimmer species, and instead become colonized by gull, pelican, or solitary shorebird species (Soots and Parnell 1975). For brown pelicans it will be virtually impossible to use dredged material to create breeding habitat (dune areas sparsely vegetated with beach grasses) without creating potential breeding habitat for herring gulls.

[6] **D.Jorde, PhD., Personal Communication, 1996,Patuxent Wildlife Research Center, USGS, Biological Resources Division, Laurel, MD.**

Table A-4 Colonial waterbird species, other then wading birds, which have been recorded as nesting in Maryland (Robbins 1996)

| Species common name | Scientific name | Status |
|---|---|---|
| brown pelican | *Pelecanus occidentalis* | |
| double-crested cormorant | Phalacrocorax auritus | |
| great black-backed gull | Larus marinus | |
| herring gull | Larus argentatus | |
| laughing gull | Larus atricilla | |
| royal tern | Sterna maxima | |
| sandwich tern | Sterna sandvicensis | |
| common tern | Sterna hirundo | |
| roseate tern | Sterna dougalii | |
| Forster's tern | Sterna forsteri | |
| least tern | Sterna antillarum | threatened |
| gull-billed tern | Sterna nilotica | |
| black skimmer | Rynchops niger | threatened |

### Shorebirds

*Populations/Habitats/Threats*

There are few shorebirds that have historically bred at Smith Island. However, willet (*Catoptrophorus semipalmatus*) nests were located on Smith in 1996.[7] American oystercatcher (*Haematopus palliatus*), a state-listed rare shorebird, have also been sited on the island (Armistead, 1974). Willets generally nest just above the beach foredune, in dune grass or even low shrub communities (Bent 1962, Hayman et al. 1986), while oystercatchers nest in habitats similar to least tern breeding areas, i.e. higher parts of dry, flat, sandy beaches (Bent 1962).

While shorebird breeding activitiy at Smith is low, migrating shorebirds make extensive use of the mudflats and sandy intertidal areas on the island complex. Numerous species of shorebirds stopover and feed in the Smith Island during spring and fall migration such as plovers, various sandpipers; dowitchers; yellowlegs, etc. (see Table A-5).

**7 D.Jorde, PhD. Personal Communication, 1996, Patuxent Wildlife Research Center, USGS, Biological Resources Division, Laurel, MD.**

Table A-5 Shorebirds recorded at Martin National Wildlife Refuge.[8]

| Common Name | Scientific Name |
|---|---|
| American oystercatcher | |
| willet | |
| semipalmated sandpiper | |
| spotted sandpiper | |
| least sandpiper | |
| western sandpiper | |
| purple sandpiper | |
| pectoral sandpiper | |
| black-bellied plover | |
| semipalmated plover | |
| killdeer | |
| dunlin | |
| red knot | |
| lesser yellowlegs | |
| greater yellowlegs | |
| snipe | |
| sanderling | |

Shorebirds rely on sandy and muddy shorelines as forage and rest sites. These birds feed on small mollusks, worms, and crustaceans, foraging in mudflats, tidal pools, and sandy intertidal zones. Tidal flats on Smith Island, such as those found along the eastern shoreline at Twitch Cove, Wellridge Creek, and the southeastern shore of Big Thoroughfare, provide such forage areas.

Erosional and human-caused loss of island and mainland shoreline habitat in the Chesapeake Bay, as described in the sections on colonial waterbirds, has decreased forage, resting, and (to a limited exent) breeding habitats for shorebirds.

*Restoration/Protection Opportunities*

Because of its isolation from the mainland Smith Island presents an opportunity to create temporary avian foraging and resting sites, as well as more permanent foraging and breeding

8 **E.Johnson, Personal Communication, 1996, Blackwater National Wildlife Refuge, Cambridge, MD.**

areas. Dredged material, sandy or more fine-grained, could be placed along shorelines protected from waves and currents. If the final elevation of the dredged material placement site is intertidal, it could serve as a forage site. However, such projects will likely create only *temporary* feeding/resting habitat for shorebirds and other wading birds. These areas will not require maintenance, nor stability structures.

Dredged material could also be incorporated into long-term habitat types, with erosion control benefits. Material, especially sandy material, could be placed behind properly sized stabilizing structures (such as geotextile tubes or low-elevation rip-rap) to create permanent forage areas along eroding shorelines. Such projects have already been carried out within the Chesapeake Bay, such as at Eastern Neck NWR (Gill et al. 1995). Tidal pools and intertidal flats could be shaped from dredged material, potentially creating forage habitat for dabbling ducks, geese, shorebirds and wading birds. Higher dune areas, created by mounding dredged material behind the intertidal placement area, could serve as breeding habitats for various coastal birds, depending upon the material type and the succeeding vegetation.

Restoration initiatives for shorebird breeding habitats, such as willet and American oystercatcher, are limited on Smith Island. Use of dredge material to create back-dune grassland habitats suitable for willets also carries the potential to create areas attractive to breeding herring gulls. Such creation sites should be planted with coastal shrub species to discourage gull use. Beneficial use projects focused on restoring foredune habitats for terns/skimmers, as descibed above, may also benefit the American Oystercatcher. These restoration sites should be well isolated from mammalian predators.

**Waterfowl**

*North American Trends*

Certain waterfowl populations have declined at Smith, reflecting waterfowl trends throughout North America. Between 1958 and 1963, North American pintail breeding population estimates dropped from about 10 million to about 3 million. After a rebound in the early 1970's, populations declined again to present levels of about 2 million pintails (Caithamer et al. 1995). Similarly, mallard populations in North America generally declined, dropping from an estimated breeding population of about 10 million in 1971 to about 4.5 million from the late 1980's through to 1993 (Caithamer et al. 1995). North American widgeon breeding populations declined from the early 1980's (about 3.5 million) to the mid-1980's (about 1.75 million). The USFWS attributes these decreases largely to prairie nesting habitat loss and degradation (Caithamer et al. 1995). More recently (1995-1996), estimated numbers of these and other dabbling ducks have increased, attributed, in part, to favorable climatic conditions on breeding grounds.

*Mid-Atlantic Trends*

Mid-winter counts of diving ducks have also decreased considerably on the Chesapeake Bay. Diver numbers in mid-winter in the Chesapeake Bay between 1987-1996 (165,323) were much lower than the 1956-1965 average (250,459), as well as the 1956 and 1996 average

(192,938). These trends were generally reflected at Smith Island. Mid-winter counts of diving ducks at Smith between 1987-1996 (734) were lower than the 1956-1996 average (1,395).

During the 1950's, the Chesapeake Bay harbored over 250,000 wintering canvasbacks. These populations declined to about 50,000 in the late 1980's, and have slightly rebounded to about 60,000 currently (Haramis 1991; Forsell 1996). While several factors have contributed to the decline of North American populations of canvasback (loss of prairie nesting habitat, degradation of migratory habitat, hunting pressure), the USFWS considers one of the most important factors in the Chesapeake Bay to be the drastic decline in Submerged Aquatic Vegetation (SAV) during the 1970's (Haramis 1991). Canvasbacks will consume animal foods, such as Baltic clam and mud crab; however, preferred food items are wild celery, eelgrass, sago pondweed, redhead grass, and widgeon grass. As these plant species have declined in the Chesapeake Bay, so have numbers of canvasback.

Redhead were also historically abundant diving ducks in the Chesapeake Bay region. During the late 1950's and early 1960's, midwinter counts of redhead in the Bay were on the order of 50,000 (Forsell 1996). As with the canvasback, habitat destruction and hunting pressure have contributed to redhead declines. In addition, the redhead is also an important consumer of SAV. During fall and spring migration, redhead were historically found in fresh and brackish SAV areas in the upper and middle Bay. Cold winter periods, with heavy freezing, generally moved the birds to the eelgrass and widgeon grass beds in the lower Bay (Haramis 1991). However, as SAV declined in the Chesapeake Bay, redheads did not adapt to animal foods, but essentially abandoned the region. Populations shifted south, to North Carolina, and most likely the Florida Gulf coast (Haramis 1991). Chesapeake Bay mid-winter populations have drastically declined since the 1960's, to a low, relatively stable average of about 1,921 birds (1987-1996).

Other waterfowl populations have shown declines. Mid-winter Canada goose counts in the Chesapeake Bay have declined since the late 1980's. Current mid-winter counts stand at approximately 300,000 birds, while numbers in the 1980's were generally above 500,000 geese. The Canada goose population in the Atlantic flyway is currently in decline, prompting the closure of the hunting season on this species in 1996. Recent (1987-1996) average midwinter populations of Canada goose at Smith Island (1,612) are lower than historic (1956-1965) average midwinter populations (2,902) (Forsell 1996).

*Smith Island Trends*

The Atlantic mid-winter waterfowl survey is flown along standardized flight-paths along the major rivers and water bodies in the Atlantic flyway, including the Chesapeake Bay. The survey is conducted during the first 2 weeks of January and provides a comparative index of mid-winter waterfowl populations along the flyway. Numbers of species counted at Smith Island during the mid-winter waterfowl surveys, between 1956 and 1996 and the mid-winter counts for each species across the entire Chesapeake Bay are listed in Tables at the end of this Appendix. Also shown in the Tables is the average count for each species, at Smith Island, for the intervals 1956-1965, 1987-1996, and 1956-1996. In addition, each of these average counts for Smith Island is represented as a percentage of average Chesapeake Bay counts for these time intervals.

The average number of dabbling ducks counted in mid-winter in the Chesapeake Bay between 1987-1996 (91,743) was lower than the 1956-1965 average (177,039), and lower than the overall average between 1956 and 1996 (119,789). These trends were reflected at Smith Island. Mid-winter Smith Island counts between 1987-1996 (1,300) were much lower than the 1956-1965 average (5,563), and the 1956-1996 average (2,715).

Recently, mid-winter counts of dabbling ducks on the Bay (1991-1996) have shown slight increases since the 1980's. USFWS reports that the increase in dabbling duck counts in recent years is due, in part, to good reproductive success on prairie breeding grounds. However, the average number of dabbling ducks counted during mid-winter at Smith Island did not increase during the 1990's.

Smith Island harbors an important proportion of the midwinter populations of dabbling ducks on the Chesapeake Bay - 2.27% of the counts for the entire Chesapeake Bay between 1956-1996. Over this time period, the island complex contained over 1% of the Chesapeake Bay mid-winter counts for the following species: black duck, gadwall, widgeon, and pintail. In addition, Smith contained over 1% of the Chesapeake Bay mid-winter counts for five other species of waterfowl: readhead, bufflehead, scoter, oldsquaw, brant, and tundra swan. Considering that Smith Island contains (.0001 %?) of the shoreline of the entire Chesapeake Bay, the island concentrates a major portion of the mid-winter waterfowl population of the bay in a small area.

Compared to 1956-1965, the 1987-1996 mid-winter counts on Smith Island have decreased for mallard, black duck, widgeon, pintail, redhead, and canvasback. In addition, the percentage of the Chesapeake Bay mid-winter counts on Smith dropped: pintail (23.57% down to 1.76%) and mallard (0.52% down to 0.17%).

Except for mallard, several species have declined throughout the Chesapeake Bay during the 1956-1996 interval. Of these six species, only black duck and mallard breed in significant numbers on the Chesapeake Bay. Breeding black duck populations in the Atlantic flyway, including Maryland, have suffered precipitous declines since the 1950's, generally due to over harvest, loss of breeding and wintering habitat, pollution, and hybridization and competition with the mallard (USFWS 1986, Krementz 1991). Although they have recently stabilized, populations of black duck continue to be low, about 10% of populations in the 1950's (Krementz 1991).

*Smith Island Foraging and Migrating Habitats*

Smith Island contains extensive shallow-water habitats, SAV beds, tidal mudflats, and miles of fringing low marsh. Each of these habitats provides important wintering forage for a variety of waterfowl. The large eelgrass and widgeongrass beds in the Big Thoroughfare, Terrapin Sand Cove, Shanks Creek, and Back Cove are important to migrating and wintering waterfowl as feeding and resting areas. Eelgrass is an important food source for American black duck, widgeon, Canada goose, redhead, and brant. The plant provides nutrition through seeds, leaves, and root-stalks (Hurley 1992), and associated invertebrate foods. Widgeongrass, which generally grows in shallower habitats than eelgrass, is consumed by a variety of ducks that frequent Smith Island: black duck, gadwall, widgeon, mallard, green-wing and blue-wing teal, and pintail, and Canada goose and tundra swan (Martin et al. 1951; Bellrose 1976; Hurley 1992).

Low marsh habitats on Smith Island (extensive *Spartina alterniflora* marshes fringing tidal creeks and the associated mudflats) also provide important waterfowl forage areas for animal foods. American black duck, in particular, can subsist to a large extent on animal foods found in the low saltmarsh such as snails, mussels, small crustaceans, and aquatic insects (Martin et al. 1951; Bellrose 1976). Mudflat habitats and shallow marsh habitats are also heavily used by green-winged and blue-winged teal. These ducks feed upon the seeds of moist soil plants deposited in the intertidal zone, and associated invertebrate species (Bellrose 1976). *Spartina alterniflora* rootstocks are a significant part of the diet of wintering snow- and Canada- geese (Martin et al. 1951; Bellrose 1976).

*Smith Island Breeding Habitats*

Smith Island is an important breeding area for American black duck, mallard, and to a lesser extent, gadwall, on the Chesapeake Bay. Black duck nest in a variety of habitats on the Chesapeake Bay, including wooded areas, marshes, and old duck blinds (Stotts and Davis 1960). Mallards and Gadwall prefer to nest on small upland sites, such as the hammocks at Smith, rather than directly over marshes (Bellrose 1976).

*Restoration/Protection Opportunities*

Restoration

Martin National Wildlife Refuge and undeveloped marshes of Smith Island provide important habitats for wintering and migrating waterfowl, including dabbling ducks and geese. Creating tidal wetlands and/or mudflats, through intertidal placement of dredged materials, may benefit these species. Also, creating temporary avian foraging and resting sites (see the shorebird habitat section of this report) could also serve as forage habitat for waterfowl such as black ducks, mallard, gadwall, and teal. Dredged material placed along shorelines, protected from major wave and current influence, could serve as temporary feeding/resting habitat for waterfowl.

In addition, dredged material could also be incorporated into long-term waterfowl habitats. Material placed behind properly sized stabilizing structures could be planted with high-marsh and low-marsh wetland vegetation, to create more permanent saltmarsh forage and potential breeding habitats for waterfowl species. These marsh creation projects should incorporate raised ridges of material, and interior tidal pools, into the overall marsh design, to maximize the diversity of vegetative communities. These marsh creation projects could benefit a variety of waterbirds, including waterfowl and wading birds, while protecting eroding shorelines.

Restoration activities on existing large dredge-material disposal sites on Smith Island, such as the site at Easter Point, could benefit waterfowl. Nontidal or brackish pools could be created in the interior areas of such dredge sites, where material is generally fine-textured and poorly drained. Such pools could be planted with, or be allowed to naturally populate with, submerged aquatic vegetation native to the region, such as widgeongrass (*Ruppia maritima*), muskgrass (*Chara* sp.), and pondweeds (*Sago* sp.). These species would provide feeding areas for dabbling ducks. In addition, eliminating *Phragmites* sp. using herbicide, and planting with coastal shrubs and grasses, would greatly enhance these sites as potential breeding areas for waterfowl, or shrub-nesting colonial waterbirds. For example, habitat restoration on a diked-dredge disposal area is currently underway at Swash Bay, Virginia, through a cooperative arrangement between the Norfolk Corps of Engineers, The Nature Conservancy Virginia Coast Reserve, and the U.S. Fish and Wildlife Service (Mitchell and Gill [b]1996).

Dabbling ducks that breed at Smith Island could benefit from newly created isolated islands from beneficial placement of dredged material. New marsh and upland habitats may provide additional forage habitats for a variety of waterfowl, and nesting habitat for mallard, black duck and gadwall. These creation activities should focus on creating islands in areas that do not currently contain important benthic habitats and are isolated from large uplands areas inhabitated by mammalian predators. Final elevation of these islands should be 6-8 m above high tides, which can cause nest failure in tidal marshes. The islands should be vegetated with tall, dense, herbaceous vegetation, such as salt meadow hay and switchgrass (*Panicum virgatum*), and coastal shrubs. For example, similar island creation projects are underway at Poplar Island, in Chesapeake Bay, and Chincoteague Inlet, in the Coastal Lagoon System in Virginia.

In past decades, dieout of eelgrass along the Atlantic Coast has been blamed for decreases in Atlantic brant populations (Bellrose 1976; Martin et. al. 1951). Other waterfowl feed on eelgrass, including widgeon, black duck, scaup and scoters. Re-establishment of eelgrass beds, or creation of new beds would benefit waterfowl, especially Atlantic brant. Researchers believe that new beds of eelgrass establish on sandy substrates, and gradually accumulate finer sediment particles, by slowing currents (Stevenson and Staver 1996, Taylor 1996). Establishment of eelgrass beds in sandy substrates is currently under investigation, and bears further research. The Nature Conservancy reports that attempts within the Virginia Coastal Reserve to establish eelgrass have not been successful.[9] The Virginia Institute of Marine Science has undertaken several SAV establishment projects in Virginia in the last 15 years. Bob Orth of VIMS reports that these experiments have had low survivorship and potential propagule problems. Research is ongoing, focusing mechanisms of revegetation of existing SAV beds.[10]

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**9 B.Truitt, Personal Communication, 1996, The Nature Conservancy, Virginia Coast Reserve, P.O. Box 158, Nassawaddox, VA.**

**10 R.Orth, Personall Communication, 1996, during the EPA Chesapeake Bay Program, Submerged Aquatic Vegetation Workgroup Meeting, Dec. 6, 1996, Annapolis, MD.**

Protection

SAV beds provide critical feeding and resting areas for waterfowl. SAV beds at Smith Island that are threatened by erosion (e.g. in Terrapin Sand Cove and Twitch Cove) could be protected through beneficial use of dredged material. Material could be used to create erosion barriers, such as geotextile tubes, or to reinforce eroding spits of land that currently protect important SAV beds, e.g. the eroding islands at Terrapin Sand Point. In addition, dredged material could be used to close recently blown-out guts on the west side of Smith Island. These blow-outs may have increased water energy within the interior bays of Smith (e.g. the Big Thoroughfare, and Shank's Creek), and may contribute to loss of SAV at Smith.

U.S. Fish and Wildife Service personnel[11] and biologists from the Patuxent Wildlife Research Center[12] have observed black duck nests on the upland hammocks on Smith Island. As noted above, these hammocks are generally vegetated with coastal shrubs, vines, and dense grasses, nesting habitats utilized by black duck and gadwall on the Chesapeake Bay (Stotts and Davis 1960). These hammocks are limited on Smith Island, and potentially important to a variety of species. As noted in the colonial waterbird restoration-protection section, these sites should be acquired and/or protected by permanent conservation easements/agreements.

## MAMMALS

The most prevalent mammalian species on Smith Island are muskrats (*Ondatra zibethica*) and small rodents such as the meadow vole (*Microtus pennsylvanicus*). River otter (*Lutra canadensis*), mink (*Mustela vison*), and red fox also occur. Restoration projects which protect and/or create wetland habitats will benefit aquatic furbearer species. Upland habitat restoration will benefit rodents and the red fox. As discussed in the report sections dealing with waterbirds, projects which promote fox habitat will negatively impact ground nesting birds. Given the population status of these two guilds of animals, waterbird breeding habitats should be prioritized.

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**[11] M.Harrison, Personal Communication, 1996, Glenn L. Martin National Wildlife Refuge, Ewell, Smith Island, MD.**

**[12] G.M. Haramis and D. Jorde, Personal Communication, 1996, Patuxent Wildlife Research Center, USGS, Biological Resources Division, Laurel, MD.**

## LITERATURE CITED


Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service. FWS/OBS-79/31. 103 pp.

Fonseca, M.S., D.L. Meyer, and M.O. Hall. 1996. Development of Planted Seagrass Beds in Tampa Bay, Florida, USA. II. Faunal Components. Marine Ecology Progress Series 132:141-156.

Heck, K.L. and T.A. Thoman. 1984. The Nursery Role of Seagrass Meadows in the Upper and Lower Reaches of the Chesapeake Bay. Estuaries 7:70-92.

Lippson, A.J. 1973. The Chesapeake Bay in Maryland, An Atlas of Natural Resources. The Johns Hopkins University Press. 55 pp.

Maryland Geological Survey. 1975. Historical Shorelines and Erosion Rates Maps.

McHugh, J.C. 1966. Management of Estuarine Fishes. Amer. Fish. Soc., Spec. Pub. No. 3:133- 154.

Reed, T. 1997. Reed's Nautical Almanac, North American East Coast 1997. Thomas Reed Publications, Inc.

U.S. Environmental Protection Agency. 1995. Guidance for Protecting Submerged Aquatic Vegetation in Chesapeake Bay From Physical Disruption. EPA 903-R-95-013, CBP/TRS139/95. 24pp.

Virginia Institute of Marine Science, School of Marine Science, The College of William and Mary. 1994. 1994 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay. 100 pp.

Amos, W. H. and S.H. Amos. 1989. *Atlantic & Gulf Coasts*. Alfred A. Knopf, Inc., New York, New York.

Armistead, H.T. 1974. Lower Chesapeake heronries of Maryland, Smith Island to Barren

Island. Maryland Birdlife. 30:9-27.

Auger, P.J. and P. Giovannone. 1979. On the fringe of existence, Diamondback Terrapins at Sandy Neck. *Cape Naturalist.* 8:44-58.

Bent, A. C. 1962. *Life Histories of North American Shorebirds.* Dover Publications, Inc. New York, New York.

Bishop, J.M. 1983. Incidental capture of diamondback terrapins by crab pots. Estuaries. 6:426- 430.

Brinker, D.F., L.A. Byrne, P.J. Tango, and G.D. Therres. 1996. Population trends of colonial nesting waterbirds on Maryland's coastal plain. Report to the Coastal and Watershed Resources Division, Tidewater Administration, Maryland Department of Natural Resources.

Burger, J. 1976. Behavior of hatchling diamondback terrapins (*Malaclemys terrapin*) in the field. Copeia. 1976:742-748.

Caithamer, D.F., J.A. Dubvosky, J.P. Bladen, F.A. Johnson, J.R. Kelley, Jr., C.T. Moore, and G.W. Smith. 1995. Waterfowl population status, 1995. U.S. Fish and Wildlife Service, Office of Migratory Bird Management.

Erwin, R.M. 1979. Coastal waterbird colonies: Cape Elizabeth, Maine to Virginia. U.S. Fish and Wildlife Services Program., FWS/OBS-79/10. 212 pp.

Erwin, R. M. and J. A. Spendelow. 1991. Colonial wading birds, herons and egrets. *In:* Funderburk, S. L., J.A. Mihursky, S.J. Jordan, and D. Riley (eds.). *Habitat Requirements for Chesapeake Bay Living Resources.* Prepared by the Habitat Objectives Workgroup, Living Resources Subcommittee and the Chesapeake Research Consortium, Inc., Solomons, MD.

Forsell, D. 1996. Unpublished data: mid-winter waterfowl survey data for the Chesapeake Bay, 1956-1996; Provided through the U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, Maryland.

Galenter, D. 1990. Eastern shore island losses. Unpublished report prepared by University of Maryland's Center for Global Change, Laurel, MD, for the USFWS, Chesapeake Bay Field Office, Annapolis, MD, Project Manager, John W. Gill. *In* Gill, J. W., P. McGowan, and L. E. Gerlich. 1995. Monitoring study, Eastern Neck National Wildlife Refuge. Technical Report WRP-RE-12, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Gill, J.W., P. McGowan, and L. E. Gerlich. 1995. Monitoring study, Eastern Neck National Wildlife Refuge. Technical Report WRP-RE-12, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Hamel, P.B. 1992. Land manager's guide to birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.

Haramis, M. 1991. Canvasback. *In:* Funderburk, S. L., J.A. Mihursky, S.J. Jordan, and D. Riley (eds.). *Habitat Requirements for Chesapeake Bay Living Resources.* Prepared by the Habitat Objectives Workgroup, Living Resources Subcommittee and the Chesapeake Research Consortium, Inc., Solomons, MD.

Haramis, M. 1991. Redhead. *In:* Funderburk, S. L., J.A. Mihursky, S.J. Jordan, and D. Riley (eds.). *Habitat Requirements for Chesapeake Bay Living Resources.* Prepared by the Habitat Objectives Workgroup, Living Resources Subcommittee and the Chesapeake Research Consortium, Inc., Solomons, MD.

Hayman, P., J. Marchant, and T. Prater. 1986. *Shorebirds*. Houghton Mifflin Company, Boston.

Hurley, L. 1990. *Field Guide to the Submerged Aquatic Vegetation of the Chesapeake Bay*. U.S. Fish and Wildlife Service, Chesapeake Bay Esturary Program, Annapolis, MD.

Jones, W. L. and W.C. Lehman. 1987. *Phragmites* control and revegetation following aerial applications of glyphosate in Delaware. *In* W.R. Whitmand and W.H Meredith, eds., Waterfowl and Wetlands Symposium, Delware Department of Natural Resources and Environmental Control, Dover.

Kearney, M. and J.C. Stevenson. 1991. Island land loss and marsh vertical accretion rate. Evidence for historical sea-level change in the Chesapeake Bay. Journal of Coastal Research. 7:403-415.

Krementz, D.G., V.D. Stotts, D.B. Stotts, J.E. Hines, and S.L. Funderburk. 1991. Historical changes in laying date, clutch size, and nest success of American black ducks. Journal of Wildlife Management. 55:462-466.

Lazell, J.D. and P.J. Auger. 1981. Predation of diamondback terrapin (*Malaclemys terrapin*) by dune grass (*Ammophila breviligulata*). Copeia. 1981:723-724.

Lovich, J.E., A.D. Tucker, D.E. Kling, J.W. Gibbons, and T.D. Zimmerman.1991. Behavior of hatchling diamondback terrapins (*Malaclemys terrapin*) released in a South Carolina marsh. Herp Review. 22(3): 81-83.

Marks, M., B. Lapin, and J. Randall. 1994. *Phragmites australis* (*P. communis*): Threats, Management, and Monitoring. Natural Areas Journal. 14:285-294.

Martin, A.C., H.S. Zim, and A.L. Nelson. 1951. *American Wildlife and Plants, A Guide to Wildlife Food Habits.* Dover Publications, Inc. New York.

Mitchell, L.R. and J. Gill [a]. 1996. Notes from USFWS, Chesapeake Bay Field Office, reconnaisance trip circumnavigating Smith Island with Mike Harrison, USFWS biological technician at Martin National Wildlife Refuge, June 25, 1996.

Mitchell, L.R. and J. Gill [b]. 1996. Notes from USFWS, Chesapeake Bay Field Office, reconnaisance trip to Swash Bay,Virginia, dredge material placement site restoration, December 17, 1996.

McKnight, J. 1990. Smith Island colonial bird rookeries. A memorandum to the Assistant Secretary for Capital Programs, Maryland Department of Natural Resources, Program Open Space. July 27, 1990.

Orth, R. 1996. Personal Communication. From the minutes of the EPA Chesapeake Bay Program, Submerged Aquatic Vegetation Workgroup Meeting, December 6, 1996. USFWS, Annapolis, MD.

Pitler, R. 1985. *Malaclemys terrapin terrapin* (northern diamondback terrapin). Behavioral Herpetological Review. 16:82.

Roosenburg, W.M. 1991. The diamondback terrapin: Habitat requirements, and population dynamics, and opportunities for conservation. Pages 237-234. In: Chaney, A. and J. Mihursky (eds.) *New Perspectives in the Chesapeake System: a Research and management partnership. Proceedings of a Conference.* Chesapeake Research Consortium Publication No. 137. Solomons, MD.

Roosenburg, W.M. 1992. The Chesapeake diamondback terrapin investigations, 1992. Chesapeake Research Consortium Publication No. 146. Solomons, MD.

Roosenburg, W.M. 1994. Nesting habitat requirements of the diamondback terrapin: a geographic comparison. Environmental Concern Wetland Journal. Volume 6, No. 2, Spring, 1994. pp. 8-11.

Siegel, R.A. 1984. Parameters of two populations of diamondback terrapins (*Malaclemys terrapin*) on the Atlantic Coast of Florida. Pages 77-87 In: Seigel, R.A., L.E. Hunt, J.L. Knight, L. Malaret, and N.L. Zuschlag (eds.) Vertebrate ecology and systematics - a tribute to Henry S. Fitch. Museum of Natural History, University of Kansas, Lawerance, KS.

Soots, R.F. and J.F. Parnell. 1975. Ecological succession of breeding birds in relation to plant succession on dredge islands in North Carolina esturaries. Sea Grant Program. 1234

Burlington Laboratories, N.C. State University, Raleigh, North Carolina 27607.

Stotts, V.D. and D.E. Davis. 1960. The black duck in the Chesapeake Bay of Maryland: breeding behavior and biology. Chesapeake Science. 1:127-154.

Stegmann, E.W., R.B. Primark, and G.S. Ellmore. 1988. Absorption of nutrient exudates from terrapin eggs by roots of *Ammophila breviligulata*. Canadian Journal of Botany. 66:714-718.

Stevenson, C. and Staver, L. 1996. Submerged Aquatic Vegetation of the Chesapeake Bay, A Literature Synthesis. U.S. Fish and Wildlife Service, Annapolis. In preparation.

Stolzenburg, W. 1995. Hovering on the Edge; Waterbirds Rise to the Challenges of Life on Virginia's Eastern Shore. *Nature Conservancy*. Volume 45, Number 2, March/April, 1995. pp. 24-29.

Taylor, J. 1996. The dieout of *Zostera marina* on the seaside of the eastern shore of Virginia. Report Submitted to: University of Virginia, Long-Term Ecological Research Project, Oyster, Virginia.

U.S. Fish and Wildlife Service. 1986. North American waterfowl management plan, a strategy for cooperation. Prepared jointly by the U.S. Department of Interior, Fish and Wildlife Service and the Canadian Wildlife Service.

Watts, B. 1994. Distribution of Colonial Waterbirds on the Eastern Shore of Virginia: Implications for Beneficial Uses of Dredged material. Final Report to the Virginia Department of Game and Inland Fisheries, Nongame and Endangered Wildlife Program. College of William and Mary, Williamsburg, Virginia.

Wray, R.D. 1995. Island Loss in the Chesapeake Bay. Report to the USFWS Chesapeake Bay Esturary Program. In preparation.

# SMITH ISLAND ENVIRONMENTAL RESTORATION AND PROTECTION, MARYLAND

**RECONNAISSANCE REPORT**

**MAY 1997**

# APPENDIX B

**ECONOMICS**

# Appendix B-1

## Social and Economic Setting

Most of Smith Island is located in Somerset County, Maryland , with the southern tip located in Accomack County, Virginia. Somerset County, on Maryland's Eastern Shore, is the State's southernmost county. The Chesapeake Bay forms its western boundary, Virginia its southern. Routes U. S. 13 and MD 413 provide access to major interstate routes. The Norfolk/Hampton Roads metropolitan area is 95 miles south, the highway distance to Baltimore, MD and Washington, D.C. is 119 miles and 133 miles respectively. A water-oriented County, Somerset attracts fishermen, hunters, and water sports enthusiasts. With seven wildlife management areas, Somerset County abounds with naturalists and weekend vacationers, while historians are attracted to its towns and cities.

Somerset's 377 businesses employed 3,050 workers in 1995; 4 of these businesses have 100 or more workers. Crisfield and Princess Anne are the two major business and industrial centers of the County. Major employers are Lankford/SYSCO Foods, Rubberset, Mountaire Farms, Perdue Hatchery, John T. Handy Co., Inc., and Shellfish Seafoods. The County is a major seafood producer. It is also soybean country and provides a rich harvest of vegetables and corn. Princess Anne is the site of the University of Maryland-Eastern Shore, with undergraduate and graduate programs, including doctoral programs in marine, estuarine, and environmental sciences.

Despite the presence of the University of Maryland, Eastern Shore as a stabilizing factor in the County's economy, the County consistently has a higher than average unemployment rate and relatively lower income levels than other Maryland counties. With a population of nearly 24,000, the County 's unemployment rate has averaged 10 percent since 1990. The County's per capita income of $10,632 in 1992 is 54 percent of the Maryland average and 64 percent of the U. S. average. The estimated market value of real property in Somerset County is $578 million or a modest $24,000 per capita. By comparison, the market value per capita for the entire state of Maryland is $60,000. This struggling economic profile reflects the seasonal nature of a significant portion of the employment base reliance on agriculture, seafood products, and outdoor recreation activities. Somerset's economy is undergoing a transition from a reliance on resource-based agriculture and fishing to a mix of government, services and manufacturing. However the transition has not been able to keep pace with the growth in its population and labor force.

Nearly all of the 440 permanent residents of Smith Island are entirely dependent on the seafood industry for their livelihood. Seafood is harvested and either processed locally or packed for shipment. Although crabs dominate, oysters and clams are also harvested and shipped across Tangier Sound to Crisfield and the return trips yield supplies and petroleum. While there is no other industry on the island, there is a museum, restaurant, and gift shop which caters to the seasonal tourists disembarking from the tour boats from May to October. The three towns of Ewell, Rhodes Point, and Tylerton as well as the project areas delineated in this report are all within the jurisdiction of Somerset County.

## Appendix B-2

## Analysis of Alternative Plans

The period of analysis for all alternative plans is assumed to be 50 years and the interest rate for all discounting purposes is 7-3/8 percent. The current price level is 1997 dollars and the inflation rate for future years cost and damage estimates is 3 percent per year. The capital recovery factor used to annualize capital over 50 years with an assumed rate of return of 7-3/8 percent is .0759135. The useful life of stone revetments and stone breakwaters is 50 years; the geotextile tubes are assumed to require 100 percent replacement every 25 years at the original construction cost escalated at 3 percent per year to year 25. A 3 percent per year inflation rate over 25 years equates to a factor of 2.094 times the original cost. Annual operation and maintenance costs are estimated to equal 1 percent of the original cost for the geotextile tube, the stone revetments, and the stone breakwaters.

### Area 1. Rhodes Point - Sheep Pen Gut

Sheep Pen Gut, Plan 1, Alternative 1, is a geotextile tube construction for Sheep Pen Gut shoreline protection with an initial construction cost of $575,000. The replacement cost at year 25 is 2.094 times the original geotextile tube cost which equals $1,204,050. The present worth of the cost of the geotextile tube in year 25 is .1688187 times $1,204,050 which equals $203,266. The present value of the 50-year project life of the geotextile tube with 100 percent replacement in year 25 is $575,000 + $203,266 = $778,266. This total first cost of $778,266 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $59,081. The annual operation and maintenance cost associated with this alternative is estimated to be $5,750. Therefore for Area 1, Plan 1, Alternative 1, geotextile tube construction, the total annual cost is $64,831.

Sheep Pen Gut, Plan 1, Alternative 2, is a stone revetment for Sheep Pen Gut Shoreline Protection with an initial construction cost of $1,040,000. The stone revetment is projected to have a useful project life of 50 years with appropriate annual maintenance. The initial cost of $1,040,000 equals the present value of the 50-year project life of the stone revetment with zero replacement cost. This total first cost of $1,040,000 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $78,950. The annual operation and maintenance cost associated with this alternative is estimated to be $10,400. Therefore, for Area 1, Plan 1, Alternative 2, stone revetment, the total annual cost is $89,350.

In comparison, for Plan 1, Alternative 1 ($64,831) costs 27 percent less than Alternative 2 ($89,350) on a total annual cost basis. By initial construction cost comparison, Alternative 1 ($575,000) is 55 percent less costly than Alternative 2 ($1,040,000). Therefore, in terms of cost effectiveness, Alternative 1 is the preferred alternative given both alternatives perform the same function of protecting Rhodes Point from further shoreline erosion and in essence, preserving the town. The annual cost of the preferred Alternative 1 is $64,831 which would equal less than half of the potential annual benefits claimed ($139,358) in the Sheep Pen Gut vicinity. In addition 75 acres of SAV are created with this alternative.

Sheep Pen Gut, Plan 2, Alternative 1, is a single jetty which, when implemented in addition to one of the shore line protection alternatives from Plan 1, will reduce the amount of shoaling in the Federal navigation channel which extends from Rhodes Point through Sheep Pen Gut to deep water in the Chesapeake Bay. The single jetty is perpendicular to the shoreline extending from the shoreline to the north of Sheep Pen Gut into the Bay. The single jetty has an initial construction cost of $595,000. The single jetty is projected to have a useful project life of 50 years with appropriate annual maintenance. The initial cost of $595,000 equals the present value of the 50-year project life of the single jetty with zero replacement cost. This total first cost of $595,000 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $45,168. The annual operation and maintenance cost associated with this alternative is estimated to be $5,950. Therefore for Area 1, Plan 2, Alternative 1, Single Jetty, the total annual cost is $51,118.

Sheep Pen Gut, Plan 2, Alternative 2, is twin jetties which, when implemented in addition to one of the shore line protection alternatives from Plan 1, will reduce the amount of shoaling in the Federal navigation channel which extends from Rhodes Point through Sheep Pen Gut to deep water in the Chesapeake Bay. The twin jetties are parallel to the existing channel. The twin jetties have an initial construction cost of $1,800,000. The twin jetties are projected to have a useful project life of 50 years with appropriate annual maintenance. The initial cost of $1,800,000 equals the present value of the 50-year project life of the twin jetties with zero replacement cost. This total first cost of $1,800,000 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $136,644. The annual operation and maintenance cost associated with this alternative is estimated to be $18,000. Therefore for Area 1, Plan 2, Alternative 2, twin jetties, the total annual cost is $154,644.

Sheep Pen Gut, Plan 2, Alternative 3, is realigned channel/twin jetties which is a realignment of the existing Federal navigation channel which will extend from the mouth of Sheep Pen Gut directly to deep water in the Chesapeake Bay and includes construction of twin jetties parallel to the realigned channel. This realigned channel/twin jetties, when implemented in addition to one of the shore line protection alternatives from Plan 1, will reduce if not eliminate, the amount of shoaling in the realigned Federal navigation channel as the twin jetties act to prevent material from arriving at the realigned channel from both the north and the south. The realigned channel/twin jetties has an initial construction cost of $5,600,000. The realigned channel/twin jetties are projected to have a useful project life of 50 years with appropriate annual maintenance. The initial cost of $5,600,000 equals the present value of the 50-year project life of the twin jetty with zero replacement cost. This total first cost of $5,600,000 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $425,115. The annual operation and maintenance cost associated with this alternative is estimated to be $18,000. Therefore, for Area 1, Plan 2, Alternative 3, Realigned Channel/Twin Jetties, the total annual cost is $443,115.

Sheep Pen Gut, Plan 2, Alternative 4, is a single jetty which, when implemented in addition to one of the shore line protection alternatives from Plan 1, will reduce the amount of shoaling in the Federal navigation channel which extends from Rhodes Point through Sheep Pen Gut to deep water in the Chesapeake Bay. The current alignment of the Federal navigation channel would remain unchanged. The single jetty is perpendicular to the shoreline extending from the shoreline to the north of Sheep Pen Gut and extends much further into the bay than does Alternative 1. The single jetty has an initial construction cost of $2,900,000. The single jetty is projected to have a useful project life of 50 years with appropriate annual maintenance. The initial cost of $2,900,000 equals the present value of the 50-year project life of the single jetty with zero replacement cost. This total first cost of $2,900,000 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $220,149. The annual operation and maintenance cost associated with this alternative is estimated to be $29,000. Therefore, for Area 1, Plan 2, Alternative 4, single jetty, the total annual cost is $249,149.

In summary, for Area 1, Plan 2, the initial construction costs are: Alternative 1 ($595,000); Alternative 2 ($1,800,000); Alternative 3 ($5,600,000); and Alternative 4 ($2,900,000). In comparison, for Area 1, Plan 2, total annual costs are: Alternative 1 ( $51,118); Alternative 2 ($154,644); Alternative 3 ($443,115); and Alternative 4 ($249,149). Given that the four alternatives do not perform the same function, an analysis based on relative costs and anticipated project benefits from each alternative is warranted.

Alternative 3 is eliminated since it cost nearly 3 times as much as Alternative 2 on an annual basis and has negligible additional benefits (note that reduced dredging has not been quantified). Alternative 4 is also eliminated since it cost 1.6 times as much as Alternative 2 on an annual basis and does not provide protection to the channel from the southern approach. Although Alternative 2 costs 3 times more than Alternative 1, Alternative 2 functions to completely stabilize the Sheep Pen Gut shoreline from both the north and south, provides substantial navigational benefits on the bay side of the existing federal channel where shoaling is currently a large problem, and provides substantial erosion protection for the Rhodes Point watermen. More notably, Alternative 2 adds 75 more acres of SAV to the vicinity of Rhodes Point area than does Alternative 1 which adds 25 more SAV acres. Alternative 2 is the preferred alternative and has a moderate annual cost of $154,644.

**Area 2 Ewell - Swan Island and Vicinity**

Swan Island and Vicinity, Plan 1, is a Geotextile Tube Construction for filling in the three breaches between Swan Island and the barrier islands that extend along the northwest coastline. The three breaches require six small geotextile tubes with a combined initial construction cost of $820,000. The annual operation and maintenance cost associated with this plan is estimated to be $8,200.

Plan 1 is a preferred plan because at a relatively low initial cost of under one million dollars, the three breaches will be filled in by geotextile tubes and create 270 acres of SAV. In addition, 5 acres of wetlands will be restored and shoaling will decrease in the navigational channel used by the entire island and recreational visitors.

Swan Island and Vicinity, Plan 2, Alternative 1 is Geotextile Tube Breakwaters on the lower northwest coastline in the vicinity of Swan Island. The eighteen geotextile tube breakwaters have a combined initial construction cost of $1,030,000. The annual operation and maintenance cost associated with this alternative is estimated to be $10,300.

Swan Island and Vicinity, Plan 2, Alternative 2 is Geotextile Tube Breakwaters on the entire northwest coastline in the vicinity of Swan Island. The thirty eight geotextile tube breakwaters have an combined initial construction cost of $1,230,000. The annual operation and maintenance cost associated with this alternative is estimated to be $12,300.

Swan Island and Vicinity, Plan 2, Alternative 3 is Armor Stone Breakwaters on the lower northwest coastline in the vicinity of Swan Island. The twenty one armor stone breakwaters have an combined initial construction cost of $1,700,000. The annual operation and maintenance cost associated with this alternative is estimated to be $17,000.

Swan Island and Vicinity, Plan 2, Alternative 4 is Armor Stone Breakwaters on the entire northwest coastline in the vicinity of Swan Island. The thirty two armor stone breakwaters have an combined initial construction cost of $2,540,000. The annual operation and maintenance cost associated with this alternative is estimated to be $25,400.

Alternatives 1 and 3 are not preferred alternatives since they both protect only the lower portion of the northwest coastline and would therefore allow future breaches in the northern shoreline by not protecting the function of the geotextile tubes over time. Alternatives 2 and 4 protect both the north and south portions of the northwest coastline and although the additional benefits are difficult to quantify, a breakwater is necessary to maintain the benefits of the functioning geotextile tubes which are proposed under Plan 1. Stone structures are generally preferred by coastal engineers in such high energy wave climates as Swan Island and vicinity. Given such structures have proven reliable in the past, Alternative 4 is recommended.

**Area 3. Tylerton**

Tylerton, Plan 1, Alternative 1 is a Wooden Bulkhead Replacement for western side of Tylerton Shoreline Protection with an initial construction cost of $1,140,000. The wooden bulkhead is projected to have a useful project life of 10 years with appropriate annual maintenance. The replacement cost at year 10 is 1.344 times the original wooden bulkhead cost which equals $1,532,160. The replacement cost at year 20 is 1.806 times the original wooden bulkhead cost which equals $2,058,840. The replacement cost at year 30 is 2.427 times the original wooden bulkhead cost which equals $2,766,780. The replacement cost at year 40 is 3.262 times the original wooden bulkhead cost which equals $3,718,680. The present worth of the cost of the wooden bulkhead in year 10 is .4908720 times $1,532,160 which equals $752,094. The present worth of the cost of the wooden bulkhead in year 20 is .2409553 times $2,058,840 which equals $496,088. The present worth of the cost of the wooden bulkhead in year 30 is .1182782 times $2,766,780 which equals $327,250. The present worth of the cost of the wooden bulkhead in year 40 is .0580595 times $3,718,680 which equals $215,905. The present value of the 50-year project life of the wooden bulkhead with 100 percent replacement in years 10, 20, 30, and 40 is $1,140,000 + $752,094 + $496,088 + $327,250 + $215,905 = $2,931,337 which is equivalent to the total first cost. This total first cost of $2,931,337 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $222,528. The annual operation and maintenance associated with this alternative is estimated to be $11,400. Therefore, for Area 3, Plan 1, Alternative 1, Wooden Bulkhead Replacement, the Total Annual Cost is $233,928.

Tylerton, Plan 1, Alternative 2 is a Stone Revetment for western side of Tylerton Shoreline Protection with an initial construction cost of $1,410,000. The stone revetment is projected to have a useful project life of 50 years with appropriate annual maintenance. The initial cost of $1,410,000 equals the present value of the 50-year project life of the stone revetment with zero replacement cost. This total first cost of $1,410,000 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $107,038. The annual operation and maintenance cost associated with this alternative is estimated to be $14,100. Therefore, for Area 3, Plan 1, Alternative 2, Stone Revetment, the Total Annual Cost is $121,138.

Alternative 2, the stone revetment in comparison to Alternative 1, the wooden bulkhead is the preferred alternative, in terms of annual cost and environmental preference, for protecting the west side of Tylerton. Alternative 2 with an annual cost of $121,138 functions strictly as shoreline protection encompassing storm damages, flood protection, and erosion protection for Tylerton and also decreases sedimentation in the water currents. The annual cost of the preferred Alternative 2 is $121,138 which would equal nearly 75 percent of the potential annual benefits claimed ($164, 767) in the Tylerton vicinity. No SAV acres are created with this alternative.

Tylerton, Plan 2, Alternative 1 is Geotextile Tube Breakwaters for southern end of Tylerton Shoreline Protection which, when implemented in addition to one of the western shoreline protection alternatives from Plan 1, will provide shoreline erosion protection to the southern end of Tylerton. The geotextile tube breakwaters have an initial construction cost of $260,000. The replacement cost at year 25 is 2.094 times the original geotextile tube cost which equals $544,440. The present worth of the cost of the geotextile tube in year 25 is .1688187 times $544,440 which equals $91,911. The present value of the 50-

year project life of the geotextile tube with 100 percent replacement in year 25 is $260,000 + $91,911 = $351,911. This total first cost of $351,911 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $26,715. The annual operation and maintenance cost associated with this alternative is estimated to be $2,600. Therefore for Area 3, Plan 2, Alternative 1, Geotextile Tube Breakwaters, the Total Annual Cost is $29,315.

Tylerton, Plan 2, Alternative 2 is Armor Stone Breakwaters for southern end of Tylerton Shoreline Protection which, when implemented in addition to one of the western shoreline protection alternatives from Plan 1, will provide shoreline erosion protection to the southern end of Tylerton. The armor stone breakwaters have an initial construction cost of $460,000. The stone breakwaters are projected to have a useful project life of 50 years with appropriate annual maintenance. The initial cost of $460,000 equals the present value of the 50-year project life of the stone breakwaters with zero replacement cost. This total first cost of $460,000 with interest and amortization for a 50-year project life at 7-3/8 percent equates on an annual basis to $34,920. The annual operation and maintenance cost associated with this alternative is estimated to be $4,600. Therefore, for Area 3, Plan 2, Alternative 2, Stone Breakwaters, the Total Annual Cost is $39,520.

Alternative 1 and Alternative 2 are both segmented breakwaters south of Tylerton and perform equally well. Alternative 1, the geotextile tube is 75 percent of the cost of the Alternative 2 on an annual cost basis and is therefore the preferred alternative. The annual cost of Alternative 1 is $29,315 and functions to stop further erosion on the southern edge of Tylerton which will also help to reduce storm damages and flood damages from the south. This alternative serves to preserve the town and prevent further loss of wetlands. In addition, 12 acres of SAV are created with this alternative.

**Area 4. Martin Wildlife Refuge - Northeast Coves**

Northeast Coves, Plan 1, Alternative 1, is Geotextile Tube Breakwaters for three coves in the Martin Wildlife Refuge -- Fog Point Cove, Back Cove, and Terrapin Sand Cove. The fifty one segments of geotextile tube breakwaters have a combined initial construction cost of $755,000. The annual operation and maintenance cost associated with this alternative is $7,550.

Northeast Coves, Plan 1, Alternative 2, is Armor Stone Breakwaters for three coves in the Martin Wildlife Refuge -- Fog Point Cove, Back Cove, and Terrapin Sand Cove. The fifty one segments of armor stone breakwaters have a combined initial construction cost of $2,330,000. The annual operation and maintenance cost associated with this alternative is $23,300.

Alternatives 1 and 2 perform the same shoreline protection function. Alternative 1 is a preferred plan because at a relatively low initial cost of $755,000, shoreline protection for three northeast coves will be provided by a series of geotextile tube breakwaters and create 421 acres of SAV.

TABLE 1

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 1: Sheep Pen Gut ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $25,110 | $0 | $0 | $0 | $0 | $25,110 | 0.931315483 | $23,385 |
| 2 | $26,366 | $0 | $0 | $0 | $0 | $26,366 | 0.867348529 | $22,868 |
| 3 | $27,684 | $0 | $0 | $0 | $0 | $27,684 | 0.807775114 | $22,362 |
| 4 | $29,068 | $0 | $0 | $0 | $0 | $29,068 | 0.752293471 | $21,868 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $90,483

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $6,869

TABLE 1A

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 1: Sheep Pen Gut ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $10,000 | $0 | $0 | $0 | $10,000 | 0.931315483 | $9,313 |
| 2 | $0 | $10,500 | $0 | $0 | $0 | $10,500 | 0.867348529 | $9,107 |
| 3 | $0 | $11,025 | $0 | $0 | $0 | $11,025 | 0.807775114 | $8,906 |
| 4 | $0 | $11,576 | $0 | $0 | $0 | $11,576 | 0.752293471 | $8,709 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $36,035

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $2,736

TABLE 1B

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 1: Sheep Pen Gut ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $0 | $12,000 | $0 | $0 | $12,000 | 0.931315483 | $11,176 |
| 2 | $0 | $0 | $12,600 | $0 | $0 | $12,600 | 0.867348529 | $10,929 |
| 3 | $0 | $0 | $13,230 | $0 | $0 | $13,230 | 0.807775114 | $10,687 |
| 4 | $0 | $0 | $13,892 | $0 | $0 | $13,892 | 0.752293471 | $10,450 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $43,242

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $3,283

TABLE 1C

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 1: Sheep Pen Gut ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $0 | $0 | $20,000 | $0 | $20,000 | 0.931315483 | $18,626 |
| 2 | $0 | $0 | $0 | $21,000 | $0 | $21,000 | 0.867348529 | $18,214 |
| 3 | $0 | $0 | $0 | $22,050 | $0 | $22,050 | 0.807775114 | $17,811 |
| 4 | $0 | $0 | $0 | $23,153 | $0 | $23,153 | 0.752293471 | $17,417 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $72,070

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $5,471

TABLE 1D

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 1: Sheep Pen Gut ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $0 | $0 | $0 | $0 | $0 | 0.931315483 | $0 |
| 2 | $0 | $0 | $0 | $0 | $0 | $0 | 0.867348529 | $0 |
| 3 | $0 | $0 | $0 | $0 | $0 | $0 | 0.807775114 | $0 |
| 4 | $0 | $0 | $0 | $0 | $0 | $0 | 0.752293471 | $0 |
| 5 | $0 | $0 | $0 | $0 | $2,275,000 | $2,275,000 | 0.700622557 | $1,593,916 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $1,593,916

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $121,000

TABLE 1E

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 1: Sheep Pen Gut ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $25,110 | $10,000 | $12,000 | $20,000 | $0 | $67,110 | 0.931315483 | $62,501 |
| 2 | $26,366 | $10,500 | $12,600 | $21,000 | $0 | $70,466 | 0.867348529 | $61,118 |
| 3 | $27,684 | $11,025 | $13,230 | $22,050 | $0 | $73,989 | 0.807775114 | $59,766 |
| 4 | $29,068 | $11,576 | $13,892 | $23,153 | $0 | $77,688 | 0.752293471 | $58,444 |
| 5 | $0 | $0 | $0 | $0 | $2,275,000 | $2,275,000 | 0.700622557 | $1,593,916 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $1,835,746

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $139,358

TABLE 1

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 3: Tylerton ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $41,850 | $0 | $0 | $0 | $0 | $41,850 | 0.931315483 | $38,976 |
| 2 | $43,943 | $0 | $0 | $0 | $0 | $43,943 | 0.867348529 | $38,113 |
| 3 | $46,140 | $0 | $0 | $0 | $0 | $46,140 | 0.807775114 | $37,270 |
| 4 | $48,447 | $0 | $0 | $0 | $0 | $48,447 | 0.752293471 | $36,446 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $150,806

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $11,448

TABLE 1A

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 3: Tylerton ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $10,400 | $0 | $0 | $0 | $10,400 | 0.931315483 | $9,686 |
| 2 | $0 | $10,920 | $0 | $0 | $0 | $10,920 | 0.867348529 | $9,471 |
| 3 | $0 | $11,466 | $0 | $0 | $0 | $11,466 | 0.807775114 | $9,262 |
| 4 | $0 | $12,039 | $0 | $0 | $0 | $12,039 | 0.752293471 | $9,057 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $37,476

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $2,845

TABLE 1B

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 3: Tylerton ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $0 | $12,480 | $0 | $0 | $12,480 | 0.931315483 | $11,623 |
| 2 | $0 | $0 | $13,104 | $0 | $0 | $13,104 | 0.867348529 | $11,366 |
| 3 | $0 | $0 | $13,759 | $0 | $0 | $13,759 | 0.807775114 | $11,114 |
| 4 | $0 | $0 | $14,447 | $0 | $0 | $14,447 | 0.752293471 | $10,869 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $44,971

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $3,414

TABLE 1C

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 3: Tylerton ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $0 | $0 | $20,800 | $0 | $20,800 | 0.931315483 | $19,371 |
| 2 | $0 | $0 | $0 | $21,840 | $0 | $21,840 | 0.867348529 | $18,943 |
| 3 | $0 | $0 | $0 | $22,932 | $0 | $22,932 | 0.807775114 | $18,524 |
| 4 | $0 | $0 | $0 | $24,079 | $0 | $24,079 | 0.752293471 | $18,114 |
| 5 | $0 | $0 | $0 | $0 | $0 | $0 | 0.700622557 | $0 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $74,952

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $5,690

TABLE 1D

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 3: Tylerton ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $0 | $0 | $0 | $0 | $0 | $0 | 0.931315483 | $0 |
| 2 | $0 | $0 | $0 | $0 | $0 | $0 | 0.867348529 | $0 |
| 3 | $0 | $0 | $0 | $0 | $0 | $0 | 0.807775114 | $0 |
| 4 | $0 | $0 | $0 | $0 | $0 | $0 | 0.752293471 | $0 |
| 5 | $0 | $0 | $0 | $0 | $2,658,000 | $2,658,000 | 0.700622557 | $1,862,255 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $1,862,255

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $141,370

TABLE 1E

SMITH ISLAND
Existing & Future Without Project Economic Evaluation
Area 3: Tylerton ($ 000'S)

| | |
|---|---|
| Discount Rate | 0.07375 |
| Price Level | 1997 |
| Inflation Factor | 0.03 |
| Damage Escalation | 0.02 |

| Evaluation Period | Watermen Cost | Road/Sewer Cost | Dock/Ramp Cost | Revetment Cost | Major Infrastructure Damages | Total Cost | Present Worth Factor | Present Worth of Total Cost |
|---|---|---|---|---|---|---|---|---|
| 1 | $41,850 | $10,400 | $12,480 | $20,800 | $0 | $85,530 | 0.931315483 | $79,655 |
| 2 | $43,943 | $10,920 | $13,104 | $21,840 | $0 | $89,807 | 0.867348529 | $77,894 |
| 3 | $46,140 | $11,466 | $13,759 | $22,932 | $0 | $94,297 | 0.807775114 | $76,171 |
| 4 | $48,447 | $12,039 | $14,447 | $24,079 | $0 | $99,012 | 0.752293471 | $74,486 |
| 5 | $0 | $0 | $0 | $0 | $2,658,000 | $2,658,000 | 0.700622557 | $1,862,255 |
| 6 | $0 | $0 | $0 | $0 | $0 | $0 | 0.652500635 | $0 |
| 7 | $0 | $0 | $0 | $0 | $0 | $0 | 0.607683945 | $0 |
| 8 | $0 | $0 | $0 | $0 | $0 | $0 | 0.565945466 | $0 |
| 9 | $0 | $0 | $0 | $0 | $0 | $0 | 0.527073775 | $0 |
| 10 | $0 | $0 | $0 | $0 | $0 | $0 | 0.490871968 | $0 |
| 11 | $0 | $0 | $0 | $0 | $0 | $0 | 0.457156664 | $0 |
| 12 | $0 | $0 | $0 | $0 | $0 | $0 | 0.425757079 | $0 |
| 13 | $0 | $0 | $0 | $0 | $0 | $0 | 0.39651416 | $0 |
| 14 | $0 | $0 | $0 | $0 | $0 | $0 | 0.369279776 | $0 |
| 15 | $0 | $0 | $0 | $0 | $0 | $0 | 0.343915973 | $0 |
| 16 | $0 | $0 | $0 | $0 | $0 | $0 | 0.320294271 | $0 |
| 17 | $0 | $0 | $0 | $0 | $0 | $0 | 0.298295014 | $0 |
| 18 | $0 | $0 | $0 | $0 | $0 | $0 | 0.277806765 | $0 |
| 19 | $0 | $0 | $0 | $0 | $0 | $0 | 0.258725741 | $0 |
| 20 | $0 | $0 | $0 | $0 | $0 | $0 | 0.240955289 | $0 |
| 21 | $0 | $0 | $0 | $0 | $0 | $0 | 0.224405391 | $0 |
| 22 | $0 | $0 | $0 | $0 | $0 | $0 | 0.208992215 | $0 |
| 23 | $0 | $0 | $0 | $0 | $0 | $0 | 0.194637686 | $0 |
| 24 | $0 | $0 | $0 | $0 | $0 | $0 | 0.181269091 | $0 |
| 25 | $0 | $0 | $0 | $0 | $0 | $0 | 0.168818711 | $0 |
| 26 | $0 | $0 | $0 | $0 | $0 | $0 | 0.157223479 | $0 |
| 27 | $0 | $0 | $0 | $0 | $0 | $0 | 0.14642466 | $0 |
| 28 | $0 | $0 | $0 | $0 | $0 | $0 | 0.136367553 | $0 |
| 29 | $0 | $0 | $0 | $0 | $0 | $0 | 0.127001214 | $0 |
| 30 | $0 | $0 | $0 | $0 | $0 | $0 | 0.118278197 | $0 |
| 31 | $0 | $0 | $0 | $0 | $0 | $0 | 0.110154316 | $0 |
| 32 | $0 | $0 | $0 | $0 | $0 | $0 | 0.10258842 | $0 |
| 33 | $0 | $0 | $0 | $0 | $0 | $0 | 0.095542184 | $0 |
| 34 | $0 | $0 | $0 | $0 | $0 | $0 | 0.088979915 | $0 |
| 35 | $0 | $0 | $0 | $0 | $0 | $0 | 0.082868373 | $0 |
| 36 | $0 | $0 | $0 | $0 | $0 | $0 | 0.077176599 | $0 |
| 37 | $0 | $0 | $0 | $0 | $0 | $0 | 0.071875761 | $0 |
| 38 | $0 | $0 | $0 | $0 | $0 | $0 | 0.066939009 | $0 |
| 39 | $0 | $0 | $0 | $0 | $0 | $0 | 0.062341336 | $0 |
| 40 | $0 | $0 | $0 | $0 | $0 | $0 | 0.058059451 | $0 |
| 41 | $0 | $0 | $0 | $0 | $0 | $0 | 0.054071666 | $0 |
| 42 | $0 | $0 | $0 | $0 | $0 | $0 | 0.05035778 | $0 |
| 43 | $0 | $0 | $0 | $0 | $0 | $0 | 0.04689898 | $0 |
| 44 | $0 | $0 | $0 | $0 | $0 | $0 | 0.043677746 | $0 |
| 45 | $0 | $0 | $0 | $0 | $0 | $0 | 0.040677761 | $0 |
| 46 | $0 | $0 | $0 | $0 | $0 | $0 | 0.037883829 | $0 |
| 47 | $0 | $0 | $0 | $0 | $0 | $0 | 0.035281796 | $0 |
| 48 | $0 | $0 | $0 | $0 | $0 | $0 | 0.032858483 | $0 |
| 49 | $0 | $0 | $0 | $0 | $0 | $0 | 0.030601614 | $0 |
| 50 | $0 | $0 | $0 | $0 | $0 | $0 | 0.028499757 | $0 |

TOTAL PRESENT WORTH OF FUTURE WITHOUT PROJECT COSTS $2,170,460

FUTURE WITHOUT PROJECT AVERAGE ANNUAL COST
7 3/8%, 50 YEARS $164,767

# Appendix B-3

## Existing Economic Conditions

The economic effects of the identified problems and needs on Smith Island were investigated. The immediate effects of shoreline erosion and channel shoaling are evidenced in the towns of Rhodes Point and Tylerton. These effects include increased time and fuel to navigate around the shoaled channels, vessel damage incurred during low tide, and the annual cost of increased maintenance on the roads, docks, ramps, utilities, and revetments attributable to the shoreline erosion and incremental breaching of Smith Island. These effects were quantified for current conditions in a three year timeframe. In addition, major effects resulting from continuous shoreline erosion were estimated for the five year time horizon. While the existing quantification of damages and potential benefits focuses on the parts of Rhodes Point and Tylerton most vulnerable in the near term, the entire island is susceptible to damages from shoreline erosion, tidal flooding and storm damages. Of equal importance is the concomitant loss of submerged aquatic vegetation and wetlands largely resulting from the continuous erosion of the island's shoreline and increased sedimentation in the channels. The existing condition damages for the four potential project areas are summarized.

### B-3.1 Sheep Pen Gut

The shoreline erosion and the shoaling of the navigation channel are the two major existing problems in the Rhodes Point through the Sheep Pen Gut vicinity. The current estimated damage categories in this vicinity are: navigational (time delay, additional fuel cost, and vessel damage); additional road and sewer repair; dock and ramp damage; and increased revetment maintenance. For years two through four these damage categories are escalated by 3% due to inflation and by 2% due to increased intensity of damages as erosion conditions on the western side shore of Rhodes Point worsen. In year five, major infrastructure damages will occur to portions of the road, sewer and water pipes, revetment, and dock if the situation continues where no remedial action is taken.

The existing and future without project economic evaluation for the Sheep Pen Gut vicinity is shown on Tables 1 through 1E in Appendix B-3. Each Table shows the potential benefits attributable to the specific damage category. The current year damages are calculated as follows. For the watermen cost, time is lost by going around through Tylerton and up around Ewell thereby avoiding Sheep Pen Gut at times when the tide is low. The average time it takes to make the detour each way is 30 minutes. Thirty boats are impacted by the detour and average 5 gallons of fuel per hour. The watermen attest that they make 1,560 round trips per year with a value of their time estimated conservatively at $6 per hour. This equals 1,560 hours (1 hour = 1 round trip ) times $6 per hour = $9,360 for the value of their time foregone.  With fuel cost at $1.25 per gallon times 5 gallons per hour, the fuel cost expended equals $6.25 per extra hour on the water. Again for 1,560 hours times $6.25 per hour in fuel cost = $9,750 for the additional fuel expense incurred.  Damages to the watermens boats are estimated to be a modest $200 per year as most of the time their high navigational skill level avoids damages and they know when to avoid the channel through Sheep Pen Gut.  Thirty boats times $200 = $6,000 for vessel damage.

The total cost for the three watermen damage categories is $25,110 for the current condition in 1997.  The Somerset County roads Department estimates that it currently spends an additional $10,000 a year on the 2500 feet of road and sewer pipe in Rhodes Point that is damaged due to  the shoreline erosion and an additional $12,000 a year on the county dock and ramp.  The current cost of repairing the 2,500 feet of revetment is $20,000.

By year 5, the threat of imminent danger of the western shoreline of Rhodes Point translates into a major infrastructure cost as 2,500 feet of road, sewer and water pipe, dock, and revetment are eroded away by the eroding condition of the shoreline.  The costs in year 5 are conservatively estimated by Somerset County to total $2,275,000 for replacing the damaged infrastructure.  The total cost is disaggregated as follows: $1,250,000 bulkhead or stone revetment ($500 per foot times 2500 feet); sewer pipe $50,000 ($20 per foot times 2500 feet); water pipe $25,000 ($10 per foot times 2500 feet); county dock  $200,000; county road
$750,000 ( $300 times 2500 feet).

Between 1990 and 1995,  Rhodes Point was estimated to have lost 92% of its submerged aquatic vegetation.  The most current estimate of acreage remaining is 27.

**B-3.2  Swan Island and Vicinity**

The major existing problem in Swan Island is the breaching that is occurring between Swan Island and the barrier islands to the north.  Stabilizing the shoreline of Swan Island and the northern barrier islands would provide a sheltering effect from storm waves in the Ewell area and decrease sedimentation in the channels which impedes navigation.  The town of Ewell is becoming more vulnerable to damages from the northwest side of town as the encroachment of the shoreline depletes the wetlands and moves closer to the county road.  Benefits have not been quantified for this area but perceived benefits would largely be environmental in terms of potential recovery of SAV.

Between 1990 and 1995, Big Thorofare, which is in the vicinity of Swan Island, is estimated to have lost 57% of its SAV.  The most current estimate of acreage remaining is 610.

### B-3.3 Tylerton

The shoreline erosion of the southern end of Tylerton and the shoaling of the navigation channel in the Sheep Pen Gut vicinity which is utilized by Tylerton watermen are the two major existing economic problems in the town of Tylerton. The current estimated damage categories in this vicinity are: navigational (time delay, additional fuel cost, and vessel damage); additional road and sewer repair; dock and ramp damage; and increased revetment maintenance. For years two through four these damage categories are escalated by 3% due to inflation and by 2% due to increased intensity of damages as erosion conditions on the western side shore of Rhodes Point worsen. In year five, major infrastructure damages will occur to portions of the road, sewer and water pipes, revetment, and dock if the situation continues where no remedial action is taken.

The existing and future without project economic evaluation for Tylerton is shown on Tables 1 through 1E in Appendix B-3. Each Table shows the potential benefits attributable to the specific damage category. The current year damages are calculated as follows. For the watermen cost, time is lost by going around up around Ewell thereby avoiding Sheep Pen Gut at times when the tide is low. The average time it takes to make the detour each way is 30 minutes. Fifty boats are impacted by the detour and average 5 gallons of fuel per hour. The watermen attest that they make 2,600 round trips per year with a value of their time estimated conservatively at $6 per hour. This equals 2,600 hours ( 1 hour = 1 round trip )times $6 per hour = $15,600 for the value of their time foregone. With fuel cost at $1.25 per gallon times 5 gallons per hour, the fuel cost expended equals $6.25 per extra hour on the water. Again for 2,600 hours times $6.25 per hour in fuel cost = $16,250 for the additional fuel expense incurred. Damages to the watermens boats are estimated to be a modest $200 per year as most of the time their high navigational skill level avoids damages and they know when to avoid the channel through Sheep Pen Gut. Fifty boats times $200 = $10,000 for vessel damage.

The total cost for the three watermen damage categories is $41,850 for the current condition in 1997. The Somerset County roads Department estimates that it currently spends an additional $10,400 a year on the 2,600 feet of road and sewer pipe in Rhodes Point that is damaged due to the shoreline erosion and an additional $12,480 a year on the county dock and ramp. The current cost of repairing the 2,600 feet of revetment is $20,800.

By year 5, the threat of imminent danger of the southern shoreline of Tylerton translates into a major infrastructure cost as 2,600 feet of road, sewer and water pipe, dock, and revetment are eroded away by the eroding condition of the shoreline. The costs in year 5 are conservatively estimated by Somerset County to total $2,658,000 for replacing the damaged infrastructure. The total cost is disaggregated as follows: $1,300,000 bulkhead or stone revetment ($500 per foot times 2,600 feet); sewer pipe $52,000 ($20 per foot times 2600 feet); water pipe $26,000 ($10 per foot times 2,600 feet); county dock , ramp, and marina $500,000; county road $780,000 ( $300 per foot times 2,600 feet).

Between 1990 and 1995, Tylerton was estimated to have lost 78% of its SAV. The most current estimate of SAV remaining is 94 acres (see Figure 3.1 and Table 3.1).

### B-3.4 Northeast Coves

The major existing problem in the Martin Wildlife Refuge is the erosion of the shoreline and the general deepening of the three interior coves: Fog Point Cove, Back Cove, and Terrapin Sand Cove. This condition has contributed to the loss of the wetland areas as well as submerged aquatic vegetation. Benefits have not been quantified for this area but perceived benefits would largely be environmental in terms of potential recovery of wetland areas and submerged aquatic vegetation.

Between 1990 and 1995, Fog Point Cove, Back Cove, and Terrapin Sand Cove were estimated to have lost 49%, 40% and 34% of its submerged aquatic vegetation (see Figure 3.1 and Table 3.1). The most current estimate of acreage remaining is 42, 307, and 667 respectively.

## Appendix B-4

## Most Probable Future Conditions

Smith Island in its vulnerable location, between the Chesapeake Bay on the west and Tangier Sound on the east, is continually exposed to the damaging forces of nature. The west side of the island, where two out of the three population centers are located, is particularly susceptible to erosion and inundation damage by wind-generated waves from the Chesapeake Bay. These two population centers, Rhodes Point and Tylerton, also provide the home base for the economic livelihood for the overwhelming majority of the towns' citizens. A recent article in the Journal of Coastal Research, November 1995, "Historic and Future Land Loss for Upland and Marsh Islands in the Chesapeake Bay, Maryland, U.S.A.", by Wray, Leatherman and Nicholls delineates the precarious condition of the Upland and Marsh Islands in the Bay, in particular Smith Island. The article notes that the Chesapeake Bay islands provide excellent case studies of land loss as written records of inhabitants and good historic maps clearly document their decline in area.

Coastal erosion is the most obvious means of land loss. In the past century, over 18,000 hectares of coastal areas in the Chesapeake Bay have eroded, providing about 3.6 million cubic meters of sediment to the Bay each year, according to a 1991 U.S. Army Corps of Engineers, Chesapeake Bay Shoreline Erosion Study. Nearly 50 years ago, the scientists Singlewald and Slaughter published in the Maryland Department of Geology, Mines and Mineral Resources Bulletin an article titled "Shore Erosion and Measurement in Maryland, 1949." After a thorough examination of historical records of the Bay, the article attests that land loss has occurred in the Bay, specifically Smith Island, since at least the mid 1800's. There have been several studies in the 1990's (for example, Kearney and Stevenson, 1991 and Leatherman et al., 1994) analyzing historical rates and patterns of land loss in the Bay which have similar conclusions. The results show that, given the evidence of a slow rise in sea-level during the last few thousand years and that land loss is not a new phenomenon, the rate of coastal land loss in the Chesapeake Bay (including Smith Island) has likely accelerated just in the past century.

The 1995 article by Wray, Leatherman and Nicholls, cited above, reports that the rate of loss on Smith Island is much higher than the other islands. Since 1849, there has been a significant amount of perimeter erosion along the western shore and from the northeast corner of the island, reflecting exposure to the maximum fetch. In 1987 the island size of Smith Island was 3168 hectares. Modeling future shoreline response was based on the long-term historic land loss rates and likely scenarios of future sea-level rise. Future rates of shoreline change were based on the Intergovernmental Panel on Climate Change (1990) eustatic sea-level rise scenarios plus local subsidence in the Chesapeake Bay region. The projections for Smith Island in the year 2030 show an island size of 2192 hectares, which is 976 hectares less than in 1987, or equivalently a 31 percent loss over 43 years. During the next 40 years, by 2070, the island will shrink to 984 hectares, or equivalently, a 55 percent loss during that timeframe. Within the next 30 years, by the turn of the 22nd century, Smith Island will no longer exist. These projections are based on shore erosion rates and do not include active interior marsh loss which significantly affects the integrity of marsh islands such as Smith. In summary, land loss estimates for Smith Island are a conservative estimate, and therefore, the ultimate disappearance of the islands is more imminent than predicted by the historic trend analysis.

Given that the most probable future condition in year 2200 is the total loss of Smith Island, the near term future has a more definable set of problems which can be categorized as current and imminent damages. The continual loss of land on Smith Island is attributable to current, near-term and eventual damage scenarios on Smith Island. As noted above, the two towns of Rhodes Point and Tylerton are currently suffering the economic cost of continual erosion. These islanders face shoaling delays weekly, damages to their boats sporadically, and an increased road, sewer, dock, ramp, and revetment maintenance costs annually. If current conditions persist without any relief, there is an imminent danger that the continual shoreline erosion on portions of Rhodes Point and Tylerton will result in major infrastructure damages to the road, sewer pipe, water pipe, dock, ramp, and marina in these two towns. It is estimated that these major infrastructure costs could be incurred by year five in the current analysis. It is also possible that these major infrastructure damages could be incurred tomorrow given the particular vulnerability to storm damage that the continual erosion has created. Whenever these major infrastructure damages do occur, many of the 288 structures on the island, the sewer pump station, and additional roads and utilities would be in immediate danger of tidal or storm flooding.

In addition, the continual breaching that has occurred in Swan Island and vicinity and the erosion in the Northeast Coves of the island have intensified the overall threat to the integrity of the island and the ability of the islanders to earn a living in the seafood industry. All of this erosion is related to the survival of the island and its historic culture and way of life. With erosion in check, the concomitant navigational problems with channel shoaling, eroding of the docks, ramps, and marinas, roads, and utilities, will be in relief. Finally, of great importance is the recovery of submerged aquatic vegetation surrounding the island and the re-establishment of wetlands on the shoreline of the island which can occur if the further erosion and breaching of the island is prevented.

# SMITH ISLAND ENVIRONMENTAL RESTORATION AND PROTECTION, MARYLAND

**RECONNAISSANCE REPORT**

**MAY 1997**

# APPENDIX C

**ENGINEERING**

# Appendix C
# Engineering Considerations

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## C-1. Overview of Technical Issues

### SHORELINE EROSION

Shoreline erosion, from an engineering perspective, is a problem that underlies and contributes to a broad range of other difficulties. High erosion rates have led to rapid silting of key navigation channels, such as the Sheep Pen Gut channel. In addition, erosion has resulted in loss of low-lying wetlands that act as barriers to provide storm protection for adjoining areas. It is an important factor that leads to loss of habitat and of submerged aquatic vegetation (SAV), and thus contributes to diminishing resources, water fowl, fish and plant life.

Four critical locations on Smith Island have been identified for remediation and various plans have been developed for further investigation. The purpose of these plans is to reduce the shoreline erosion problems currently being experienced and also to improve navigation at Sheep Pen Gut. Each of the alternative plans will provide a certain level of erosion control and both positive and negative impacts to the study area environment. The effectiveness of each of these plans will be investigated more thoroughly during a later project phase, as well as other issues such as constructability and environmental impacts. The construction costs for the plans will be weighed against the economic benefits to determine the most effective solution.

### SHORELINE PROTECTION MEASURES

Several alternative means for stabilizing the shoreline sections considered were evaluated. Some of the alternatives were selected based on their demonstrated ability to provide cost-effective erosion control and reduce sedimentation in nearby waters. Some of the alternatives considered do not have as long a track record, but their consideration is warranted due to potential cost savings. General descriptions of the alternative means for stabilizing the shoreline are presented in the following paragraphs.

#### Breakwaters

Breakwaters are generally shore-parallel structures that effectively reduce the amount of wave energy reaching the protected shoreline. Their function is to reduce the wave energy in their lee and thus reduce the sediment carrying capacity of the waves.

A number of plan configurations are possible with breakwaters. For example, a continuous length or intermittent segments of breakwater may be located at the shoreline or offshore. Breakwaters can have a high crest or a low crest. However, low crested breakwaters are often submerged during storm events, and their effect on waves is relatively small. While they may cause some of the large waves to break, the intended function is to retard onshore and offshore movement of sediment. Dredge material may be placed in the lee of these structures to provide additional protection from overtopping waves. The areas created by placing fill shoreward of breakwaters can subsequently be planted with vegetative material to help stabilize the fill, or vegetative succession can be allowed to occur.

The shoreline response resulting from the construction of breakwaters is governed by the resulting changes in the longshore sediment transport, and the onshore-offshore sediment transport in the vicinity of the breakwater. The effects on sediment transport are a function of the structure length, crest elevation, permeability, gap width, and distance from the shoreline. For example, although a low crested, impermeable nearshore breakwater can reduce offshore transport, overtopping can result in a net seaward flow of water and sand through the gaps between the breakwater segments. Generally, following breakwater construction, a new equilibrium shoreline will be established in response to the altered transport processes.

Breakwater structures in the Chesapeake Bay region are usually constructed of armor stone. However, sand-filled geotextile tubes have been used recently on the Chesapeake Bay shoreline at various locations, with encouraging results. One such area is located immediately west of Rhodes Point, where geotextile tubes have been placed to form a continuous breakwater. Geotextile tubes are therefore being considered to protect other shoreline areas of the island.

**Revetments**

Typically revetment structures consist of a continuous wall of armor stone or riprap. Revetments stabilize a shoreline by dissipating wave energy on the revetment slope before it reaches the upland areas. A splash apron or shoreward extension of the crest of the revetment may be necessary if the revetment crest height cannot be built to an elevation that will prevent significant overtopping.

**Groins**

Stone or timber groins constructed perpendicular to the shoreline can reduce erosion along a shoreline by trapping longshore moving littoral drift in the groin compartments. However, this creates a potential for accelerating erosion downdrift of the groins due to interruption of the littoral drift. More importantly, a system of groins does not provide any significant protection during storm events with elevated tide levels. The elevated tides allow waves to attack the shoreline directly, resulting in offshore movement of the sediment. Groins were not considered as a viable alternative for the study area for this reason.

**Non-Traditional Bulkheads and Walls**

Innovative shoreline bulkhead and walls constructed of material such as pilings, timber slats, rubber tires, jersey barriers, have been used with mixed success in the Chesapeake bay and tributaries. Typically, these structures offer only a limited amount of erosion control over a relatively short project life. Therefore, these measures were not considered viable erosion control alternatives for the study area.

**Proprietary Erosion Control Measures**

Proprietary structures such as Beach Prisms, Beach Beams, Sand Grabbers, Surge Breakers, etc have been used with limited success in the Chesapeake Bay region. Because of their limited success, they were not considered viable alternatives for the study area.

## AREAS FOR SHORELINE PROTECTION RECOMMENDATIONS

The island was divided into four separate areas where wave dissipation measures and reclamation of some of the shoreline were considered. The areas identified as part of the study are:

- Sheep Pen Gut and the shoreline to the south, where protection is provided for Rhodes Point and the adjoining navigation channel.
- The shoreline at Tylerton.
- Swan Island and the adjoining barrier islands along the northwest coast, where protection is provided for Ewell and the adjoining navigation channel.
- Barrier islands and spits of land in the Martin Wildlife Refuge, where erosion has caused loss of marsh shoreline and SAV. Three coves, Terrapin Sand Cove, Back Cove, and an unname north cove, were evaluated.

### Area 1. Sheep Pen Gut

The location where Sheep Pen Gut joins the Bay is immediately west-northwest of the town of Rhodes Point. It has become apparent the barrier island at this location acts to shelter the Rhodes Point community from the damaging effects of storms on the Chesapeake Bay and that high rates of erosion are occurring in this area. Previous estimates indicate this shoreline to be eroding at an average rate of 8 feet per year. Attempts have been made to stabilize the bay shoreline directly west of Rhodes Point by placing geotextile tubes along the shoreline and filling behind the tubes with dredged material. This effort is ongoing as part of the continued maintenance dredging of the Federal navigation channels in the area. However, the southern point of land where Sheep Pen Gut joins the Bay and the shoreline to the south are continuing to erode, resulting in less protection to the Rhodes Point area.

Figure 1 is a photograph of the Sheep Pen Gut area. Note the erosion of the point and shoreline in the foreground. It is proposed to stabilize this shoreline by constructing a continuous breakwater of armor stone or placing a single geotube along this shoreline and southward down the coast towards the previous disposal area (visible on the right side of the photo). The concern is that if the shoreline continues to erode, then Rhodes Point (visible in the background) will be more directly exposed to high wave energy from the bay.

Figure 1.  Mouth of Sheep Pen Gut looking towards Rhodes Point.

**Area 2.  Swan Island and Vicinity**

Swan Island and the north jetty of the existing Federal navigation project shelter the navigation channel and the Ewell area from wave activity from the west through northwest directions.  At present, the north jetty has become separated from Swan Island.  In addition, a large breach has developed in the barrier island immediately to the north of Swan Island, and two smaller breaches have occured along the shoreline farther to the north.  It appears that the sheltering effect of these barrier islands are significantly reduced by these breaches and increased wave activity is now reaching Ewell.  Plans are under way to rehabilitate the north jetty.  However, additional measures are required to stabilize the shoreline of Swan Island and the areas to the north.

**Area 3.  Tylerton**

Previous estimates indicate that the shoreline along the southern end of Tylerton is experiencing an erosion rate of about one foot per year.  The remainder of the shoreline is bulkheaded, however the bulkhead is generally in a state of disarray and in need of replacement. Damages to the road, sewer system, homes, and property are likely to occur if the general trend for erosion continues unabated.

**Area 4. Northeast Coves**

There are three coves in the Martin Wildlife Refuge that historically were sheltered by barrier islands and spits of land. The spits of land that form the coves have eroded, and erosion of the shoreline along with a general deepening of the interior of the coves has occured. This situation has contributed to the loss of wetland areas, SAV, and fish and wildlife habitat.

## C-2. Coastal Engineering

### DATA DEVELOPMENT AND ANALYSIS

A general understanding of the coastal processes in the area is useful in scoping the possible atlernatives for erosion control for the areas identified Consequently, an analysis of the coastal processes active in the area was conducted. This analysis included the development of the annual wave climate, storm wave conditions, tidal elevations, longshore sediment transport rates, and historical shoreline changes. This analysis is discussed in the following paragraphs.

### WIND CONDITIONS

An Airport Climatological Summary for the Patuxent Naval Air Station for the period 1945 to 1980 was available from the National Climatic Data Center in Asheville, North Carolina. This summary included wind direction versus wind speed (percent frequency of observations) data for the individual twelve months of the year during this period. Percent frequency of observation data combining all months (an annual distribution) was also available. This wind station was used because of the quality and length of record.

The relative percentage of winds and the mean wind speed by direction are shown in Table 1. These data indicate that winds from the WNW through the N directions (clockwise) are both more frequent and of a greater magnitude.

Various return interval wind speeds for each of the principal compass directions were also calculated. The approach used to estimate the return intervals was to divide the wind observations into the sixteen principal compass directions, i.e. north, northeast, northwest, south, southeast, etc. The highest observed wind speed for each direction and each year of record was tabulated as shown in Table 2. A Gumbel statistical distribution was fit to the maximum wind speeds for a particular direction. Using the Gumbel distribution, the return interval wind speeds were calculated for the 5-year, 10-year, 25-year, 50-year, and 100-year storm events for each of the principal sixteen directions. Table 3 shows the various return interval wind speeds by direction.

| TABLE 1<br>PATUXENT NAVAL AIR STATION<br>WIND OCCURRENCE VS. DIRECTION<br>NO. OF OBSERVATIONS - 1945 TO 1980 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **WIND SPEED (kts)** | | | | | | | | |
| | **5** | **12.5** | **17.5** | **22.5** | **27.5** | **32.5** | **37.5** | **42.5** | **47.5** |
| **Direction/Occurrences** | | | | | | | | | |
| **N** | 6490 | 4172 | 1229 | 422 | 83 | 25 | 4 | 1 | 0 |
| **NNE** | 5814 | 3325 | 1173 | 396 | 65 | 11 | 2 | 2 | 0 |
| **NE** | 6792 | 3442 | 880 | 237 | 29 | 6 | 0 | 0 | 0 |
| **ENE** | 3330 | 1596 | 302 | 75 | 16 | 13 | 5 | 1 | 0 |
| **E** | 4031 | 1547 | 255 | 58 | 17 | 5 | 1 | 0 | 1 |
| **ESE** | 3732 | 1591 | 329 | 90 | 32 | 10 | 10 | 3 | 2 |
| **SE** | 9239 | 5339 | 1348 | 329 | 42 | 12 | 1 | 0 | 0 |
| **SSE** | 6989 | 4147 | 1035 | 190 | 22 | 5 | 0 | 0 | 1 |
| **S** | 9160 | 4218 | 695 | 163 | 11 | 1 | 1 | 0 | 0 |
| **SSW** | 7409 | 5460 | 1188 | 154 | 18 | 1 | 0 | 0 | 0 |
| **SW** | 7768 | 7121 | 2090 | 529 | 52 | 3 | 1 | 1 | 0 |
| **WSW** | 4643 | 3186 | 856 | 200 | 22 | 4 | 0 | 0 | 0 |
| **W** | 5798 | 2968 | 766 | 265 | 41 | 10 | 1 | 0 | 0 |
| **WNW** | 5532 | 3663 | 1813 | 897 | 322 | 89 | 14 | 2 | 1 |
| **NW** | 7327 | 6441 | 3479 | 2572 | 768 | 262 | 52 | 8 | 2 |
| **NNW** | 6297 | 5073 | 2449 | 989 | 247 | 77 | 12 | 6 | 3 |

## WAVE CONDITIONS

Smith Island is exposed to wind generated waves approaching from all directions. In general, the wave height and period (time in seconds for two successive crests or troughs to pass a fixed point) of waves reaching an area are dependent on the fetch (distance over water that the wind blows for a given direction), depth of water over a given fetch, the wind velocity and duration. Longer fetch lengths, deeper water over the fetch, higher wind velocities and longer durations result in greater wave heights propagating into an area.

**TABLE 2**
**PATUXENT NAVAL AIR STATION**
**MAXIMUM WIND SPEEDS (KNOTS)**
**PER YEAR AND PRINCIPAL COMPASS DIRECTION**

| YEAR | N | NNE | NE | ENE | E | ESE | SE | SSE | S | SSW | SW | WSW | W | WNW | NW | NNW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1945** | 34 | 27 | 27 | 39 | 26 | 29 | 32 | 28 | 25 | -- | 28 | 31 | 24 | 33 | -- | 33 |
| **1946** | 25 | 28 | 29 | 25 | 21 | 25 | 27 | 25 | 35 | 26 | 30 | 24 | 32 | 40 | 48 | 46 |
| **1947** | 30 | 31 | 24 | 22 | 23 | 18 | 23 | 23 | 22 | 22 | 25 | 31 | 30 | -- | 40 | -- |
| **1948** | 33 | 40 | 30 | 22 | 18 | 20 | 25 | -- | 25 | 28 | 24 | 23 | 30 | 38 | 37 | 47 |
| **1949** | 25 | 30 | 28 | 20 | 18 | 28 | 28 | 24 | 20 | 25 | 25 | 24 | 30 | 38 | -- | 35 |
| **1950** | 35 | 23 | 20 | 18 | 33 | 35 | 30 | 30 | 20 | 30 | 40 | 22 | 35 | 35 | 39 | 31 |
| **1951** | 40 | 27 | 25 | 20 | 28 | 26 | 30 | 30 | 25 | 20 | 25 | 23 | 24 | 45 | 33 | 35 |
| **1952** | 32 | 25 | 22 | 20 | -- | 37 | 38 | 32 | 20 | 21 | 28 | 24 | 34 | 38 | 32 | 47 |
| **1953** | 35 | 30 | 25 | 18 | 18 | 18 | 25 | 26 | 26 | 22 | 22 | 80 | 26 | 30 | 35 | 35 |
| **1954** | 31 | 32 | 20 | 20 | 20 | 49 | 62 | 23 | 30 | 20 | 29 | 50 | 24 | 30 | 38 | 32 |
| **1955** | 30 | 25 | 30 | 36 | 30 | 70 | 34 | 44 | 24 | 26 | 29 | 26 | 28 | 34 | 35 | 33 |
| **1956** | 30 | 29 | 33 | 40 | 28 | 30 | 28 | 25 | 21 | 25 | 25 | 20 | 25 | 30 | 35 | 36 |
| **1957** | 30 | 22 | 24 | 22 | 45 | 28 | 20 | 28 | 24 | 20 | 35 | 21 | 25 | 34 | 45 | 30 |
| **1958** | 32 | 28 | 24 | 22 | 28 | 17 | 20 | 26 | 28 | 22 | 25 | 28 | 26 | 32 | 36 | 40 |
| **1959** | 24 | 26 | 24 | 25 | 18 | 18 | 24 | 22 | 25 | 22 | 24 | 26 | 26 | 34 | 35 | 33 |
| **1960** | 22 | 20 | 21 | 30 | 20 | 18 | 20 | 23 | 20 | 21 | 28 | 23 | 22 | 35 | 35 | 30 |
| **1961** | 18 | 18 | 16 | 27 | 28 | 26 | 23 | 23 | 18 | 17 | 26 | 26 | 22 | 28 | 80 | 27 |
| **1962** | 23 | 21 | 16 | 14 | 22 | 24 | 15 | 17 | 16 | 20 | 20 | 20 | 20 | 20 | 24 | 19 |
| **1963** | 18 | 16 | 15 | 16 | 12 | 20 | 18 | 17 | 18 | 18 | 19 | 18 | 22 | 26 | 25 | 20 |
| **1964** | 26 | 28 | 25 | 18 | 30 | 20 | 26 | 22 | 17 | 22 | 26 | 25 | 25 | 24 | 28 | 30 |
| **1965** | 20 | 22 | 20 | 16 | 20 | 24 | 22 | 18 | 21 | 24 | 30 | 22 | 24 | 32 | 30 | 26 |
| **1966** | 18 | 16 | 20 | 18 | 18 | 19 | 20 | 18 | 20 | 20 | 22 | 25 | 34 | 24 | 22 | 19 |
| **1967** | 19 | 20 | 17 | 16 | 14 | 17 | 18 | 20 | 20 | 24 | 20 | 28 | 22 | 26 | 30 | 22 |
| **1968** | 26 | 30 | 15 | 23 | 20 | 17 | 16 | 21 | 18 | 26 | 21 | 22 | 25 | 25 | 33 | 26 |
| **1969** | 18 | 18 | 18 | 16 | 20 | 16 | 20 | 22 | 19 | 20 | 21 | 18 | 20 | 26 | 24 | 20 |
| **1970** | 19 | 16 | 14 | 16 | 14 | 18 | 19 | 22 | 26 | 14 | 24 | 26 | 27 | 22 | 28 | 26 |
| **1971** | 20 | 20 | 18 | 20 | 18 | 14 | 19 | 19 | 21 | 26 | 22 | 21 | 28 | 31 | 31 | 20 |
| **1972** | 20 | 15 | 16 | 17 | 19 | 18 | 13 | 15 | 21 | 22 | 18 | 20 | 24 | 30 | 31 | 20 |
| **1973** | 18 | 18 | 20 | 11 | 13 | 13 | 16 | 16 | 16 | 17 | 22 | 24 | 22 | 20 | 18 | 18 |
| **1974** | 15 | 15 | 13 | 13 | 28 | 13 | 20 | 15 | 16 | 17 | 22 | 22 | 26 | 20 | 19 | 20 |
| **1975** | 22 | 15 | 13 | 12 | 15 | 12 | 15 | 17 | 22 | 16 | 23 | 21 | 33 | 30 | 24 | 27 |
| **1976** | 17 | 12 | 12 | 13 | 9 | 14 | 15 | 16 | 16 | 18 | 20 | 16 | 16 | 21 | 20 | 24 |
| **1977** | 15 | 15 | 20 | 22 | 20 | 17 | 17 | 20 | 17 | 20 | 16 | 20 | 21 | 34 | 24 | 22 |
| **1978** | 18 | 16 | 28 | 18 | 17 | 14 | 18 | 20 | 19 | 22 | 30 | 26 | 25 | 26 | 25 | 14 |
| **1979** | 15 | 15 | 15 | 20 | 17 | 14 | 24 | 24 | 22 | 22 | 20 | 22 | 20 | 23 | 22 | 28 |
| **1980** | 20 | 17 | 13 | 11 | 12 | 22 | 16 | 19 | 20 | 21 | 19 | 21 | 19 | 21 | 26 | 20 |

**TABLE 3**
**WIND SPEED (kts) RETURN PERIODS**
**ADJUSTED FOR 33 FT. ELEVATION**

| **DIRECTION** | **RETURN PERIOD (years)** | | | | |
|---|---|---|---|---|---|
| | **5** | **10** | **25** | **50** | **100** |
| **N** | 29.85 | 34.23 | 39.76 | 43.86 | 47.94 |
| **NNE** | 27.75 | 31.95 | 37.26 | 41.2 | 45.1 |
| **NE** | 25.51 | 29.16 | 33.78 | 37.21 | 40.61 |
| **ENE** | 26.13 | 30.57 | 36.19 | 40.36 | 44.50 |
| **E** | 26.92 | 31.90 | 38.19 | 42.86 | 47.49 |
| **ESE** | 31.35 | 38.10 | 46.63 | 52.96 | 59.24 |
| **SE** | 27.27 | 31.44 | 36.71 | 40.62 | 44.50 |
| **SSE** | 27.14 | 30.84 | 35.51 | 38.97 | 42.41 |
| **S** | 24.96 | 27.69 | 31.14 | 33.70 | 36.67 |
| **SSW** | 24.39 | 26.65 | 29.51 | 31.63 | 33.73 |
| **SW** | 28.56 | 31.72 | 35.71 | 38.67 | 41.61 |
| **WSW** | 32.68 | 38.28 | 45.35 | 50.60 | 55.81 |
| **W** | 29.19 | 32.12 | 35.83 | 38.58 | 41.31 |
| **WNW** | 34.65 | 38.76 | 43.95 | 47.80 | 51.62 |
| **NW** | 40.03 | 46.82 | 55.37 | 61.71 | 68.00 |
| **NNW** | 35.10 | 40.60 | 47.54 | 52.68 | 57.79 |

The wave approach directions (fetches) critical to each of the areas of Smith Island considered as part of this study are shown in Figures 2 through 7. All directions which can cause waves to propagate towards the respective project areas were evaluated to determine which direction causes the most severe conditions. The fetch lengths and average depths over these fetches are shown in Tables 4 thru 9 for each of the areas. These data are required to calculate the offshore wave heights and periods.

An annual wave climatology affecting the western shoreline of Smith Island was developed using the shallow water wave forecasting equations as presented in the Automated Coastal Engineering System (ACES) computer program. Wave heights were developed corresponding to the wind speed group and percent occurrence of that group by direction from the airport climatology. The data was adjusted to show the number of occurrences of various wave heights by direction over a typical year period. This wave climatology is presented in Table 10.

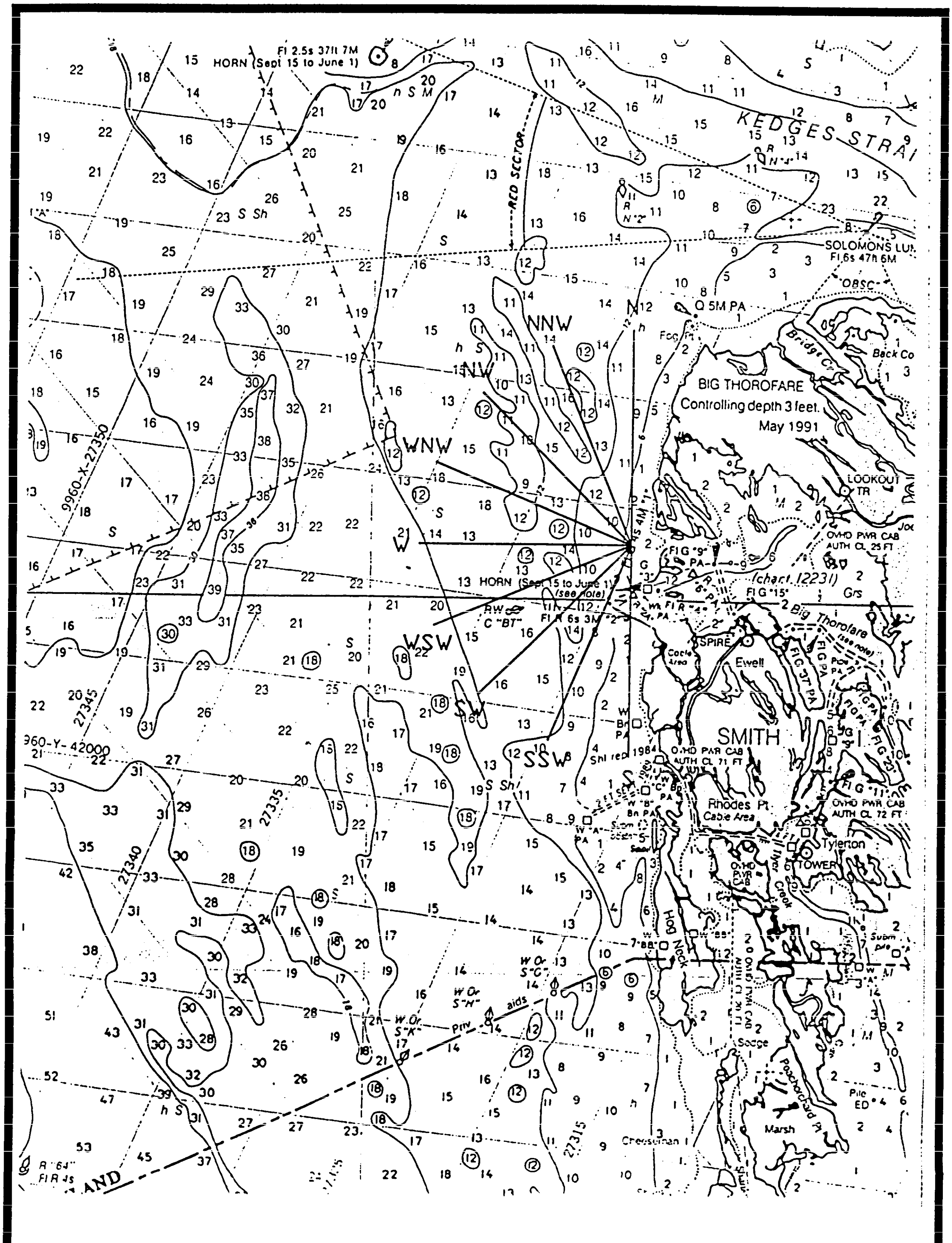



Figure 2. Swan Island Wave Approach Directions

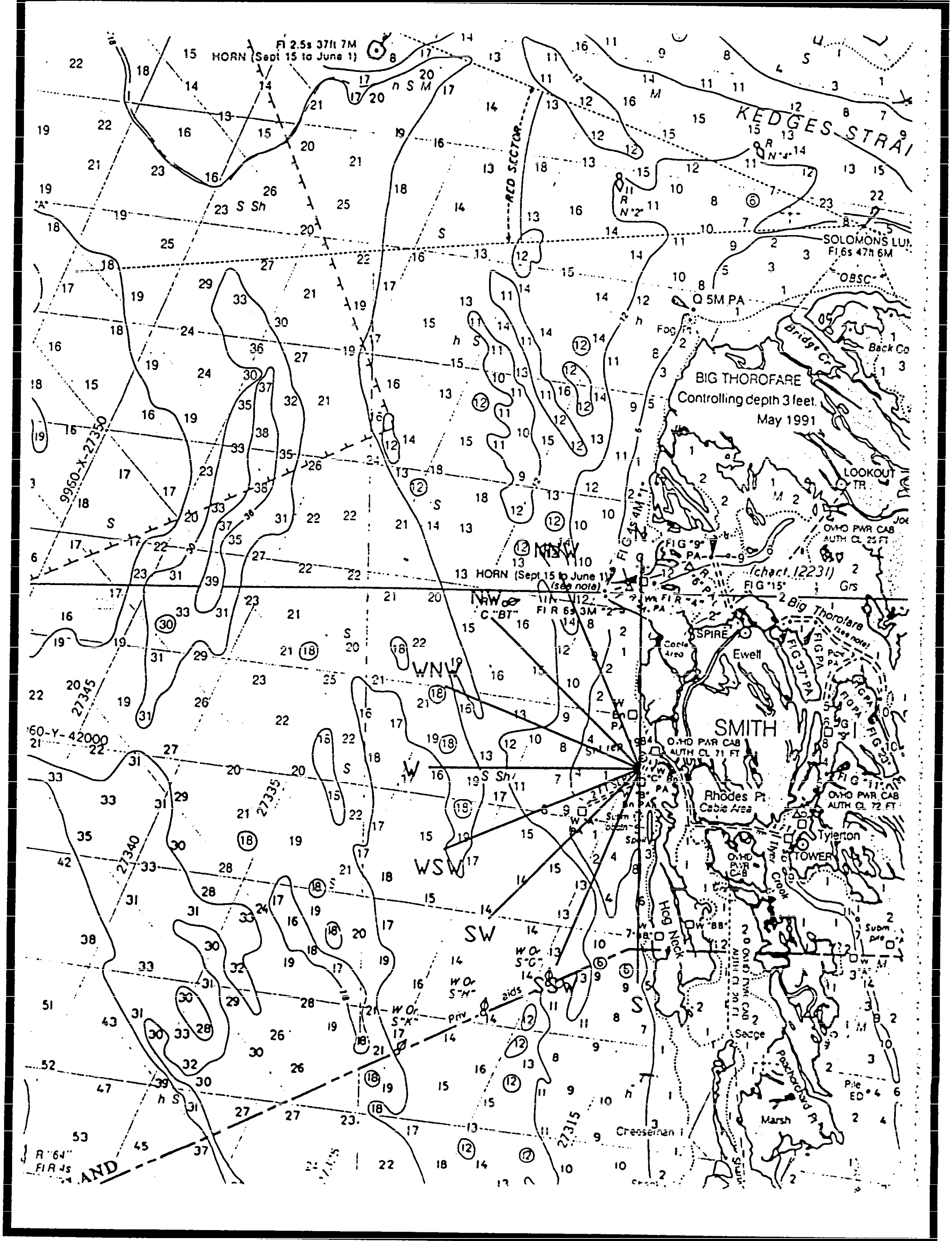



Figure 3. Rhodes Point Wave Approach Directions

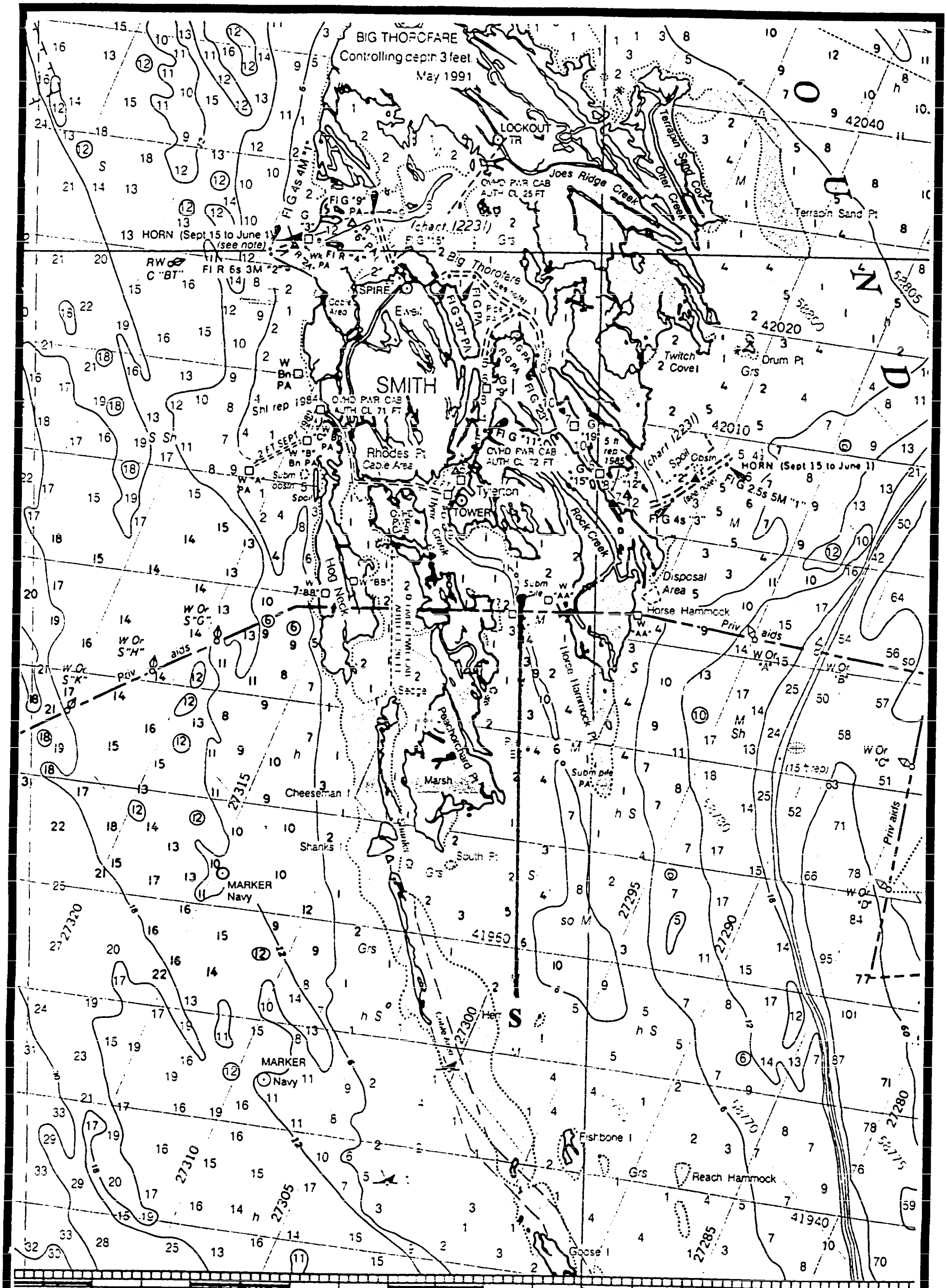



Figure 4. Tylerton Wave Approach Directions

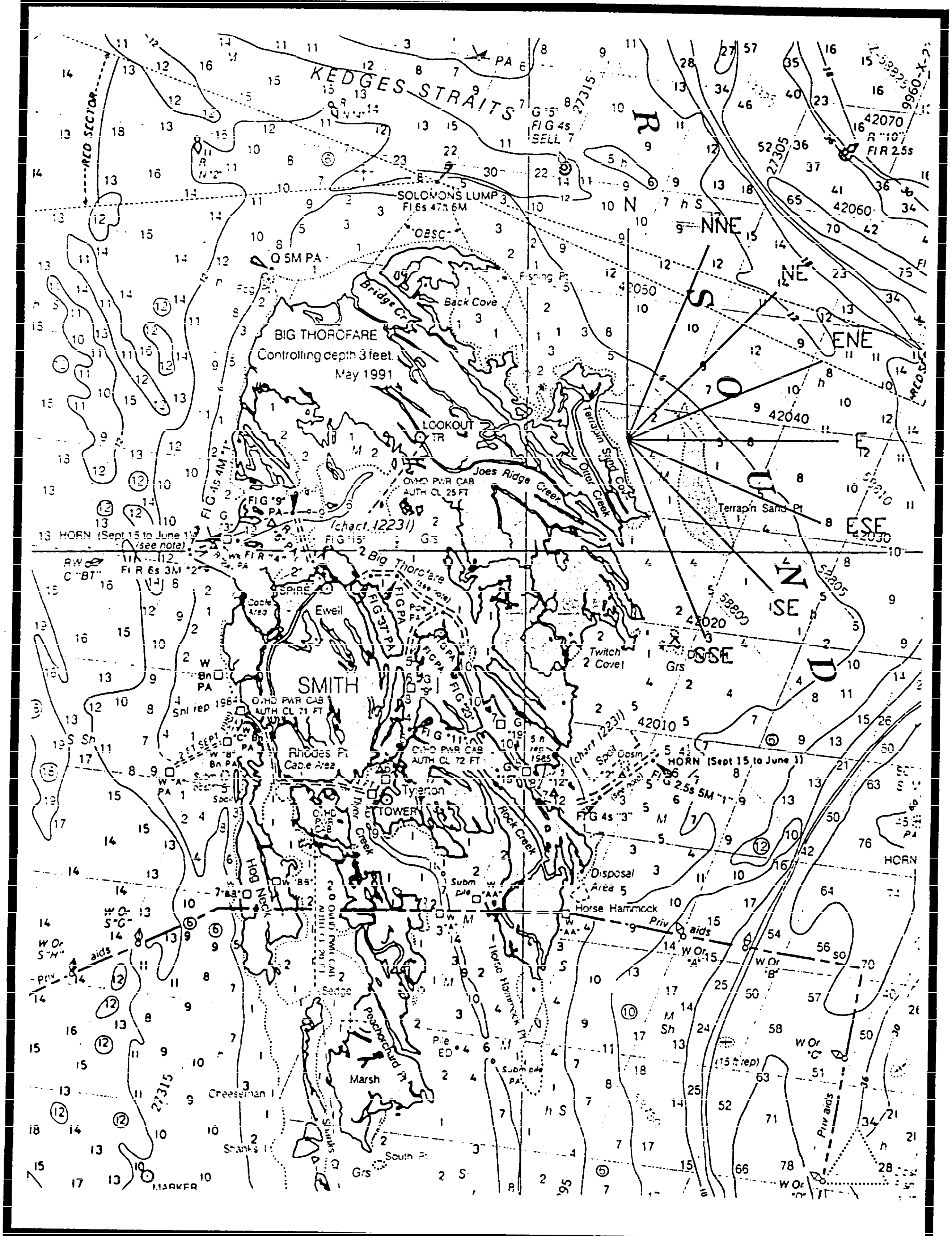



Figure 5. Terrapin Sand Cove Wave Approach Directions

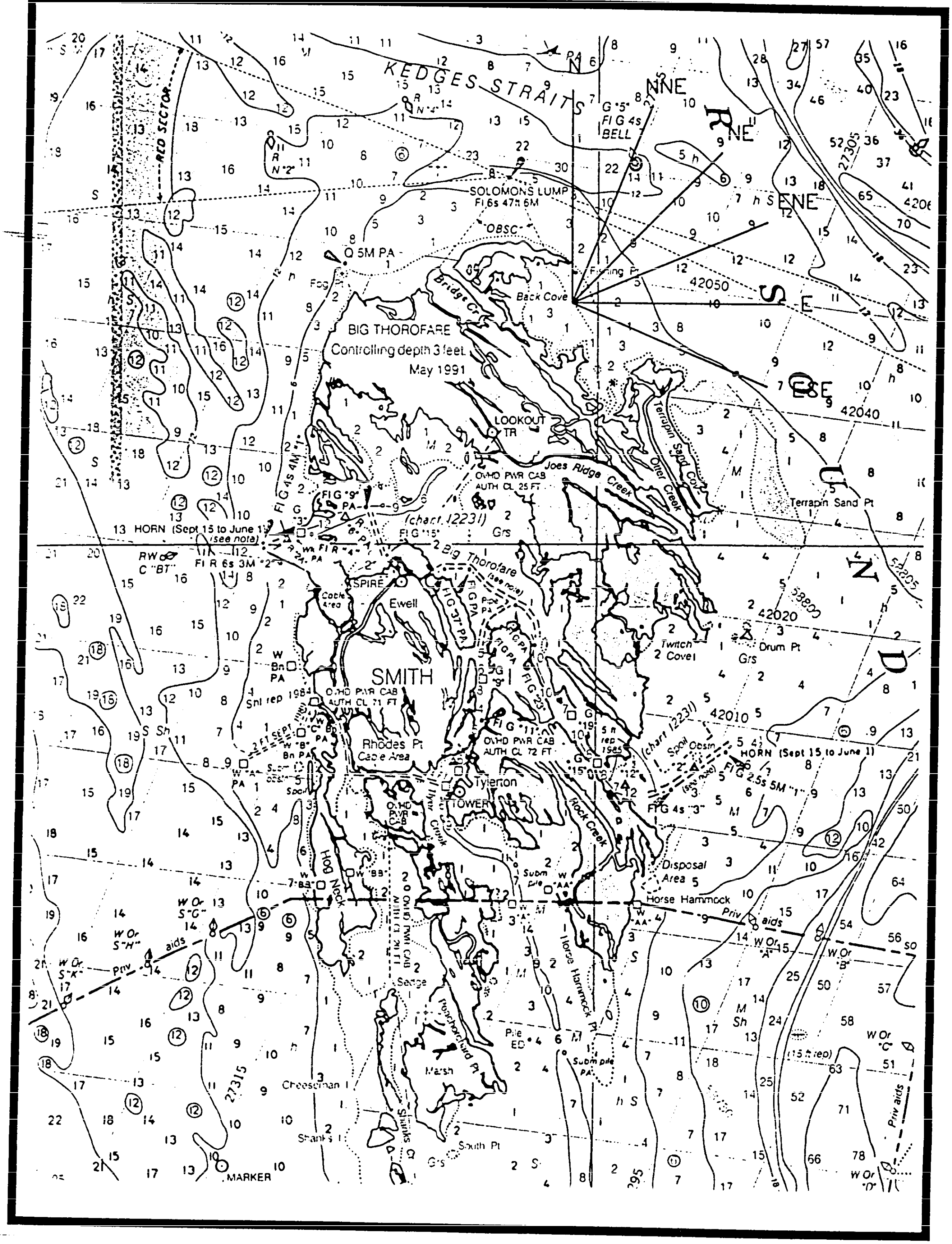



Figure 6. Back Cove Wave Approach Directions

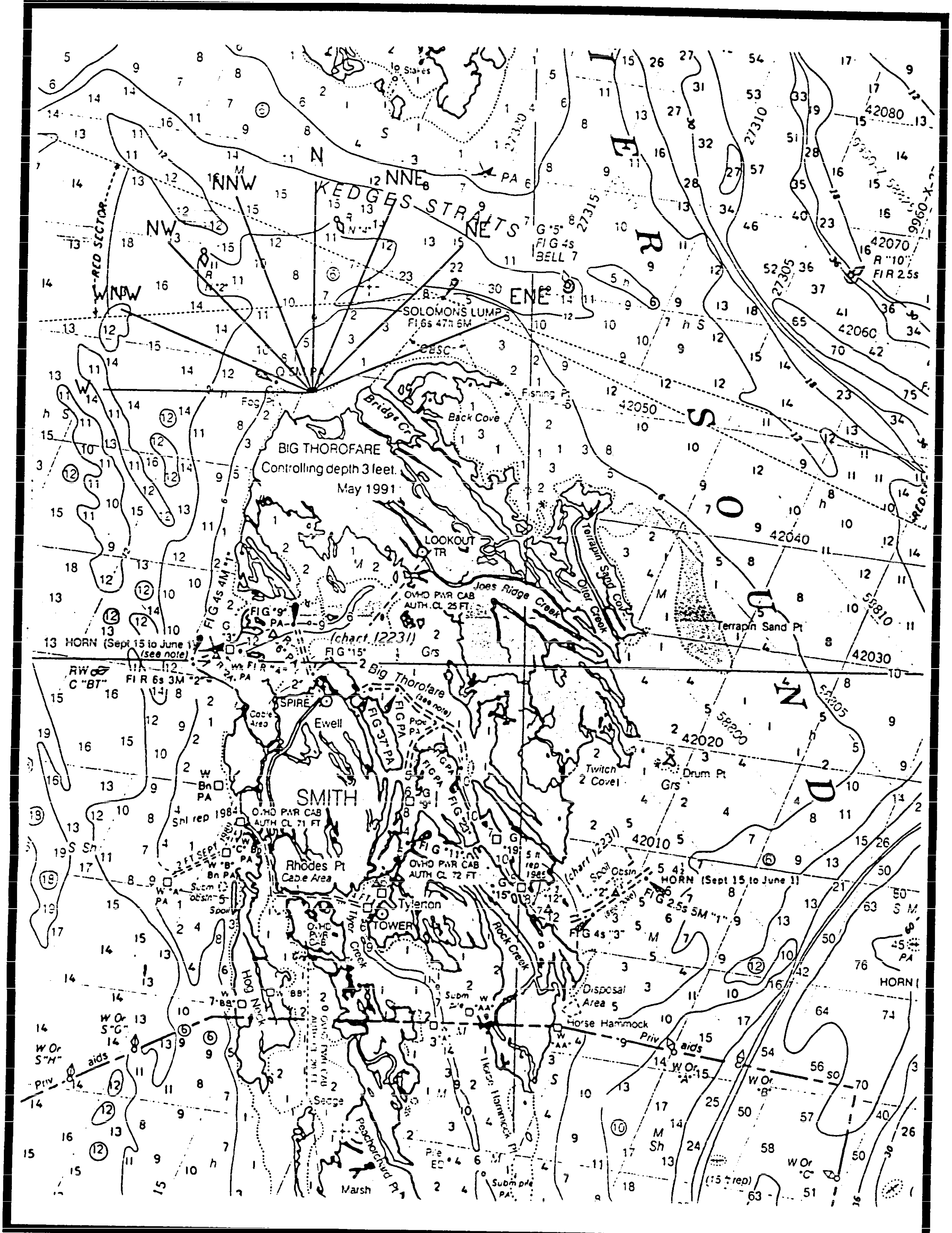



Figure 7. Fog Point Cove Wave Approach Directions

An annual wave climatology affecting the western shoreline of Smith Island was developed using the shallow water wave forecasting equations as presented in the Automated Coastal Engineering System (ACES) computer program. Wave heights were developed corresponding to the wind speed group and percent occurrence of that group by direction from the airport climatology. The data was adjusted to show the number of occurrences of various wave heights by direction over a typical year period. This wave climatology is presented in Table 10.

In addition, offshore wave heights for the appropriate wave fetch directions were developed using annual extreme wind data from the Patuxent naval Air Station. Statistical analyses of the annual extreme wind data from Patuxent resulted in the wind speed corresponding to various return interval storms. These wind data were then used to generate the wave heights corresponding to these winds. The most significant wave heights for various return interval storms are shown in Table 11 for the respective shoreline areas.

**TABLE 4**
**FETCH CHARACTERISTICS**
**NORTHWEST SHORELINE**

| Direction | Fetch Length (miles) | Average Depth (feet) |
|---|---|---|
| **WNW** | 16.3 | 31.0 |
| **NW** | 26.9 | 30.8 |
| **NNW** | 25.8 | 13.5 |
| **N** | 6.2 | 11.1 |
| **S** | 57.0 | 31.5 |
| **SSW** | 35.6 | 41.2 |
| **SW** | 16.6 | 30.0 |
| **WSW** | 14.3 | 35.5 |
| **W** | 21.0 | 32.2 |

**TABLE 5**
**FETCH CHARACTERISTICS**
**RHODES POINT**

| Direction | Fetch Length (miles) | Average Depth (feet) |
|---|---|---|
| **WNW** | 16.3 | 31.0 |
| **NW** | 26.9 | 30.8 |
| **NNW** | 25.8 | 13.5 |
| **N** | 6.2 | 11.1 |
| **S** | 57.0 | 31.5 |
| **SSW** | 35.6 | 41.2 |
| **SW** | 16.6 | 30.0 |
| **WSW** | 14.3 | 35.5 |
| **W** | 21.0 | 32.2 |

**TABLE 6**
**FETCH CHARACTERISTICS**
**TYLERTON**

| Direction | Fetch Length (miles) | Average Depth (feet) |
|---|---|---|
| S | 57.0 | 31.5 |

**TABLE 7**
**FETCH CHARACTERISTICS**
**BACK COVE**

| Direction | Fetch Length (miles) | Average Depth (feet) |
|---|---|---|
| ESE | 6.6 | 17.0 |
| E | 6.8 | 21.0 |
| ENE | 7.4 | 16.0 |
| NE | 10.5 | 9.5 |
| NNE | 6.9 | 15.0 |
| N | 12.4 | 9.0 |

**TABLE 8**
**FETCH CHARACTERISTICS**
**TERRAPIN SAND COVE**

| Direction | Fetch Length (miles) | Average Depth (feet) |
|---|---|---|
| SSE | 31.5 | 15.5 |
| SE | 8.2 | 12.0 |
| ESE | 6.6 | 17.0 |
| E | 6.8 | 21.0 |
| ENE | 7.4 | 16.0 |
| NE | 10.5 | 9.5 |
| NNE | 6.9 | 15.0 |
| N | 12.4 | 9.0 |

**TABLE 9**
**FETCH CHARACTERISTICS**
**NORTH COVE**

| Direction | Fetch Length (miles) | Average Depth (feet) |
|---|---|---|
| W | 17.6 | 28 |
| WNW | 18.5 | 26 |
| NW | 28.2 | 30 |
| NNW | 18.4 | 16 |
| N | 3.2 | 8 |
| NNE | 2.7 | 8 |
| NE | 7.6 | 12 |
| ENE | 11.2 | 14 |

## TABLE 10
## ANNUAL WAVE CLIMATOLOGY
## WESTERN SHORELINE

| | WIND SPEED (mph)/NO. OF OBSERVATIONS PER YEAR/WAVE HEIGHT (ft) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Direction** | 0-9.9 | 10-14.9 | 15-19.9 | 20-24.9 | 25-29.9 | 30-34.9 | 35-39.9 | 40-44.9 | 45-49.9 | 50> |
| **WNW** | 145.57 | 96.39 | 47.71 | 23.59 | 8.47 | 2.34 | 0.37 | 0.05 | 0.03 | 0.00 |
| | .25 | 1.1 | 1.7 | 2.2 | 2.8 | 3.4 | 4.0 | 4.5 | 5.1 | |
| NW | 192.69 | 169.39 | 91.49 | 67.64 | 20.20 | 6.89 | 1.37 | 0.21 | 0.05 | 0.03 |
| | .26 | 1.3 | 2.0 | 2.7 | 3.3 | 4.0 | 4.6 | 5.2 | 5.9 | 6.7 |
| NNW | 165.60 | 133.41 | 64.41 | 26.01 | 6.50 | 2.03 | 0.32 | 0.16 | 0.08 | 0.03 |
| | .25 | 1.1 | 1.6 | 2.1 | 2.4 | 2.8 | 3.1 | 3.5 | 3.8 | 4.2 |
| N | 170.68 | 109.72 | 32.32 | 11.1 | 2.18 | 0.66 | 0.11 | 0.03 | 0.00 | 0.00 |
| | .17 | .61 | .89 | 1.2 | 1.4 | 1.7 | 2.0 | 2.2 | | |
| S | 240.90 | 110.93 | 18.28 | 4.29 | 0.29 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 |
| | .26 | 1.6 | 2.5 | 3.4 | 4.1 | 4.8 | 5.5 | | | |
| SSW | 194.85 | 143.59 | 31.24 | 4.05 | 0.47 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| | .26 | 1.4 | 2.3 | 3.1 | 3.9 | 4.7 | | | | |
| SW | 204.29 | 187.27 | 54.96 | 13.91 | 1.37 | 0.08 | 0.03 | 0.03 | 0.00 | 0.00 |
| | .25 | 1.10 | 1.7 | 2.2 | 2.8 | 3.4 | 4.0 | 4.5 | | |
| WSW | 122.10 | 83.79 | 22.51 | 5.26 | 0.58 | 0.11 | 0.00 | 0.00 | 0.00 | 0.05 |
| | .24 | 1.0 | 1.6 | 2.1 | 2.7 | 3.3 | | | | 6.0 |
| W | 152.48 | 78.05 | 20.14 | 6.97 | 1.08 | 0.26 | 0.03 | 0.00 | 0.00 | 0.00 |
| | .25 | 1.2 | 1.8 | 2.5 | 3.1 | 3.7 | 4.3 | | | |

| TABLE 11<br>WAVE CONDITIONS | | | | | | |
|---|---|---|---|---|---|---|
| | | OFFSHORE WAVE HEIGHTS | | | | |
| **AREA** | **DIRECTION** | **5-YEAR** | **10-YEAR** | **25-YEAR** | **50-YEAR** | **100-YEAR** |
| NORTHWEST | NW | 5.7 | 6.6 | 7.7 | 8.5 | 9.3 |
| RHODES POINT | NW | 5.7 | 6.6 | 7.7 | 8.5 | 9.3 |
| TYLERTON | S | 4.3 | 4.8 | 5.3 | 5.7 | 6.1 |
| NORTHEAST 1 | SSE | 3.0 | 3.3 | 3.7 | 4.0 | 4.2 |
| NORTHEAST 2 | ESE | 2.2 | 2.7 | 3.3 | 3.8 | 4.2 |
| NORTH 1 | NW | 5.7 | 6.6 | 7.7 | 8.4 | 9.2 |

## TIDAL ELEVATIONS

Tidal elevations in the study area are significant from a wave, erosion control and flooding standpoint. Higher tides allow the waves generated along the various fetches to propagate closer to shore before breaking. If the tide elevation is great enough, large portions of the island can be inundated allowing direct wave attack on interior portions of the island. Table 12 indicates the tidal elevations in the study area for the various return periods.

| TABLE 12<br>TIDAL ELEVATIONS | |
|---|---|
| RETURN INTERVAL | ELEVATION<br>(ft MLLW) |
| Mean Tide [1/] | 1.6 |
| Spring Tide [1/] | 1.9 |
| 5 year [2/] | 4.2 |
| 10 year [2/] | 4.6 |
| 25 year [2/] | 5.1 |
| 50 year [2/] | 5.5 |
| 100 year [2/] | 5.8 |

[1/] U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), Tide Tables, High and Low Water Predictions, East Coast of North and South America, 1997.

[2/] Virginia Institute of Marine Science, Storm Surge Height-Frequency Analyses and Model Prediction for Chesapeake Bay, 1978.

## SEDIMENT TRANSPORT

Sediment transport processes along the western shoreline of Smith Island were of particular interest. Principally, two sediment transport processes are active in the area. The first of these processes is longshore sediment transport. As waves approach the shoreline at an angle and feel the bottom profile, they will shoal and break. This breaking process sets the sediment in suspension and also induces a longshore current which flows parallel to the shoreline in the direction of the wave approach. This current transports the sediment set in motion during the breaking process.

Gross longshore sediment transport, $Q_g$, is the total quantity of sediment transported to a project site from both updrift and downdrift of the area. Net transport, $Q_{net}$, is the difference between the drift moving along the shoreline.

For this study, the potential longshore sediment transport rates along the western shoreline of Smith Island were developed using the wave energy flux method as presented in the Shore Protection Manual (SPM 1984) and the Automated Coastal Engineering System (ACES) computer program. This quantity was calculated by incorporating such factors as wind intensity and direction as well as the wind distribution at Swan Island and converting this information into a totally hypothetical longshore transport rate. These calculations showed that the gross transport rate is approximately 70,000 $yd^3$/year. This means that, in general, the potential for movement of 70,000 $yd^3$ of sediment past a fixed point exists along western shoreline project sites. Of this 70,000 $yd^3$ of sediment, approximately 50,000 $yd^3$ is directed southward while the remaining 20,000 $yd^3$ is directed northward, resulting in a net southward transport of approximately 30,000 $yd^3$/year.

Previous studies of the longshore sediment transport have been conducted by the Virginia Institute of Marine Sciences (VIMS)and the Maryland Department of Natural Resources. These studies indicated the net longshore rate to be approximately 65,000 $yd^3$/year and 10,000 $yd^3$/year to the south receptively. An analysis of aerial photographs during the VIMS study indicated a net movement to the south, but not as large a quantity as the computer model predicted. Therefore, a net transport rate of 10,000 to 40,000 $yd^3$/year to the south appears reasonable for the area. These measures of transport can be of interest in evaluating the potential trapping of sediment by shore perpendicular structures such as groins or jetties.

Offshore sediment transport is the second process affecting the western shoreline area. Transport of sediment in the offshore direction occurs primarily during storm events. This action tends to place sediment in suspension, transport it in an offshore direction, and place it in underwater ridges or bars parallel to the shoreline. It is estimated for the western eroding areas of Smith Island, once this sediment is deposited offshore, very little returns to the shoreline area. This is due to the lack of the less steep, longer period swell type waves which would tend to transport some of the material onshore. Both modes of transport are important in that structures placed to protect a shoreline must reduce the wave energy causing transport in the offshore direction while not impeding longshore transport.

## C-3. Geotechnical Engineering

### FOUNDATION CONDITIONS

Detailed foundation analyses, consisting of drilling and testing, will not be accomplished until the feasibility phase of the project has been initiated. At that time, a foundation exploration program will be undertaken to assess the conditions at the locations of the proposed structures. It is apparent, however, based on review of existing data, and some limited testing performed on grab samples, that foundation conditions will likely be somewhat variable. Conditions at the proposed structures are expected to vary from relatively firm sands (SP), to relatively soft, compressible clays with varying amounts of organic material (CL or CH). Test results of grab samples taken in the Sheep Pen Gut area are shown in Figures 8 - 11. The approximate locations where these samples were obtained are shown on Plate 2.

Where stone structures (jetties, breakwaters, or revetments) or sand-filled geotextile tubes are to be founded on soft compressible foundations, measures must be incorporated into the design to compensate for settlement. These measures may include excavation of the soft foundation material and replacement with stable backfill, or incorporating an appropriate overbuild into the design. It is expected that geotextile mats will be required beneath all stone structures regardless of the foundation conditions.

### MATERIALS

After the size and gradation limits of stone for jetties, breakwaters, and revetments are determined during the feasibility phase, a District geologist will research available stone sources and determine which quarries can produce stone of the size and quality required. These quarries will be listed in the contract documents for use by the contractor. It is expected that all stone will be barged to the site of placement. Material for geotextile tube fill will be clean sands dredged from offshore sites.

## C-4. Recommended Alternative Plans

The conceptual plans considered for each area are described in the following paragraphs. It should be noted that a comprehensive evaluation of all possible solutions to the erosion problems effecting each of the areas is beyond the scope of this study. More detailed analyses of alternative plans and combinations of alternative plans will be required to develop a recommended solution.

### AREA 1. SHEEP PEN GUT

Alternative solutions are presented in the following paragraphs to address two problems. Plan 1 addresses stabilization of the shoreline in the vicinity of Sheep Pen Gut to provide better storm protection for the Rhodes Point area. It is hoped that alternative 1 for this plan will be implemented in Federal fiscal year 1998 as part of the WRDA 96 Congressional legislation. Plan 2 addresses the Federal navigation channel that extends from Rhodes Point through Sheep Pen Gut to deep water in the Chesapeake Bay. The channel shoals rapidly in this channel after maintenance dredging. Several

# VISUAL-MANUAL CLASSIFICATION

PROJECT: SOMERSET CO., MD DATE: MAR 1997

AREA: SMITH ISLAND ENVIRONMENTAL RESTORATION CLASSIFIED BY: SHARPE

SHEEP PEN GUT

| SAMPLE NO. | DEPTH (FT) | VISUAL CLASSIFICATION | SYMBOL |
|---|---|---|---|
| SP-1 | | | |
| Jar-1 | 0.0'-1.6' | Very moist, brn. gray, silty clayey sand (w/ roots) 1&2 | (SC/SM) |
| -2 | 1.6'-2.0' | Wet, brn. gray, sandy fat clay 1&3 (tr. roots) | (CH) |
| | | 1. Organic odor 2. Medium to fine sand | |
| | | 3. Fine sand | |
| SP-2 | | | |
| Jar-1 | 0.0'-2.0' | Wet, brn. gray, sandy 1 fat clay (tr. roots) | (CH) |
| | | 1 Fine sand | |
| SP-3 | | | |
| Jar-1 | 0.0'-2.0' | wet, black, fat clay w/ sand 1 (w/ root fibers) | (CH) |
| SP-4 | | | |
| Jar-1 | 0.0'-1.0' | Very moist, dk. gray, lean clay w/ sand | (CL) |
| GS-1 | | (Near Refuge Shoreline Coves) | |
| Jar-1 | 0.0'-0.5' | Moist, very dark gray, poorly graded sand w/ silt 1 | (SP-SM) |
| | | 1 Mostly fine sand | |

Figure 8. Sheep Pen Gut Soils Visual-Manual Classification

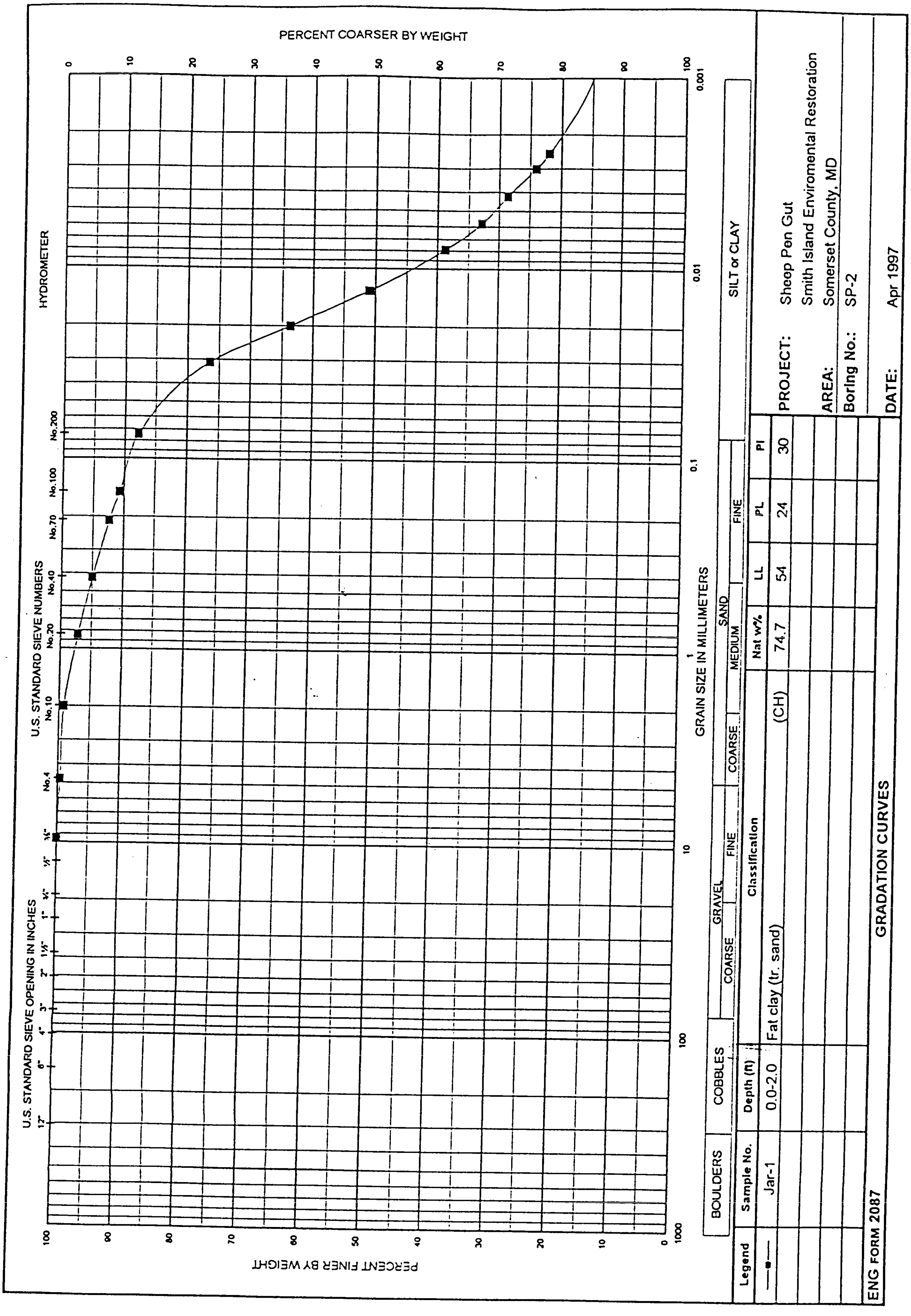



Figure 9. Soils Analysis Sheep Pen Gut Boring #2

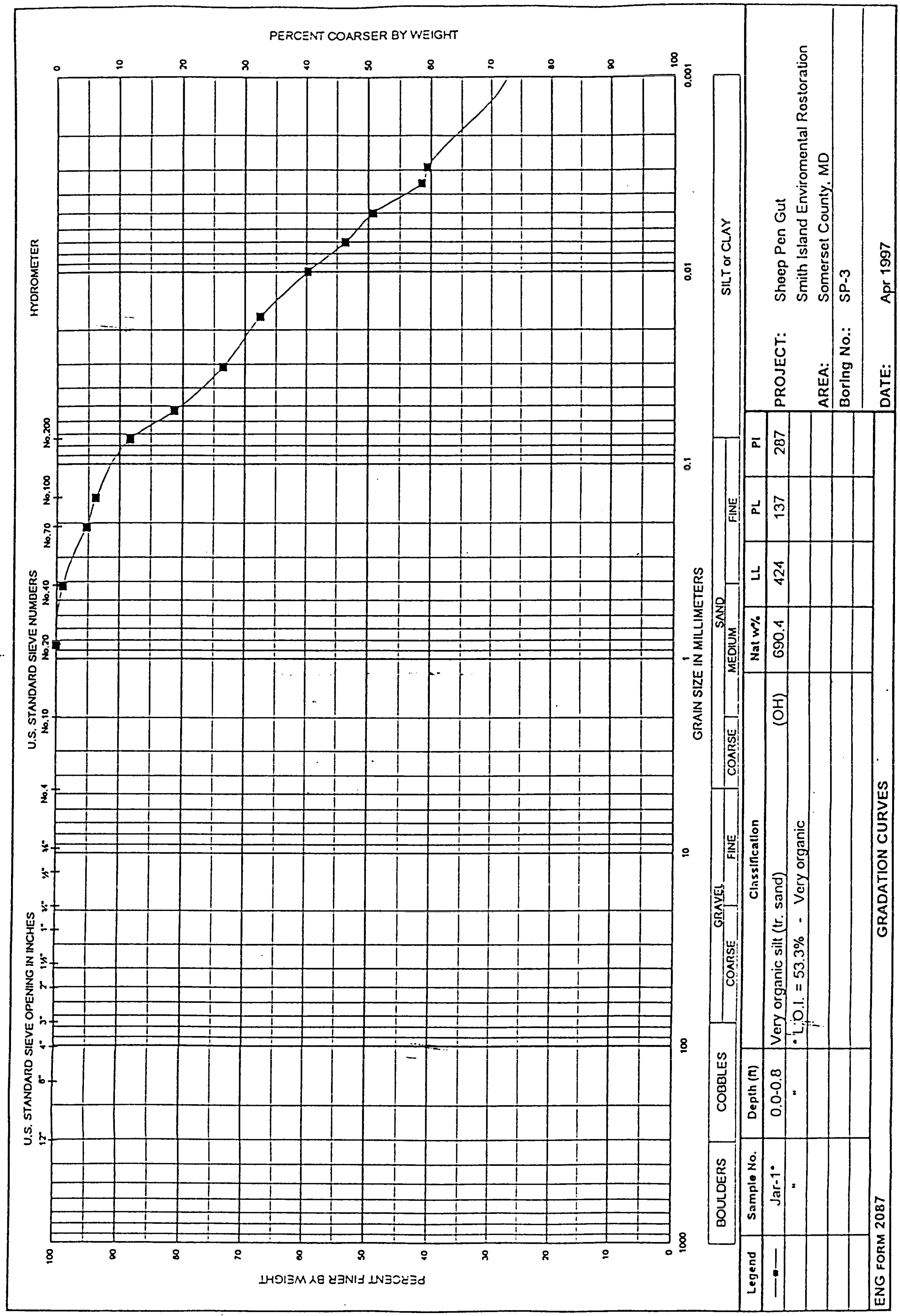



Figure 10. Soils Analysis Sheep Pen Gut Boring #3

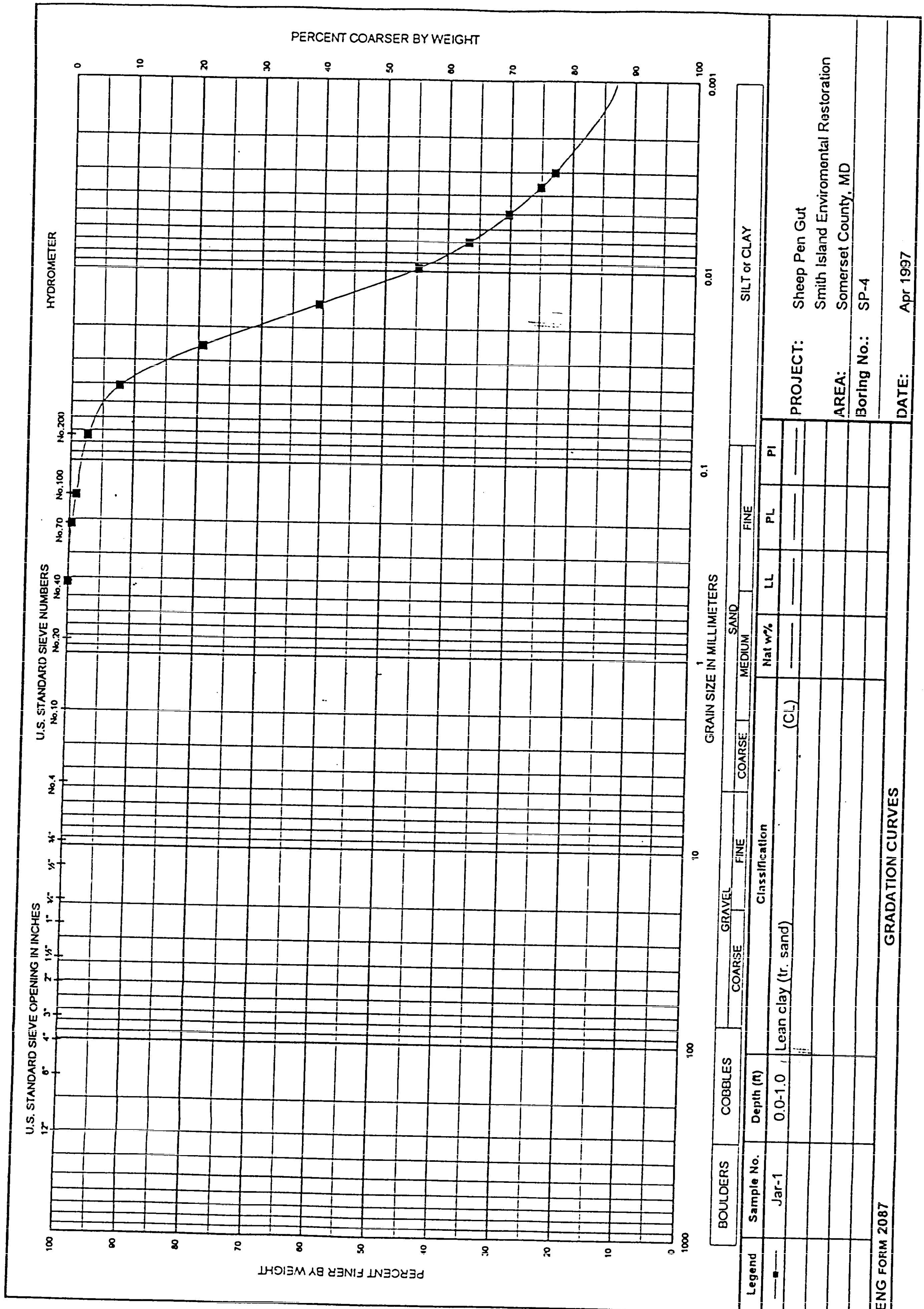



Figure 11. Soils Analysis Sheep Pen Gut Boring #4

alternative jetty configurations are proposed to reduce and/or eliminate shoaling in the channel, to be implemented together with one of the shoreline protection alternatives.

**Plan 1. Sheep Pen Gut Shoreline Protection**

Plan 1 consists of 1,980 linear feet of breakwater at Sheep Pen Gut, and is shown on Plate 2 for both alternatives. The nearshore area between the lee of the geotextile tube breakwater and the mean high water line MHWL of the barrier island will be filled with dredge material and planted. The breakwater will create fifteen acres of new wetland in its lee.

Alternative 1. Sheep Pen Gut Geotextile Tube Breakwater. Continuous geotextile tube will be used for the breakwater, and will have a crest elevation of +4 feet MLLW. The tube will be 45 feet in circumference and will be filled with material dredged from offshore. It will attain a height of approximately 6 feet. The footprint of the geotextile tube will be approximately 22 feet.

Alternative 2. Sheep Pen Gut Stone Revetment. A typical breakwater section is shown on Plate 17.

**Plan 2. Sheep Pen Gut Jetty**. These alternative plans are intended to interrupt the flow of sediment moving alongshore from north to south close to the shoreline, thereby reducing the rate of channel shoaling. A typical jetty section has crest height of +4 feet MLLW and is shown on Plate 17**.**

Alternative 1. Sheep Pen Gut Jetty. This jetty configuration, shown on Plate 3, consists of construction of a single jetty perpendicular to the shoreline extending from the shoreline to the north of Sheep Pen Gut approximately 600 feet into the bay.

Alternative 2. Sheep Pen Gut Jetty. This jetty configuration, shown on Plate 4, consists of construction of twin jetties parallel to the existing channel. The total length of jetty required is 2100 linear feet.

Alternative 3. Sheep Pen Gut Jetty. This jetty configuration, shown on Plate 5, consists of realigning the existing channel to extend from the mouth of Sheep Pen Gut directly to deep water in the Chesapeake Bay. In addition twin jetties parallel to the channel will be constructed. The intent of the jetties is to eliminate shoaling of the channel from material arriving at the channel from both the north and the south. The length of jetty each is 3000 linear feet.

Alternative 4. Sheep Pen Gut Jetty. This jetty configuration, shown on Plate 6, consists of construction of a single jetty perpendicular to the shoreline extending from the shoreline to the north of Sheep Pen Gut approximately 3000 feet into the bay. The alignment of the navigation channel would remain as it is.

## AREA 2.  SWAN ISLAND AND VICINITY

Swan Island, the adjoining jetty, and the barrier islands that extend along the northwest coastline, act together to shelter the Ewell area from wave activity from the west and northwest directions.  At present the north jetty has become separated from Swan Island.  A large breach has developed between Swan Island and the barrier island to the north.  In addition, two smaller breaches have occured along the shoreline farther north.  It appears that this has allowed increased wave activity to reach the Ewell area.  A project is now under way to rehabilitate the north jetty.  Additional measures are required to stabilize the shoreline of Swan Island and the areas to the north.

The following paragraphs discuss the Plan 1, which proposes to address the breaches in the vicinity of Swan Island, and Plan 2, which deals with stabilizing the northwest shoreline.  Plan 2 should be implemented in conjunction with Plan 1.

### Plan 1.  Breaches in the Vicinity of Swan Island

Plan 1, shown on Plates 7 and 8, consists of placing sand filled geotubes on bay side and island side of the gaps and filling between the tubes with dredged material from offshore.  These areas will subsequently be planted with vegetative material.  All three breaches will be closed in this manner.  This alternative will require the placement of 1,760 linear feet of geotube, 50,000 cubic yards of backfill and **????** acres of planting.  While this plan restores continuity of the shoreline, it does not reduce the erosion rate in the long term.  Consequently, in the future, breaches could occur at other locations, again reducing the sheltering effect of the barrier islands.

### Plan 2.  Offshore Breakwaters in the Vicinity of Swan Island

Plan 2 consist of a series of breakwaters, each 100 feet in length, located approximately 140 feet bayward of the mean low water MLW line and separated by a gap of about 100 feet.  A water depth of -2 feet MLLW was assumed at the location of the breakwater segments.  A typical section of the breakwater segments is shown on Plate 17.

This system of breakwaters will provide additional protection to all the breach areas, as well as the entire bay shoreline of the barrier island from the jetties at Swan Island north to the Martin Wildlife Refuge.  The reduced wave energy in the lee of the breakwaters will result in a decrease in eroded sediment.  This sediment is now transported away from the area in the longshore and offshore directions.  Prevention of loss of sediment will increase the integrity of the entire barrier island and will help to provide a sheltering effect from storm waves in the Ewell area.

<u>Alternative 1.  Geotextile Tube Breakwaters on the Lower Northwest Coastline.</u>  This alternative is shown on Plates 7, 8, 9 and 10.  It consists of the construction of 18 single 45 foot circumference geotextile tube breakwaters, each 100 feet in length.

<u>Alternative 2. Geotextile Tube Breakwaters on the Entire Northwest Coastline.</u>  This alternative is shown on Plates  7, 8, 9 and 11.  It consists of the construction of 38 single 45 foot circumference geotextile tube breakwaters, each 100 feet in length.

Alternative 3.  Armor Stone Breakwaters on the Lower Northwest Coastline.  This is identical to alternative 1, but with the construction of 32 armor stone breakwaters, each 100 feet in length.

Alternative 4. Armor Stone Breakwaters on the Entire Northwest Coastline.  This is identical to alternative 2, but with the construction of 32 armor stone breakwaters, each 100 feet in length.

## AREA 3.  TYLERTON

Previous estimates indicate that the shoreline along the southern end of Tylerton is experiencing an erosion rate of about 1-foot per year.  The remainder of the shoreline is bulkheaded, however the bulkhead is generally in a state of disarray and in need of replacement.  If the general trend for erosion continues unabated, damages to the road, sewer system, homes, and property are likely to occur.  The following paragraphs discuss the plans proposed to address the problems for the Tylerton area.  It should be noted these are conceptual plans and more detailed studies are required to develop a recommended solution.

### Plan 1.  Tylerton Shoreline Protection

Plan 1 would stabilize the shoreline and protect the road along this segment of shoreline.  The two plan alternatives are both shown on Plate 12.

Alternative 1.  Tylerton Wooden Bulkhead Replacement.  This alternative consists of construction of 2200 linear feet of wooden bulkhead 4 feet in height along the shoreline, to replace the existing bulkhead.

Alternative 2. Tylerton Stone Revetment Shoreline Protection.  This alternative consists of construction of 2200 feet of stone revetment along the shoreline in place of the existing bulkhead.  A typical section of the revetment is shown on Plate17.

### Plan 2.  Tylerton Breakwaters

In addition to Plan 1 above, Plan 2, shown on Plate 13 for both alternatives, consists of the construction of a series of breakwaters, each 100 feet in length, located approximately ___ feet offshore of the southern shoreline of Tylerton and separated by a gap of about 100 feet.  The breakwaters would act to reduce the wave energy in their lee, reduce and/or eliminate the shoreline erosion, thereby providing protection to the southern end of Tylerton.

Alternative 1.  Geotextile Tube Breakwaters.  This alternative is identical to alternative 1, but would use single 100-foot sections of 45 foot circumference geotextile tubes filled with sand in lieu of armor stone breakwater segments.

Alternative 2.  Armor Stone Breakwaters.  The crest elevation of the breakwaters would be +4 feet MLLW.  A water depth of -1 feet MLLW was assumed at the location of the breakwater segments.  A typical section of the breakwater segments is shown on Plate17.

## AREA 4.  NORTHEAST COVES

There are three coves in the Martin Wildlife Refuge that historically were sheltered by barrier islands and spits of land.  The coves are:  Fog Point Cove, Back Cove, and Terrapin Sand Cove.  As the spits of land have eroded, erosion of the shoreline and a general deepening of the interior of the coves have occured.  This has contributed to the loss of wetland areas and SAV.  The following plan is proposed to restore the sheltering effect to the cove areas and is shown in Plates 14, 15 and 16.

### Plan 1.  Segmented Breakwaters in the Northeast Coves.

This plan consists of the construction of 51 segments of breakwater, each 100 feet in length, and separated by a gap of about 100 feet.  The crest elevation of the breakwaters would be +4 feet MLLW. Water depths in the area vary from about -2 feet to -7 feet MLLW.  A typical section of the breakwater segment is shown on Plate 17.  The breakwaters would act to reduce the wave energy in their lee, thereby providing protection to the interior of the coves.  In alternative 1, the breakwater segments consist of single 45 foot circumference geotubes filled with sand.  The breakwater segments in alternative 2 are constructed of armor stone.

## C-5.  Cost Estimates

The following feasibility study level cost estimates have been generated in the MCACES format3.  Please note that these estimates apply to construction costs only.  All costs have been equally escalated and have equally had contingencies applied.

AREA 1.  PLAN 1.     SHEEP PEN GUT SHORELINE PROTECTION

| | |
|---|---|
| Alternative 1.  Geotextile Tube Construction (Reference Figure 12) | $   575,000 |
| Alternative 2.  Stone Revetment (Reference Figure 13 Cost Est. Alternative 5) | $1,040,000 |

AREA 1.  PLAN 2.     SHEEP PEN GUT JETTY

| | |
|---|---|
| Alternative 1.  (Reference Figure 13 Cost Est. Alternative 1) | $   595,000 |
| Alternative 2.  (Reference Figure 13 Cost Est. Alternative 2) | $1,800,000 |
| Alternative 3.  (Reference Figure 13 Cost Est. Alternative 3) | $5,600,000 |
| Alternative 4.  (Reference Figure 13 Cost Est. Alternative 4) | $2,900,000 |

: 31 Mar 1997
:. Date 02/12/97

PROJECT SMITH2: U.S. Army Corps of Engineers
Smith Island- Rhodes Point - Somerset County, Maryland
ReCon Construction Cost Estimate
** PROJECT OWNER SUMMARY - Contract **

TIME 09:43:53
SUMMARY PAGE 1

| | | QUANTY | UOM | CONTRACT | CONTINGN | ESCALATN | TOTAL COST | UNIT |
|---|---|---|---|---|---|---|---|---|
| 0001 | Mobilization and Demobilization | 1.00 | JOB | 120,015 | 12,002 | 3,300 | 135,317 | 135317 |
| 0002 | Dredging placed behind tubes | 31800 | CY | 113,880 | 11,388 | 3,132 | 128,400 | 4.04 |
| 0003 | Geotextile Tube Filling | 1.00 | JOB | 191,975 | 19,198 | 5,279 | 216,452 | 216452 |
| 0004 | Saltmarsh Planting | 1.00 | JOB | 71,810 | 7,181 | 1,975 | 80,966 | 80966 |
| 0005 | Protective Wood Piles | 1.00 | JOB | 9,848 | 985 | 271 | 11,103 | 11103 |
| 0006 | Warning Signs | 2.00 | EA | 2,304 | 230 | 63 | 2,597 | 1298.65 |
| TOTAL | Smith Island- Rhodes Point | 1.00 | EA | 509,832 | 50,983 | 14,020 | 574,835 | 574835 |

3OR ID: POPISL EQUIP ID: POPISE Currency in DOLLARS CREW ID: POPISC UPB ID: RG0295

Figure 12. Cost Estimate for Geotextile Tube Shoreline Protection at Sheep Pen Gut

Apr 1997
te 02/12/97

U.S. Army Corps of Engineers
PROJECT SMITH3: Smith Island- Rhodes Point - Somerset County, Maryland
ReCon Construction Cost Estimate
** PROJECT OWNER SUMMARY - Contract **

TIME 14:20:27
SUMMARY PAGE 1

| | | QUANTY | UOM | CONTRACT | CONTINGN | ESCALATN | TOTAL COST | UNIT |
|---|---|---|---|---|---|---|---|---|
| 0001 | Alternative No. 1 | 1.00 | EA | 587,565 | 5,173 | 1,422 | 594,160 | 594160 |
| 0002 | Alternative No. 2 | 1.00 | EA | 1,784,739 | 5,738 | 1,578 | 1,792,055 | 1792055 |
| 0003 | Alternative No. 3 | 1.00 | EA | 5,573,147 | 15,240 | 4,191 | 5,592,579 | 5592579 |
| 0004 | Alternative No. 4 | 1.00 | EA | 2,888,297 | 14,675 | 4,036 | 2,907,008 | 2907008 |
| 0005 | Alternative No. 5 | 1.00 | EA | 1,019,936 | 14,675 | 4,036 | 1,038,647 | 1038647 |
| TOTAL | Smith Island- Rhodes Point | 1.00 | EA | 11,853,685 | 55,501 | 15,263 | 11,924,448 | 11924448 |

D: POPISL EQUIP ID: POPISE Currency in DOLLARS CREW ID: POPISC UPB ID: RG0295

Figure 13. Cost Estimates for Stone Revetment and Jetty Alternatives at Sheep Pen Gut

.6 Apr 1997
Date 02/12/97

U.S. Army Corps of Engineers
PROJECT SMITH4: Smith Island-Swan Island & NW - Somerset County, Maryland
ReCon Construction Cost Estimate
** PROJECT OWNER SUMMARY - Contract **

TIME 14:07:34
SUMMARY PAGE 1

| | | QUANTY | UOM | CONTRACT | CONTINGN | ESCALATN | TOTAL COST | UNIT |
|---|---|---|---|---|---|---|---|---|
| 0001 | Alternative No. 1 | 1.00 | EA | 723,756 | 72,376 | 19,903 | 816,034 | 816034 |
| 0002 | Alternative No. 2 | 1.00 | EA | 914,479 | 91,448 | 25,148 | 1,031,075 | 1031075 |
| 0003 | Alternative No. 3 | 1.00 | EA | 1,090,093 | 109,009 | 29,978 | 1,229,080 | 1229080 |
| 0004 | Alternative No. 4 | 1.00 | EA | 1,606,341 | 72,376 | 19,903 | 1,698,620 | 1698620 |
| 0005 | Alternative No. 5 | 1.00 | EA | 2,443,305 | 72,376 | 19,903 | 2,535,584 | 2535584 |
| TOTAL | Smith Island-Swan Island & NW | 1.00 | EA | 6,777,975 | 417,584 | 114,836 | 7,310,394 | 7310394 |

ɔR ID: POPISL EQUIP ID: POPISE Currency in DOLLARS CREW ID: POPISC UPB ID: RG0295

Figure 14. Cost Estimates for Shoreline Protection Plans at Swan Island and Vicinity

17 Apr 1997
. Date 02/12/97

U.S. Army Corps of Engineers
PROJECT SMITH6: Smith Island-Northeast Coves - Somerset County, Maryland
ReCon Construction Cost Estimate
** PROJECT OWNER SUMMARY - Contract **

TIME 09:35:15
SUMMARY PAGE 1

| | | QUANTY | UOM | CONTRACT | CONTINGN | ESCALATN | TOTAL COST | UNIT |
|---|---|---|---|---|---|---|---|---|
| 0001 | Alternative No. 1 | 1.00 | EA | 1,058,157 | 64,389 | 17,707 | 1,140,253 | 1140253 |
| 0002 | Alternative No. 2 | 1.00 | EA | 1,386,902 | 15,698 | 4,317 | 1,406,917 | 1406917 |
| 0003 | Alternative No. 3 | 1.00 | EA | 224,465 | 22,447 | 6,173 | 253,085 | 253085 |
| 0004 | Alternative No. 4 | 1.00 | EA | 440,787 | 15,698 | 4,317 | 460,803 | 460803 |
| TOTAL | Smith Island-Northeast Coves | 1.00 | EA | 3,110,312 | 118,231 | 32,514 | 3,261,057 | 3261057 |

ID: POPISL EQUIP ID: POPISE Currency in DOLLARS CREW ID: POPISC UPB ID: RG0295

Figure 15. Cost Estimates for Shoreline Protection Plans at Tylerton

6 Apr 1997
Date 02/12/97

U.S. Army Corps of Engineers
PROJECT SMITH5: Smith Island-Northeast Coves - Somerset County, Maryland
ReCon Construction Cost Estimate
** PROJECT OWNER SUMMARY - Contract **

TIME 13:58:16
SUMMARY PAGE 1

| | QUANTY | UOM | CONTRACT | CONTINGN | ESCALATN | TOTAL COST | UNIT |
|---|---|---|---|---|---|---|---|
| 0001 Alternative No. 1 | 1.00 | EA | 667,927 | 66,793 | 18,368 | 753,088 | 753088 |
| 0002 Alternative No. 2 | 1.00 | EA | 2,305,666 | 15,698 | 4,317 | 2,325,681 | 2325681 |
| TOTAL Smith Island-Northeast Coves | 1.00 | EA | 2,973,593 | 82,491 | 22,685 | 3,078,769 | 3078769 |

: ID: POPISL EQUIP ID: POPISE Currency in DOLLARS CREW ID: POPISC UPB ID: RG0295

Figure 16. Cost Estimates for Shoreline Protection Plan at Northeast Coves

AREA 2. PLAN 1. BREACHES IN THE SWAN ISLAND VICINITY $ 820,000

AREA 2. PLAN 2. BREAKWATERS IN THE SWAN ISLAND VICINITY

Alternative 1. Geotextile Tube Breakwaters (Ref. Figure 14 Cost Est. Alternative 2) $1,030,000
Alternative 2. Geotextile Tube Breakwaters (Ref. Figure 14 Cost Est. Alternative 3) $1,230,000
Alternative 3. Stone Breakwaters (Ref. Figure 14 Cost Est. Alternative 4) $1,700,000
Alternative 4. Stone Breakwaters (Ref. Figure 14 Cost Est. Alternative 5) $2,540,000

AREA 3. PLAN 1. TYLERTON SHORELINE PROTECTION

Alternative 1. New Wooden Bulkhead (Ref. Figure 15 Cost Est. Alternative 1) $1,140,000
Alternative 2. Stone Revetment (Ref. Figure 15 Cost Est. Alternative 2) $1,410,000

AREA 3. PLAN 2. TYLERTON BREAKWATERS

Alternative 1. Geotextile Tube Breakwaters (Ref. Figure 15 Cost Est. Alternative 3) $ 260,000
Alternative 2. Stone Breakwaters (Ref. Figure 15 Cost Est. Alternative 4) $ 460,000

AREA 4. PLAN 1. SHORELINE PROTECTION FOR THE NORTHEAST COVES

Alternative 1. Geotextile Tube Breakwaters (Ref. Figure 16 Cost Est. Alternative 1) $ 755,000
Alternative 2. Stone Breakwaters (Ref. Figure 16 Cost Est. Alternative 2) $2,330,000

## C-6. DRAWINGS

The following drawings depict the Smith Island sites and recommended alternative plans.

| Plate # | Title |
|---|---|
| 1 | Site Map and Index of Drawings |
| 2 | Sheep Pen Gut Plan 1. Shoreline Protection |
| 3 | Sheep Pen Gut Plan 2. Jetty Alternative 1. |
| 4 | Sheep Pen Gut Plan 2. Jetty Alternative 2. |
| 5 | Sheep Pen Gut Plan 2. Jetty Alternative 3. |
| 6 | Sheep Pen Gut Plan 2. Jetty Alternative 4. |
| 7 - 8 | Swan Island and Vicinity Plan 1. Breaches |
| 9 - 10 | Swan Is. and Vicinity Plan 2 Alt. 1. Breakwaters on the Lower Northwest Coastline |
| 11 | Swan Is. and Vicinity Plan 2 Alt. 2. Extension of Breakwaters on the NW Coastline |
| 12 | Tylerton Plan 1. Shoreline Protection |
| 13 | Tylerton Plan 2. Breakwaters |
| 14 - 16 | Northeast Coves. Breakwaters |
| 17 | Typical Sections |

# SMITH ISLAND ENVIRONMENTAL RESTORATION AND PROTECTION, MARYLAND

**RECONNAISSANCE REPORT**

**MAY 1997**

# APPENDIX D

**REAL ESTATE**

**SMITH ISLAND ENVIRONMENTAL**

**Appendix D**

REAL ESTATE SECTION
SMITH ISLAND RECONNAISSANCE

The project encompasses an area known as Smith Island which is located within the limits of Somerset County Maryland, and is located 13 miles west of Crisfield in the Tangier Sound of the Chesapeake Bay. Smith Island consists of low lying land and tidal marshes. The northern land mass of the island is the Martin National Wildlife Refuge. The southern land mass has three small communities, Ewell, Rhodes Point and Tylerton, interspersed among the marsh land.

The selected plan will consist of the placement of geotextile tubes offshore at several locations around the island to dissipate wave action and reduce erosion and damage to the sub-aquatic vegetation (SAV). The proposed location of the geotextile tubes are offshore of the Glen L. Martin National Wildlife Refuge and in the vicinity of the Sheep Pen Gut charnel which leads to Rhodes Point. The material to be used for the geotextile tubes will be obtained from the various dredging efforts in and around the Smith Island navigation channels. The project will also include the construction of a bulkhead/revetment around the community of Tylerton. This structure will run for a distance of approximately 2200 linear feet and will be entirely built within the navigational waters of the United States. Presently, there is an existing bulkhead in various stages of repair, ranging from very good condition to rotted remains. The existing bulkhead is reported to have been built by various property owners over the years.

Temporary construction easements totaling approximately 1.58 acres will be required from 27 residential properties which have water frontage. Twelve piers extend from these properties to the crabbing/fishing shacks and workboats. The piers would require some modification to allow for the construction of the bulkhead/revetment, however, they would tie back onto the land once the construction is completed. There are four small crabbing/fishing sheds which have been built over top of the old bulwarks and on pilings over the water. There is also a two bedroom house which at least 75% of it has been built on pilings over the water. The house is presently being offered for sale. All these structures would be acquired and removed to accomplish the construction of the bulkhead/revetment.

Moving expenses contained in the computations for the Public Law 91-646 Assistance Payments were based on the Relocation Assistance Program schedule, published by the Department of Transportation in 61 Federal Register, dated 12 December 1996.

It is anticipated that no non-standard estates will be acquired. The estate to be acquired is as follows:

TEMPORARY WORK AREA EASEMENT ( Estate No. 15) A temporary easement and right-of-way in, on, over and across the land described in Schedule A Tract No. ______ for a period not to exceed ______ years, beginning with the date of possession of the land granted to the United States, for use by the United States, its representatives, agents, contractors as a work area or borrow area, including the right to borrow and/or deposit fill, spoil and waste materials thereon, move, store and remove equipment and supplies, and erect and remove temporary structures on the land to perform any other work necessary and incident to the______________________ project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way reserving, however to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easements for public roads and highways, public utilities, railroads and pipelines.

Navigational servitude is applicable to this project. Property within the navigational servitude(below the ordinary high water mark) was not included in the real estate acreage calculations and cost estimate.

There are no known mineral activities within the vicinity of the project.

There are no known potential HTRW sites or other contaminates in the project area.

The initial Real Estate Cost estimate for the Lands, Easements and Rights-of-Way needed to support the recommended plan is $143,071 and is summarized as follows:

| | |
|---|---|
| Acquisition | $86,629 |
| Appraisal | $18,630 |
| Relocation Assistance | $ 1,150 |
| Land Payments | $33,988 |
| Relocation Assistance Payments | $ 2,674 |

The attitude of Islanders is positive toward the proposed project. The high-water mark is, in many areas threatening to erode Tylerton Road and is alarming close to many homes in Tylerton.

Reconnaissance Study Cost Estimate-MCACES Format
Project Planning Requirements
Smith Island, Maryland
0

| | | Cost |
|---|---|---|
| 01--------- | LANDS AND DAMAGES | |
| 0101------- | PROJECT PLANNING | |
| 010101---- | Reformulation Studies (GRR, LRR) | |
| 01010101 | Real Estate Supplement/Plan | |
| | Gross Appraisal/Report | |
| | Real Estate Requirements Analysis | |
| | Preliminary Real Estate Acquisition Maps | |
| | MFR on Legal/Professional Capability of Non-Federal Sponsor to Acquire Real Estate | |
| | Physical Takings Analysis Report | |
| | Attorney's Opinion of Compensation | |
| | All Other Real Estate Documents | |
| | Subtotal | 0 |
| 010102---- | Project Design Memorandum | |
| 01010201 | Real Estate Supplement/Plan | |
| | Gross Appraisal/Report | 5,000 |
| | Real Estate Requirements Analysis | |
| | Preliminary Real Estate Acquisition Maps | 5,000 |
| | MFR on Legal/Professional Capability of Non-Federal Sponsor to Acquire Real Estate | 1,000 |
| | Physical Takings Analysis Report | |
| | Attorney's Opinion of Compensation | |
| | All Other Real Estate Documents | 9,000 |
| | Subtotal | 20,000 |
| 010103---- | Feature Design Memorandum | |
| 01010301 | Real Estate Supplement/Plan | |
| | Gross Appraisal/Report | |
| | Real Estate Requirements Analysis | |
| | Preliminary Real Estate Acquisition Maps | |
| | MFR on Legal/Professional Capability of Non-Federal Sponsor to Acquire Real Estate | |
| | Physical Takings Analysis Report | |
| | Attorney's Opinion of Compensation | |
| | All Other Real Estate Documents | |
| | Subtotal | 0 |
| 010104---- | Construction Contract Documents | |
| 01010401 | Real Estate Acquisition | |
| | Real Estate Planning and Coordination Documents | |
| | All Other Real Estate Acquisition Documents | |
| | Subtotal | 0 |
| **0101-------** | **PROJECT PLANNING TOTAL** | **$20,000** |

**Reconnaissance Study Cost Estimate-MCACES Format**
**Real Estate Acquisition Requirements**
Smith Island, Maryland
0

| Code | Item | Private # | Private $/per | Private req | Commercial # | Commercial $/per | Commercial req | Public # | Public $/per | Public req | Requirement Base | Requirement Contingency | Requirement Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0102------ | ACQUISITIONS | | | | | | | | | | | | |
| 010201--- | By Government | | | | | | | | | | | | |
| 010202--- | By Non-Federal Sponsor (NFS) | | | | | | | | | | | | |
| 01020201 | Survey and Legal Descriptions | 27 | 500 | 13,500 | 0 | | 0 | 0 | | 0 | 13,500 | 2,025 | 15,525 |
| 01020102 | Title Evidence | 27 | 600 | 16,200 | 0 | | 0 | 0 | | 0 | 16,200 | 2,430 | 18,630 |
| 01020203 | Negotiations | 27 | 1,000 | 27,000 | 0 | 2,000 | 0 | 0 | | 0 | 27,000 | 4,050 | 31,050 |
| 010203--- | By Government on Behalf of NFS | | | | | | | | | | | | |
| 010204--- | Review of NFS | | | | | | | | | | | | |
| 01020401 | Survey and Legal Descriptions | 27 | 75 | 2,025 | 0 | | 0 | 0 | | 0 | 2,025 | 304 | 2,329 |
| 01020402 | Title Evidence | 27 | 75 | 2,025 | 0 | | 0 | 0 | | 0 | 2,025 | 304 | 2,329 |
| 01020403 | Negotiations | 27 | 75 | 2,025 | 0 | | 0 | 0 | | 0 | 2,025 | 304 | 2,329 |
| | SUBTOTAL | | | | | | | | | | 62,775 | 9,416 | 72,191 |
| 0103------ | CONDEMNATIONS | | | | | | | | | | | | |
| 010301--- | By Government | | | | | | | | | | | | |
| 010302--- | By Non-Federal Sponsor (NFS) | 4 | 3,000 | 12,150 | 0 | | 0 | 0 | | 0 | 12,150 | 1,823 | 13,973 |
| 010303--- | By Government on Behalf of NFS | | | | | | | | | | | | |
| 010304--- | Review of NFS | 4 | 100 | 405 | 0 | | 0 | 0 | | 0 | 405 | 61 | 466 |
| | SUBTOTAL | | | | | | | | | | 12,555 | 1,883 | 14,438 |
| 0105------ | APPRAISALS | | | | | | | | | | | | |
| 010501--- | By Government | | | | | | | | | | | | |
| 010502--- | By Non-Federal Sponsor (NFS) | 27 | 500 | 13,500 | 0 | | 0 | 0 | | 0 | 13,500 | 2,025 | 15,525 |
| 010503--- | By Government on Behalf of NFS | | | | | | | | | | | | |
| 010504--- | Review of NFS | 27 | 100 | 2,700 | 0 | | 0 | 0 | | 0 | 2,700 | 405 | 3,105 |
| | SUBTOTAL | | | | | | | | | | 16,200 | 2,430 | 18,630 |
| 0106------ | PL 91-646 ASSISTANCE | | | | | | | | | | | | |
| 010601--- | By Government | | | | | | | | | | | | |
| 010602--- | By Non-Federal Sponsor (NFS) | 5 | 150 | 750 | | | 0 | | | 0 | 750 | 113 | 863 |
| 010603--- | By Government on Behalf of NFS | | | | | | | | | | | | |
| 010604--- | Review of NFS | 5 | 50 | 250 | 0 | | 0 | 0 | | 0 | 250 | 38 | 288 |
| | SUBTOTAL | | | | | | | | | | 1,000 | 150 | 1,150 |
| 0107------ | TEMPORARY PERMITS/LICENSES/RIGHTS-OF-WAY | | | | | | | | | | | | |
| 010701--- | By Government | | | 0 | | | 0 | | | 0 | 0 | 0 | 0 |
| 010702--- | By Non-Federal Sponsor (NFS) | | | 0 | | | 0 | | | 0 | 0 | 0 | 0 |
| 010703--- | By Government on Behalf of NFS | | | 0 | | | 0 | | | 0 | 0 | 0 | 0 |
| 010704--- | Review of NFS | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 |
| 010705--- | Other | | | 0 | | | 0 | | | 0 | 0 | 0 | 0 |
| 010706--- | Damage Claims | | | 0 | | | 0 | | | 0 | 0 | 0 | 0 |
| | SUBTOTAL | | | | | | | | | | 0 | 0 | 0 |
| **0115------** | **REAL ESTATE PAYMENTS** | | | | | | | | | | | | |
| 011501--- | Land Payments | | | | | | | | | | | | |
| 01150101 | By Government | | | | | | | | | | 0 | 0 | 0 |
| 01150102 | By Non-Federal Sponsor (NFS) | | | | | | | | | | 27,190 | 6,798 | 33,988 |
| 01150103 | By Government on Behalf of NFS | | | | | | | | | | 0 | 0 | 0 |
| 01150104 | Review of NFS | | | | | | | | | | 0 | 0 | 0 |
| 011502--- | PL 91-646 Assistance Payments | | | | | | | | | | 0 | 0 | 0 |
| 01150201 | By Government | | | | | | | | | | 0 | 0 | 0 |
| 01150202 | By Non-Federal Sponsor (NFS) | | | | | | | | | | 2,325 | 349 | 2,674 |
| 01150203 | By Government on Behalf of NFS | | | | | | | | | | 0 | 0 | 0 |
| 01150204 | Review of NFS | | | | | | | | | | 0 | 0 | 0 |
| 011503--- | Damage Payments | | | | | | | | | | 0 | 0 | 0 |
| 01150301 | By Government | | | | | | | | | | 0 | 0 | 0 |
| 01150302 | By Non-Federal Sponsor (NFS) | | | | | | | | | | 0 | 0 | 0 |
| 01150303 | By Government on Behalf of NFS | | | | | | | | | | 0 | 0 | 0 |
| 01150304 | Review of NFS | | | | | | | | | | 0 | 0 | 0 |
| | SUBTOTAL | | | | | | | | | | 29,515 | 7,146 | 36,661 |
| | Account 02 Facility/Utility Relocations (Construction cost only) | | | | | | | | | | | 0 | 0 |
| | **TOTAL LERRD** | | | | | | | | | | **$122,045** | **$21,026** | **$143,071** |

# SMITH ISLAND ENVIRONMENTAL RESTORATION AND PROTECTION, MARYLAND

RECONNAISSANCE REPORT

MAY 1997

# APPENDIX E

PUBLIC COORDINATION

# Appendix E

## Public Involvement and Agency Coordination

### Introduction

The public involvement program for the Smith Island Environmental Restoration and Protection Study was developed with a recognition for the island's unique history and culture. Early in the planning process members of the study team benefited from reading books and articles describing the social, political, environmental, and economic conditions unique to the island. That preliminary research provided a context for considering the island's problems and suggested approaches for involving the public, or several separate "publics," in the planning process. Partly because of the island's unique culture and environmental problems, as well as the islanders traditional aversion to government, the island residents were the most important faction or "public" to be considered in the study.

Several characteristics of Smith Island residents were identified as particularly important in the public involvement process. These included the islanders independence and self reliant attitude ("persistent" was an islanders' self-description), membership in the Methodist church, love for the watermen's way of life, uneasiness with government, and a closeness with the island environment and their fellow islanders. Island residents, as well as their recently relocated mainland relatives, were consistently involved and vocal throughout the study/public involvement process. Among "interested outsiders," other important "publics" included political representatives, agency representatives, environmental and scientific interests, and part-time residents or vacation-home owners.

### Purpose of Public Involvement and Agency Coordination

Corps policy and guidance emphasizes that opportunities for public involvement must be provided during the planning stages of a project. In addition, Corps guidance supports close coordination of all levels of government and natural resource management agencies. A public involvement program was developed early in the Smith Island Reconnaissance Study to outline program objectives, a tentative program schedule, and the products desired from the program.

The objectives of the Smith Island Reconnaissance Study included the following:

- Fulfill requirements of the National Environmental Policy Act (NEPA) to inform the public and decision-makers.
- Scope out problems facing the island which might be addressed under the authorizing legislation.
- Gather information about the values, perceptions, and desires of island residents.
- Gather information about environmental conditions on the island.
- Develop a team approach to the identification of problems and potential solutions, including representatives of Federal, state, and local agencies; island residents; and other interested publics.

- Provide information on and gain support for solutions recommended by the study.
- Explain the expenditure of public monies to taxpayers.

The public involvement program was designed to provide opportunities for public participation during each stage of the reconnaissance study. The study team was committed to conduct a public involvement program that incorporated public input into the planning process with the understanding that review of a study report after decisions have been made does not constitute a meaningful public involvement program. As a result of the collaborative approach used by the study team, extensive formal and informal communication with members of the several publics took place. Frequent interactions between the study team and island residents were of particular value in developing an understanding of the island. These interactions provided a window into the Smith Island way of life that led to planning and design decisions appropriate to the culture.

**Program Structure**

The major tasks in the public involvement program were divided into three stages which fit into the overall reconnaissance study schedule. The stages were Project Initiation, Development of Possible Alternatives, and the Conclusion of the Reconnaissance Study. Each stage of the public involvement program was defined by specific tasks that needed to be accomplished, appropriate forums for performing those tasks, and products that were the desired result of the tasks completed. At each stage of the program the study team endeavored to apply standard public involvement techniques in ways appropriate to the island way of life.

Stage 1 - Project Initiation

The first stage of the public involvement program was exploratory and comprehensive with regard to the identification of public values, concerns, issues, and ideas. The study team was looking for input that reflected thoughtful consideration and the sincere feelings of island residents and other participants. During this stage, activities were directed toward ensuring that as many as possible of the island residents and other participants had the opportunity to express his or her viewpoint. The information gathered was recorded and used to develop guidelines for achieving the study goals. Participants in the initial public involvement stage included Smith Island residents, representatives of the FWS and other natural resource management and regulatory agencies, and representatives of other interest groups.

The objectives of the initiation stage were values and data-collection oriented, and included (1) obtaining information useful in directing the study (such as identification of problems, issues, ideas, objectives and goals, and alternatives to be considered); (2) obtaining information about the political, social, and economic realities of island life; and (3) preparing the public, agencies, and project team for further interaction.

The public involvement process emphasized interaction with current island residents during the project initiation stage, however, other publics also participated. These other publics included agencies (such as those involved in regulating island activities), other people with an interest in the island (such as former islanders), and the information audience (people who read or heard about the project but were not otherwise involved).

The forums for Stage 1 public involvement activities included informal conversations and discussion meetings; scoping meetings and brainstorming sessions, printed information handouts; questionnaires; and news articles.

In addition to the collection of facts and figures, an important product of the project initiation stage was a foundation for further constructive interaction and information exchange among all the study participants.

## Stage 2 - Development of Alternatives

The second stage of the public involvement program focused on investigating possible solutions to the erosion, navigation, and environmental restoration problems identified as critical for the island's survival. A number of conceptual solutions were developed in a collaborative effort with island residents, engineers, environmentalists, and agency representatives. As possible alternatives were discussed, their implications became clear and the four most critical actions for erosion protection and survival of the island were identified. It is expected that the four actions recommended as critical will be constructed on an accelerated schedule, with the Rhodes Point project constructed first. Consensus was reached among the study participants that the Rhodes Point project should be completed as early as possible, due to the severity of the erosion problems and loss of SAV in that area. In addition to the four actions identified as most critical, this report recommends a number of other projects, such as shoreline protection for Ewell, which will be further developed on the usual feasibility study schedule.

Workshops, informal meetings, discussion groups, and private conversations provided effective forums for Stage 2 activities. The product of this stage was the selection of four alternative solutions to the most critical problems facing the island and addressed in this report.

## Stage 3 -Conclusion of the Reconnaissance Study

Public involvement activities at the conclusion of the study involved further coordination among all participants as alternative solutions were developed. The recommended alternatives were those that best satisfied the project requirements and had a minimum of negative impacts. Although many participants contributed to the selection and development of the recommended alternatives, a special emphasis was placed on satisfying the perceived needs of the island residents.

The forums for public involvement during this stage included meetings with island residents and agency representatives, discussions and correspondence with government officials, news articles, and many informal conversations among all study participants.

The product of Stage 3, as well as the reconnaissance study as a whole, includes four recommended alternatives addressing the erosion, navigation, and environmental restoration problems identified as most critical to the survival of the island. It is expected that funding will be received to construct the four components and stabilize the island as a habitable area within the next few years. This study also recommends several additional actions which are important to the longer term viability of the island. These include improvements to existing upland areas by removing intrusive stands of phragmites and revegetating with trees and other plants to improve wildlife benefits; using dredged material to create new upland hammocks for nesting waterbirds; improving erosion protection along the Ewell shoreline; and improving tourist facilities, such as constructing boardwalks linking different parts of the island and improving transient docking facilities. It is anticipated that a feasibility study addressing the recommendations not constructed on the accelerated schedule will be prepared. The recommendations in this report have strong support from island residents and from agencies.

## Relationship to Planning Process

The stages and tasks of the public involvement program were carried out in a way that was integrated into the planning process. Public involvement activities were used to gather needed information, to discuss options, and to achieve consensus at each stage of the planning process. Meetings and discussions with island residents provided information on their values and needs as well as an opportunity for islanders to review and comment on the project. Public involvement activities early in the study introduced study participants and acquainted island residents with the Corps planning processes. In addition, the early public involvement activities began a constructive interaction that was critical in building trust, identifying problems, and developing acceptable alternatives at later stages of the study.

## Participation and Support

Smith Island's culture, natural environment, and problems have drawn considerable attention and receive local, regional, and national press coverage on a fairly regular basis. Interest among environmentalists, politicians, historians, and even developers have resulted in actions or proposals for actions on the island. These include the USFWS, CBF, MdDNR, the Crisfield and Smith Island Cultural Alliance, and Somerset County. Each of the agencies and organizations active on the island was involved in the study.

The USFWS plays an important role on the island by managing the 4,000 acre Martin National Wildlife Refuge as wildlife habitat. The agency played a key part in the study by assisting with data gathering and preparation of the report. In addition, FWS staff on the island provided first hand reports on and tours of problem areas within the refuge and at other sites around the island.

The Chesapeake Bay Foundation brings groups of students to live at their environmental education facility in Tylerton for periods of several days or weeks. Representatives of the CBF met with study team members and attended public meetings on the island, providing ideas and offering assistance for future environmental restoration actions.

The Smith Island tourist center and museum was developed with the assistance of the Crisfield and Smith Island Cultural Alliance and the Maryland Historical Trust. Island residents also played a major role in every stage of the tourist center development, from selecting the site to preparation of displays. A number of individuals active in the organization of the tourist center and museum provided information and insights useful to the study. In addition, the museum displays provided an invaluable introduction to island history, life, and values.

Somerset County has also recognized the importance of the island in attracting tourists to the area. Several County government officers and county planning department personnel provided information and resources for the study.

The Corps of Engineers has also been a continuing presence on the island. As part of the regular maintenance of island navigation channels, the Corps' Operations Division has completed several environmental restoration and erosion protection projects on the island. Dredged material has been beneficially used to fill geotextile tubes which have been placed to create wetlands and protect shore areas. In addition, plans are currently being prepared by the Corps' Engineering Division to repair the Thorofare Channel stone jetties, constructed by the Corps in the late 1930s. Members of the recon study team and Corps staff working on other Smith Island projects collaborated by sharing information and making joint presentations on the island.

**Official Support**

In addition to the regular coordination with and participation by agencies, organizations, and the public, officials at the state and national levels of government have expressed strong support for the study. In July 1996, at the initiation of the study, an introductory presentation was made to island residents and District 1 Representative Wayne Gilchrest at Rhodes Point. In September 1996, a member of Congressman Gilchrest's staff also attended a Steering Committee meeting with a number of agency and legislative representatives. As a result of that meeting, several agency officials expressed support for the project and became involved in identifying other potential sponsors.

**Public**

The goal of the public involvement program was to meet with as many as possible of the island residents, encourage constructive interaction with the study team, and to incorporate their ideas into the planning process. The public involved with the study included a diverse group of individuals and organizations, however, the public most important to the study's success were island residents. The lack of an official island government and the disfavor with which governmental authority is generally considered by islanders required that the study team and island residents develop an effective working relationship. The patience and practicality of island residents, in addition to their "persistence" (their description) in their efforts to remain on the island and maintain their culture, proved invaluable assets to the study process. Individuals with special expertise frequently served as sources of information and representatives from each of the 3 island communities served on the Steering Committee. In addition to the help provided by specific individuals, there was a high level of participation in the study by the general population who attended the more formal public meetings. The assistance of individuals and families now living on the mainland was also important to the success of the study.

**Agency Coordination**

Coordination with other agencies and organizations was an important part of the public involvement program. The island and its cultural and environmental conditions are within the administration limits of a number of agencies and offices and coordination with those organizations were of particular value to the study. These entities include the U.S. Fish and Wildlife Service, the Maryland Historical Trust, the Department of Natural Resources, the Chesapeake Bay Foundation, and the Somerset County government. More general coordination was carried out through numerous phone conversations, correspondence, Steering Committee meetings, and by the participation of agency representatives during informal meetings on the island. A summary of key correspondence pertaining to the reconnaissance study as well as copies of letters and comments received from agencies is in Section 3 of this Appendix.

**Public Involvement Activities**

A draft Public Involvement Program was outlined early in the recon study. The draft program listed activities with general descriptions and a schedule. It was assumed that specific details would be determined as the study team became more familiar with the needs of the island and requirements for the study. The public involvement activities were planned to accomplish a number of objectives. The objectives included introducing the study, study team, and planning process to island residents and other participants; facilitating coordination with agencies and organizations; gathering ideas, comments, and concerns to be incorporated into the study; and informing the public of the study status on a regular basis. The methods of achieving the objectives included holding informal and informal meetings, coordinating with agencies and working with their representatives, presenting information and answering questions via computer links, in newsletters and other news media, and especially important in the traditional Smith Island culture, discussing the study with individuals on the island.

**Informal Meetings**

Following an initial visit and presentation during a 1 July 1996 visit by Representative Wayne Gilchrest, several informal meetings provided an opportunity for study team members to hold discussions with island residents in small, highly interactive groups. On 31 July 1996 study team members met with approximately 10 individuals in the Ewell Fire Hall to present information on the study and ask about problems on the island.

On 13 August 1996 several study team members and representatives of the USFWS met with Tylerton residents at the crab picking coop. On 29 October 1996 study team members made another visit to Tylerton accompanied by an area businessman who is an island native and part-time island resident. The group toured problem areas in Tylerton and discussed community concerns and plans for the future.

During a two-day visit to Smith Island in early December 1996, the study team, including members of the Engineering Design Section, met with several groups of watermen and other residents at Charlie’s Store in Ewell, and at the Drum Point Market at Tylerton, as well as in a private home. Watermen at the Ewell store had prepared a video of wind and wave action damaging the waterfront during a recent storm. Specific problems and potential solutions for problems facing the island were discussed at each of the meetings during this trip.

Beginning in the fall and continuing into the winter of 1996, informal meetings focused on specific problem identification. Maps of Smith Island and the surrounding waters were used to talk from and write and draw on as meeting participants discussed problems and potential solutions. These meetings were part of the first stage of the public involvement program, or Study Initiation

Other informal meetings and discussions took place any time team members were on the island or in communication with island residents.

**Scoping Meetings**

Many of the meetings held early in the study process served as scoping meetings: as a means of identifying problems and issues relevant to the study. The first formal public meeting was a scoping workshop held at Rhodes Point on 27 August 1996. The meeting was planned with a more structured format than the informal meetings held earlier in the study. Approximately 50 people attended and were asked to sign-in, handouts were provided, and maps and aerial photographs displayed. The purposes of this workshop were to more formally introduce the study process, study team members, and island residents; to identify local values, issues, and concerns; and to identify potential environmental impacts. After a brief presentation on the study background, planning process, and public involvement process, the attendees separated into 3 smaller groups. With Corps facilitators, each group brainstormed answers to several questions designed to communicate basic values and feelings: what island residents thought was good and bad about their island, what they thought should be done to improve the island, and concerns they had about the study. When each small group had responded to the questions asked, the lists of responses were shared with the larger group and the group as a whole “voted” on the topics they considered most important. In response to the question, “What is good about the island?,” the most important topics were identified as family, church, wildlife habitat, freedom, safety, and the natural beauty of the island. Erosion was almost unanimously identified as the major problem on the island. Answers to the question about improvements to the island ranged from “diking in the whole island” to adding tourist facilities, bringing back the schools, and eliminating bugs. Concerns about the study focused on the possibility that nothing would be accomplished. A list of the comments received and responses to brainstorming questions made at the public meetings is included as part of Section 4 of this Appendix.

**Public Information Workshops**

A public meeting to present alternative solutions was held on 22 February 1997 at the Rhodes Point Community Center. At the request of island watermen, the meeting was held on a Saturday prior to the opening of fishing season and approximately 40 people attended. A status report on the study was presented and a number of alternative solutions for the 4 problems identified as most critical were outlined. Design solutions, including various construction materials, costs, and possible funding sources were discussed. After a brief discussion period, a general agreement was reached on the alternatives preferred by the meeting attendees. (Information about two Corps projects that are not part of the Recon study was also presented. Those projects involve the beneficial placement of dredged material and additional geotubes at Hogs Neck and repair of the Thoroughfare Channel jetties.)

Following official approval of the reconnaissance report by the Corps and the release of the document to the public, a third public workshop will be scheduled. It is expected that the meeting will be held during the summer of 1997. The purpose of the meeting will be to present the study findings and potential future project actions to the public and to receive their comments.

**Press Coverage**

Smith Island has been the subject of much attention in the press both prior to and during the reconnaissance study process. The island regularly receives attention for its unique history, culture, environmental resources, and problems. Several television programs about the island, though not addressing the current study, have appeared within the past year and a number of articles have been published in local and regional newspapers. In some cases, the articles have addressed the project specifically or have addressed allied topics, such as the use of geotextile tubes for erosion protection. In addition, the island newsletter, published monthly, has provided information to local residents about the study and public meetings. It is anticipated that because of the appeal of Smith Island and because the proposed project actions reflect needs in other areas of the Bay, there will be extensive press coverage as the study is completed and project actions are initiated.

**Summary**

The public involvement program for the reconnaissance study was fairly intensive and critical to the success of the project. In spite of a strong no-government tradition on the island, residents participated fully in the study, providing helpful information, constructive comments, and supportive correspondence. Through a collaborative effort, problems and potential solutions were identified. The public involvement process included numerous informal as well as formal meetings, conversations, and discussions with the residents of each of the 3 Smith Island communities, with agencies and their representatives, and with local, state, and Federal government offices and officials.

The major role that public involvement and agency coordination played during every phase of the study led to a consistently high degree of communication among the participants. The result was a strong consensus on the problems, priorities, and solutions identified.

## Public Involvement Coordination and Agency Correspondence

Coordination among the individuals, agencies, interest groups, and public officials who wished to participate in the reconnaissance study required considerable correspondence and other communication. A summary of the correspondence, meeting memoranda, and other documents that were part of this process follows. Copies of key correspondence and other documents are located after the summary. In addition to formal correspondence, numerous phone conversations, electronic mail messages, and facsimile transmissions were used for communication among study team members, agency representatives, island residents, and other interested parties.

26 July 1996 — Letter from the Corps to Congressional representatives and government agencies announcing the study initiation.

26 July 1996 — Coordination letter from the Corps to government agencies announcing the study initiation.

30 July 1996 — Public Notice announcing the study initiation sent to approximately 100 agencies and individuals.

2 August 1996 — Letter from Maryland Department of Natural Resources providing a point of contact for the study.

12 August 1996 — Letter from the Corps to 10 agencies with a specific interest in Smith Island and to citizen representatives of the 3 island communities, requesting their participation on a steering committee for the study.

12 August 1996 — Letter from Maryland Department of the Environment naming points of contact for the study.

12 August 1996 — Letter from Maryland Department of the Environment providing information on shellfish harvest water monitoring stations near Smith Island.

13 August 1996 — Informal meeting at the Crab Picking Co-op in Tylerton with representatives of the USFWS and community members.

21 August 1996 — Letter from Maryland Department of the Environment naming points of contact for the study.

27 August 1996 — Public Scoping workshop held in Rhodes Point.

1 September 1996 — Smith Island Times Newsletter article reporting on public meeting.

| | |
|---|---|
| 3 September 1996 | Letter from Senator Mikulski forwarding a letter from Tylerton resident Mr. Harvey Corbin requesting her support for erosion protection for the community. |
| 17 September 1996 | Letter from Maryland Department of Natural Resources providing information on designated oyster bars in the Smith Island area. |
| 18 September 1996 | Steering committee meeting on Smith Island. |
| 30 September 1996 | Letter from the College of William and Mary providing a contact point for the study. |
| 6 November 1996 | Copy of a letter from the Maryland Department of the Environment to Mr. Charles Marsh of Tylerton, providing a response to questions concerning Smith Island erosion problems. |
| 25 February 1997 | Copy of letter signed by Maryland State Senator Stoltzfus and State Delegates Bozman, Conway, and McClenahan, sent to Mr. and Mrs. Alan Smith, of Tylerton, expressing support for the study and the island. |
| 3 March 1997 | Letter from Mr. Henry Armistead providing ornithological information on Smith Island. |

Planning Division

JUL 2 6 1996

Honorable Barbara A. Mikulski
United States Senate
Washington, DC 20510-2003

Dear Senator Mikulski:

The Baltimore District Corps of Engineers has initiated the Smith Island, Maryland and Virginia Environmental Restoration and Protection Reconnaissance Study (see enclosed vicinity map). The study is being undertaken in accordance with a study resolution by the House Committee on Public Works and Transportation, dated September 28, 1994. The purpose of this letter is to inform you of the study and our upcoming efforts.

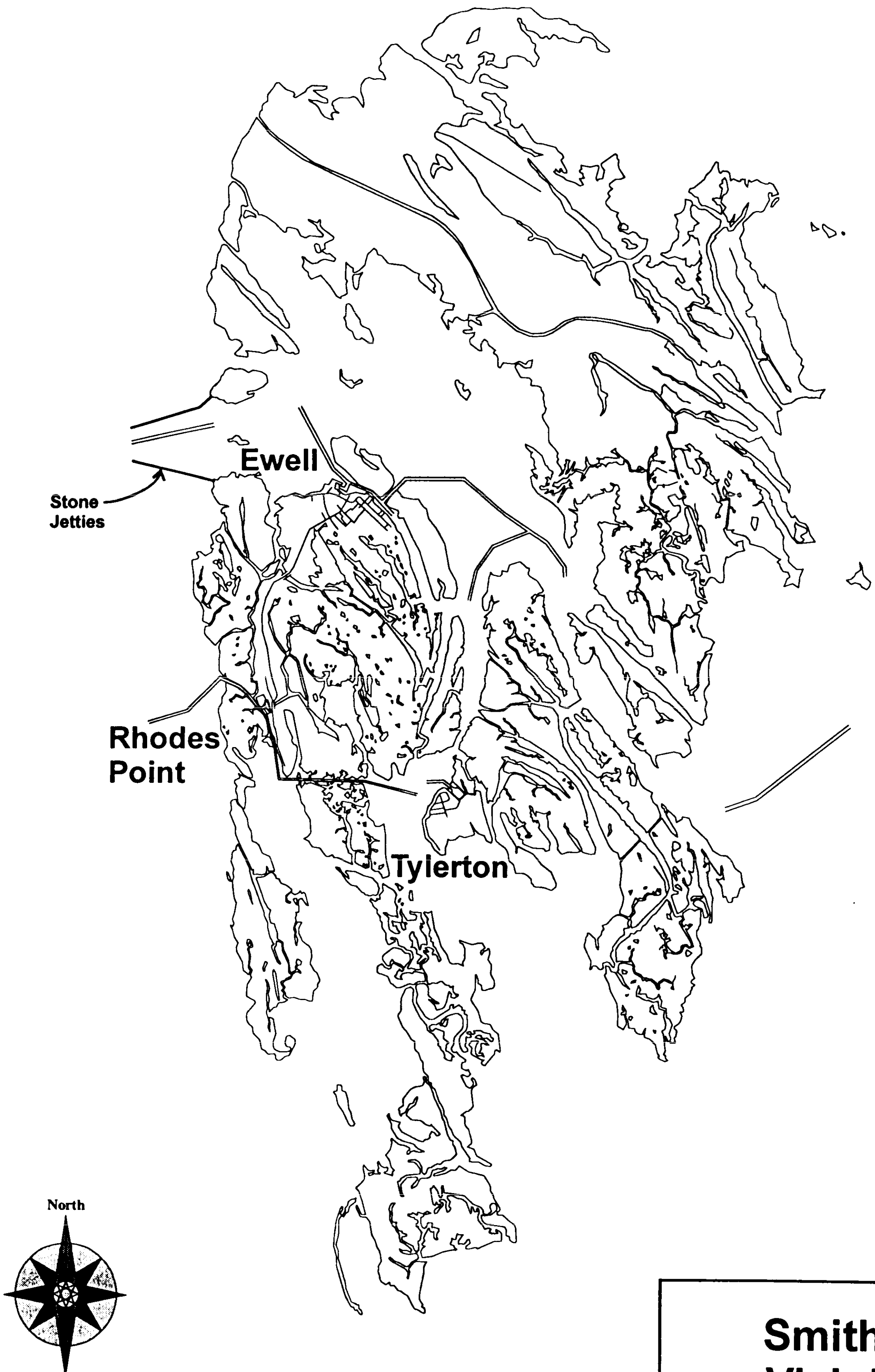
The Reconnaissance Study will last 12 months and include data collection, problem definition, and a determination as to whether the solutions to the identified problems are in the Federal interest. The Reconnaissance Study, which is Federally funded, will culminate with a list of potential projects which could be further studied in the Feasibility Phase. The cost of the Feasibility Study will be shared with a local sponsor to be identified during the Reconnaissance Phase. The final product of the Feasibility Phase will be a report, which includes the National Environmental Policy Act documentation, that will identify plans for improvement for Smith Island, if technically and economically feasible, and environmentally acceptable.

We will keep you informed on the findings of the Reconnaissance Study as they are developed. Identical letters have been sent to individuals on the enclosed mailing list. If you have any questions or comments at any time throughout the study, please contact me or have a member of your staff contact my action officer, Dr. James Johnson, Chief, Planning Division, at (410) 962-4900.

Sincerely,

Randall R. Inouye, P.E.
Colonel, Corps of Engineers
District Engineer

Enclosure
CF:
CECW-PE, CECW-RL, CENAD-PL, CENAD-EX, CENAB-EX, CENAB-PA, CECW-ZE
CF:
PD BRANCH READING FILE
CONGRESSIONAL READING FILE




**Smith Island Vicinity Map**

Identical letters have been sent to the following:

Honorable Barbara A. Mikulski
United States Senate
Washington, DC 20510-2003

Honorable Paul S. Sarbanes
United States Senate
Washington, DC 20510-2002

Honorable Wayne T. Gilchrest
House of Representatives
Washington, DC 20515-2001

Mr. Perry Weed
District Field Representative to
Representative Wayne T. Gilchrest
121 North Washington Street
Easton, Maryland 21601

Honorable Herbert H. Bateman
House of Representatives
Washington, DC 20515-4601

Honorable Parris N. Glendening
Governor of Maryland
Annapolis, Maryland 21401

Honorable George Allen
Governor, Commonwealth of Virginia
Richmond, Virginia 23219

Honorable Robert S. Bloxom
Virginia State Delegate
Mappsville, Virginia 23407

Honorable Bennett Bozman
Maryland General Assembly
Annapolis, Maryland 21401

Honorable Norman H. Conway
Maryland General Assembly
Annapolis, Maryland 21401

Honorable Charles A. McClenahan
Maryland General Assembly
Annapolis, Maryland 21401

Honorable J. Lowell Stoltzfus
Maryland General Assembly
Annapolis, Maryland 21401

July 26, 1996

Planning Division

Mr. Ronald E. Lambertson
Regional Director
U. S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, Massachusetts 01035-9589

Dear Mr. Lambertson:

I am writing to advise you that the Baltimore District Corps of Engineers has initiated the Smith Island, Maryland Environmental Restoration and Protection Reconnaissance Study. The study is being undertaken in accordance with a study resolution by the House Committee on Public Works and Transportation, dated September 28, 1994. The purpose of this letter is to begin coordination with your agency and request your participation in establishing goals, gathering data, and developing project alternatives. We are requesting information on biological resources, and environmental, aesthetic, historic, cultural, economic, and social conditions in the study area. A map of the study area is included.

The Reconnaissance Study will last 12 months and include data collection, problem definition, and a determination as to whether the solutions to the identified problems are in the Federal interest. The Reconnaissance Study, which is Federally funded, will culminate with a list of potential projects which could be further studied in the Feasibility Phase. The cost of the Feasibility Study will be shared with a local sponsor to be identified during the Reconnaissance Phase. The final product of the Feasibility Phase will be a report, which includes the National Environmental Policy Act documentation, that will identify plans for improvement for Smith Island, if technically and economically feasible, and environmentally acceptable.

We recognize that many agencies possess or are currently developing valuable data on historic and existing conditions for the study area and we are requesting available written and digital information. All digital information will be used in the development of a comprehensive Geographic Information System database for the study area. At the completion of the study, we will make all new information available to your office in support of current and future activities.

In addition to providing information relevant to the study area, it is requested that you provide an agency point of contact within 30 days from the date of this letter to facilitate future coordination. We anticipate that individual agencies may have several representatives with different areas of expertise who will participate in the study. Your response to this request for support will ensure that your agency's ideas and concerns are addressed during the plan formulation and evaluation process. Coordination letters are also being sent to the individuals and organizations on the enclosed list. If you have any questions regarding this matter, please call Mr. Daniel Bierly, at 410-962-6139.

Sincerely,

Dr. James F. Johnson
Chief, Planning Division

Enclosures

The Coastal Design & Construction Company
Post Office Box 650
Gloucester, Virginia 23061

Director
Environmental Law Society
Marshall Wythe School of Law
College of William & Mary
Williamsburg, Virginia 23185

Chairman
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4834 Rodman Street NW
Washington, DC 20016

Operating Manager
Delmarva Power and Light Company
Post Office Box 1739
Salisbury, Maryland 21801

Mr. Arthur K. Fisher
Executive Director
Delmarva Advisory Council
Post Office Box 4277
Salisbury, Maryland 21801

Ms. Joyce Cofield
Administrator
Delmarva Water Transportation
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The Innovative Marine Prod, Inc.
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President
Izaak Walton League
13711 Parkland Drive
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Identical letter sent to the following:

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C/O National Marine Fisheries Labs
Oxford, Maryland 21654

Mr. William Voorhies
C/O Applied Aquaculture Company
Post Office Box 43
Wittman, Maryland 21676

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Audubon Naturalist Society
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Chevy Chase, Maryland 20815

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Camp Hill, Pennsylvania 17011

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Maryland Historical Trust
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Annapolis, Maryland 21401-1998

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Maryland Department of Natural Resources
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Superintendent
Police Force
Maryland Department of Natural Resources
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Land & Water Conservation Administration
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Maryland Department of Natural Resources
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Mr. David Bibo
Harbor Development
Maryland Port Administration
The Maritime Center II
2310 Broening Highway
Baltimore, Maryland 21224-6621

Ms. Jan Goldancarter
National Wildlife Federation
1400 16th Street, NW
Washington, DC 20036-2266

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Norfolk, Virginia 23508-8521

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Natural Heritage Program
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Mr. Don Stansell
Maryland Department of Natural Resources
Licensing and Registration Service
580 Taylor Avenue
Tawes State Building, B-1
Annapolis, Maryland 21401

Mr. William S. Burgess
Director
Geographical Information System
Chesapeake & Coastal Watershed Administration
Tawes State Office Building
Annapolis, Maryland 21401

Mr. Ray C. Dintaman Jr.
Director
Environmental Review Unit
Maryland Department of Natural Resources
Tawes State Office Building, B-3
Annapolis, Maryland 21401-2397

Mr. Rodney Little
State Historic Preservation Officer
Historical and Cultural,Programs
Maryland Dept of Housing & Community Development
100 Community Place, Third Floor
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Executive Director
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Saint Mary's County
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Valley Lee, Maryland 20692

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Assateague Island National Seashore
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National Park Service
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Fifth U.S. Coast Guard District
United States Department of Transportation
431 Crawford Street
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United States Environmental Protection Agency
Region III
Environmental Programs Branch
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Mr. W. Michael Mccabe
Regional Administrator
United States Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107-4431

State Geologist
Division of Mineral Resources
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Charlottesville, Virginia 22903

Commonwealth of Virginia
Department of Conservation
Historic Resources
Division of Soil Water Conservation
Shoreline Programs
Post Office Box 1024
Gloucester Point, Virginia 23062

The Commonwealth of Virginia
Department of Conservation & Historic
Resources
203 Governor Street
Richmond, Virginia 23219

President
Organization for Environmental Growth
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University of Maryland Seafood Lab
Crisfield, Maryland 21817

Chairman
Worcester Environmental Trust
Post Office Box 38
Snow Hill, Maryland 21863-0038

Environmental Resources, Inc.
One Plaza
Suite 319
Salisbury, Maryland 21801

Mr. H. Alexander Wise, Jr.
Director
Department of Historic Resources
221 Governor Street
Richmond, Virginia 23219

Dr. Robert Byrne
Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

Mr. John B. Pleasants
Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

Mr. Dwight Marshall
Watermen Association
Tangier Sound
Tylerton, Maryland 21866

Mr. William Moyer
Wetlands'Aquatic Protection
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Chairman
The Wilderness Society
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Washington, DC 20005

Commander
United States Coast Guard
2401 Hawkins Point Road
Curtis Bay, Marylnad 21226-1791

Mr. Cyril E. Childs
Chesapeake Bay Committee
Izaak Walton League, Talbot County
Route 4, Post Office Box 277
Cambridge, Maryland 21613

Mr. P. Gerald Walls
Maryland Eastern Shore Council
8133 Elliott Road
Easton, Maryland 2101-7131

US Army Corps of Engineers
Baltimore District

# Public Notice

To all interested parties:

The US Army Corps of Engineers has initiated the Smith Island, Maryland Environmental Restoration and Protection Reconnaissance Study. The purpose of this Public Notice is to inform the citizens of Smith Island and any other interested parties of the study, and to solicit ideas, suggestions, and issues of concern to be incorporated into the study process.

The study will consider all water resource related problems and opportunities on the island. These items include, but are not limited to, erosion, flood or storm damages, impediments to navigation, identification of beneficial uses of dredged material, and the creation or restoration of wetlands, oyster bars, and submerged aquatic vegetation (SAV) beds.

Public involvement is an important component of the study and public participation will be invited at every stage of the planning process. The Reconnaissance Study is scheduled for completion in May 1997. The product of the study will be a report analyzing various options and recommending one or more potential projects to be carried forward to a cost-shared, pre-construction Feasibility Study phase. If you would like to be on our mailing list or make a suggestion, please fill out the information card on this notice and return to the address on the back. We look forward to working with you on the Smith Island Reconnaissance Study.

James F. Johnson

Dr. James F. Johnson
Chief, Planning Division

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Name ________________________

Address ________________________
________________________
________________________

Interest in Smith Island:
__ Waterman
__ Citizen
__ Seasonal Resident
__ Other

Please describe any ideas, suggestions, or concerns that you feel the study should address:

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

Please feel free to contact study team members with your concerns. We can be reached at the address on the reverse side or by telephone at the following numbers:

Study Manager - Dan Bierly (410) 962-6139
Economist - Sharon Wagner (410) 962-3029
Environmental Specialist - Carol Anderson-Austra (410) 962-2910
Geographer - Pete Noy (410) 962-6100
Operations Specialist - Steve Garbarino (410) 962-6064

e-mail: daniel.m.bierly@ccmail.nab.usace.army.mil or call toll-free at 1-800-295-1610

Parris N. Glendening
*Governor*

John R. Griffin
*Secretary*

Carolyn D. Davis
*Deputy Secretary*

**Maryland Department of Natural Resources**
Environmental Review
Tawes State Office Building
Annapolis, Maryland 21401

August 2, 1996

Dr. James F. Johnson, Chief
Planning Division
U.S. Army Corps of Engineers, Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715

RE: Your Letter Dated July 26, 1996 Concerning the Smith Island, Maryland Environmental Restoration and Protection Reconnaissance Study.

Dear Dr. Johnson:

Thank you for the opportunity for the Department of Natural Resources to participate in the Environmental Restoration and Protection Reconnaissance Study for the Smith Island area. I will serve as the Department's point of contact to the Corps for the subject study review.

The Department's Environmental Review Unit, of which I am the Director, will coordinate a Departmental review of your request and provide appropriate information to you.

Sincerely,

Ray C. Dintaman, Jr.

Ray C. Dintaman, Jr., Director
Environmental Review Unit

RCD

Telephone: (410) 974-2788
DNR TTY for the Deaf: (410) 974-3683

August 12, 1996

Planning Division

Mr. John P. Wolflin
Supervisor, Chesapeake Bay Field Office
US Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, Maryland 21401

Dear Mr. Wolflin:

I am writing in reference to the Army Corps of Engineers' Smith Island Reconnaissance Study. The study was initiated in June 1996 and is expected to be completed in May 1997. The purpose of the study is to investigate possibilities for improving navigation, flood control, erosion control, environmental restoration, wetlands protection, and other purposes. Based on recent discussions with government officials and other agency representatives, it was concluded that the formulation of a steering committee would be beneficial in assuring that the study addresses Smith Island's needs. It is anticipated that the steering committee will be comprised of representatives from the Federal government, the State of Maryland, the Commonwealth of Virginia, Somerset County, and Smith Island. The committee will meet periodically during the course of the study and will provide oversight and direction as needed.

I am requesting that you appoint a representative from your office to participate on this committee. The representative would be a contact person for the study and a voice for your office. Please notify me or Mr. Dan Bierly, study manager, prior to August 20, 1996, of your representative. We would like to schedule an initial steering committee meeting during the week of September 9 , 1996.

Questions regarding this matter should be directed to me at (410) 962-4900, or Mr. Bierly at (410) 962-6139.

Sincerely,

Dr. James F. Johnson
Chief, Planning Division

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway ● Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

August 12, 1996

Dr. James F. Johnson
Chief, Planning Division
Department of the Army
U. S. Army Corps of Engineers-Baltimore District
P.O. Box 1715
Baltimore MD 21203-1715

Dear Dr. Johnson:

Secretary Jane Nishida received your recent letter requesting the assistance of the Maryland Department of the Environment (MDE) in the formulation of the Maryland Environmental Restoration and Protection Reconnaissance Study: Smith Island, and requested that I respond directly to you. In your letter, you asked that MDE designate someone to serve as a point of contact for the project and that MDE provide a list of available information and environmental data which would be helpful to your study.

Mr. Visty P. Dalal, of my staff, and Mr. Elder Ghigiarelli, from MDE's Water Management Administration, will be MDE's points of contact for the above mentioned study. Please coordinate all future efforts for this study with Mr. Dalal and Mr. Ghigiarelli. We will try to locate any available data on the biological resources and other environmental parameters that the study may need and send to Mr. Daniel Bierly.

Thank you for inviting the Maryland Department of the Environment to participate in the Smith Island Environmental Restoration and Protection Reconnaissance Study. If you have any questions, please contact Mr. Visty P. Dalal at (410) 631-3689 or Mr. Elder Ghigiarelli at (410) 974-2156.

Sincerely,

MSHaire

Michael S. Haire, Director
Technical and Regulatory Services Administration

MSH/vpd

cc: Jane Nishida, Secretary, Maryland Department of the Environment
Mr. J.L. Hearn, Maryland Department of the Environment
Mr. Elder Ghigiarelli, Maryland Department of the Environment
Mr. Visty P. Dalal, Maryland Department of the Environment

*"Together We Can Clean Up"*

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

August 12, 1996

Dr. James F. Johnson
Chief, Planning Division
Department of the Army
Baltimore District, U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore MD 21203-1715

Dear Dr. Johnson:

I have received your letter of July 26, 1996 concerning the Smith Island, Maryland Environmental Restoration and Protection Reconnaissance Study. As requested, I am forwarding information about shellfish harvest water monitoring stations surrounding Smith Island and their location. Bacteriological water quality is monitored on a monthly basis at each of these stations. In addition, pH, salinity, and dissolved oxygen are monitored at selected stations. If you need additional information, please contact Ms. Kathy Brohawn, Environmental Specialist, Shellfish Certification Division, 2500 Broening Highway, Baltimore MD 21224. Ms. Brohawn's phone number is (410) 631-3610.

In 1993, the Somerset County Sanitary Commission hired a consulting firm to evaluate the conditions the two wastewater treatment facilities on Smith Island. One of the major problems identified was severe erosion in very close proximity to the road bed and one of the pumping stations. You may wish to contact Mr. Elmo Powell, Chairman of the Somerset County Sanitary Commission for more information.

Future inquiries should be directed to Mr. Gary Setzer, Environmental Program Manager, Wetlands and Waterways Program, Tawes States Office Building, 580 Taylor Avenue, Annapolis MD 21401. Mr. Setzer's Program will serve as our agency's point of contact. You may reach him at (410) 974-2236.

Sincerely,

Mary Jo Garreis

Mary Jo Garreis
Environmental Program Manager
Environmental Risk Assessment Program

cc: Ms. Kathy Brohawn
Mr. Gary Setzer
Mr. Nauth Panday
Mr. Daniel Bierly

February 3, 1988

Smith Island
Map 16 Section 01

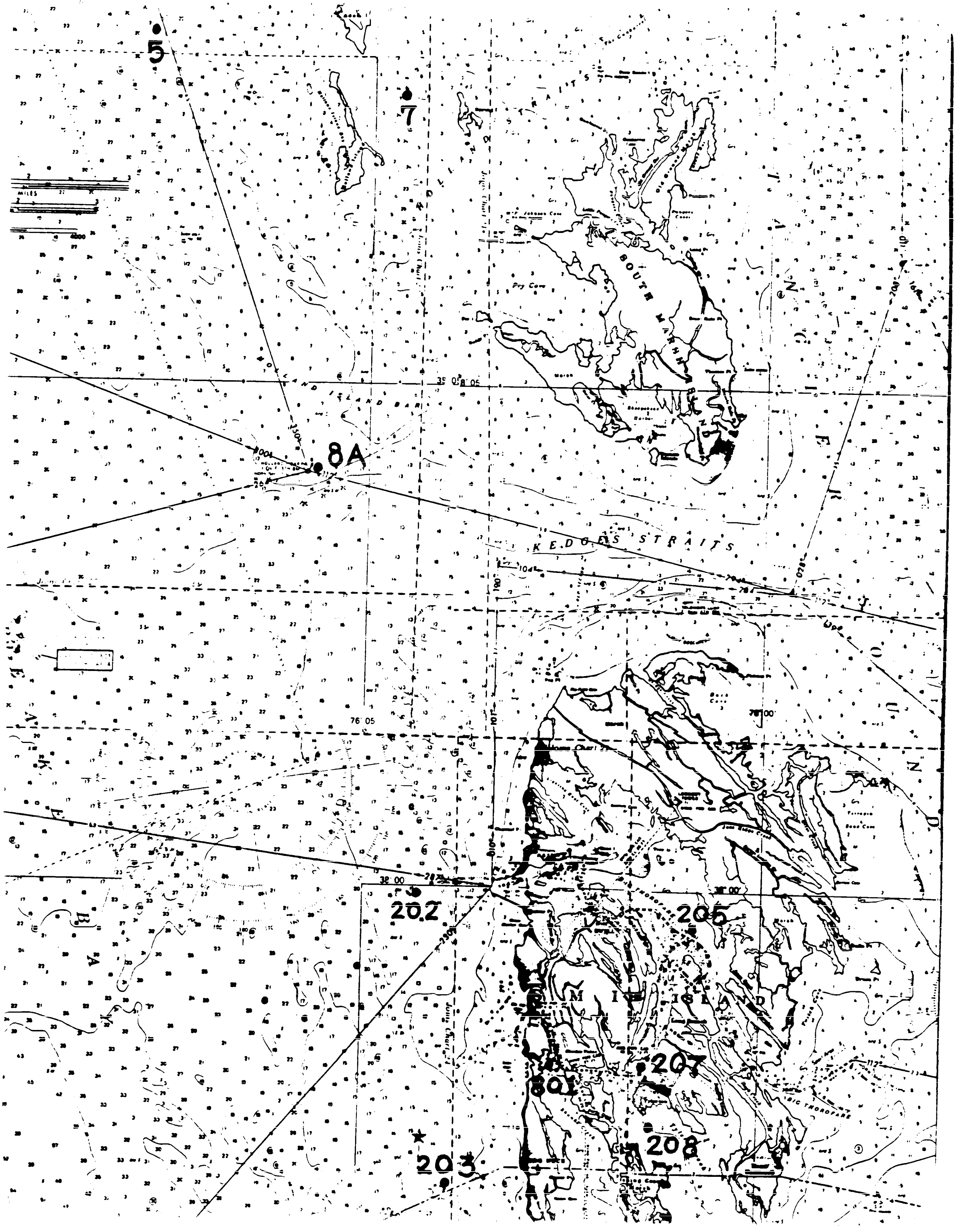
Stations - 9

| Station Number | Station Location |
|---|---|
| 16-01-005 | 4350 yards west of Adam Island (Old Nun "A2") in the Chesapeake Bay (38°08'40" N. Latitude, 76°08'29" W. Longitude) |
| 16-01-007 | Center point between S. Adam Island, N. Spring Island and E. Point of Holland Island (38°07'59" N. Latitude, 76°04'38" W. Longitude) |
| 16-01-008A | Holland Island Bar light and horn (38°04'06" N. Latitude, 76°05'45" W. Longitude) |
| 16-01-202 | Black and White Can off mouth of Smith Island Harbor - private maintained (37°59'54" N. Latitude, 76°04'23" W. Longitude) |
| 16-01-203 | State maintained Marker "H" (37°56'44" N. Latitude, 76°04'32" W. Longitude) |
| 16-01-205 | Light "31" in Big Thorofare (37°59"28" N. Latitude, 76°01'03" W. Longitude) |
| 16-01-207 | Day Beacon "13" at the southern mouth of Tyler Ditch (37°58'16" N. Latitude, 76°01'41" W. Longitude) |
| 16-01-208 | Day Beacon "9" in Tyler Creek (37°57'36" N. Latitude, 76°01'30" W. Longitude) |
| * 16-01-801 | 100 yards west of Green Daymark "5" (37°58'18" N. Latitude, 76°02'35" W. Longitude) |

Stations sampled for Salinity, Temperature, Dissolved Oxygen, and p.H.

16-01-008A 16-01-208 16-01-205

* New Station Location


5
7
8A
202
203
205
207
208
KEDGES STRAITS
HOLLAND ISLAND BAR
SOUTH MARSH
ISLAND
MILES

September 30, 1987

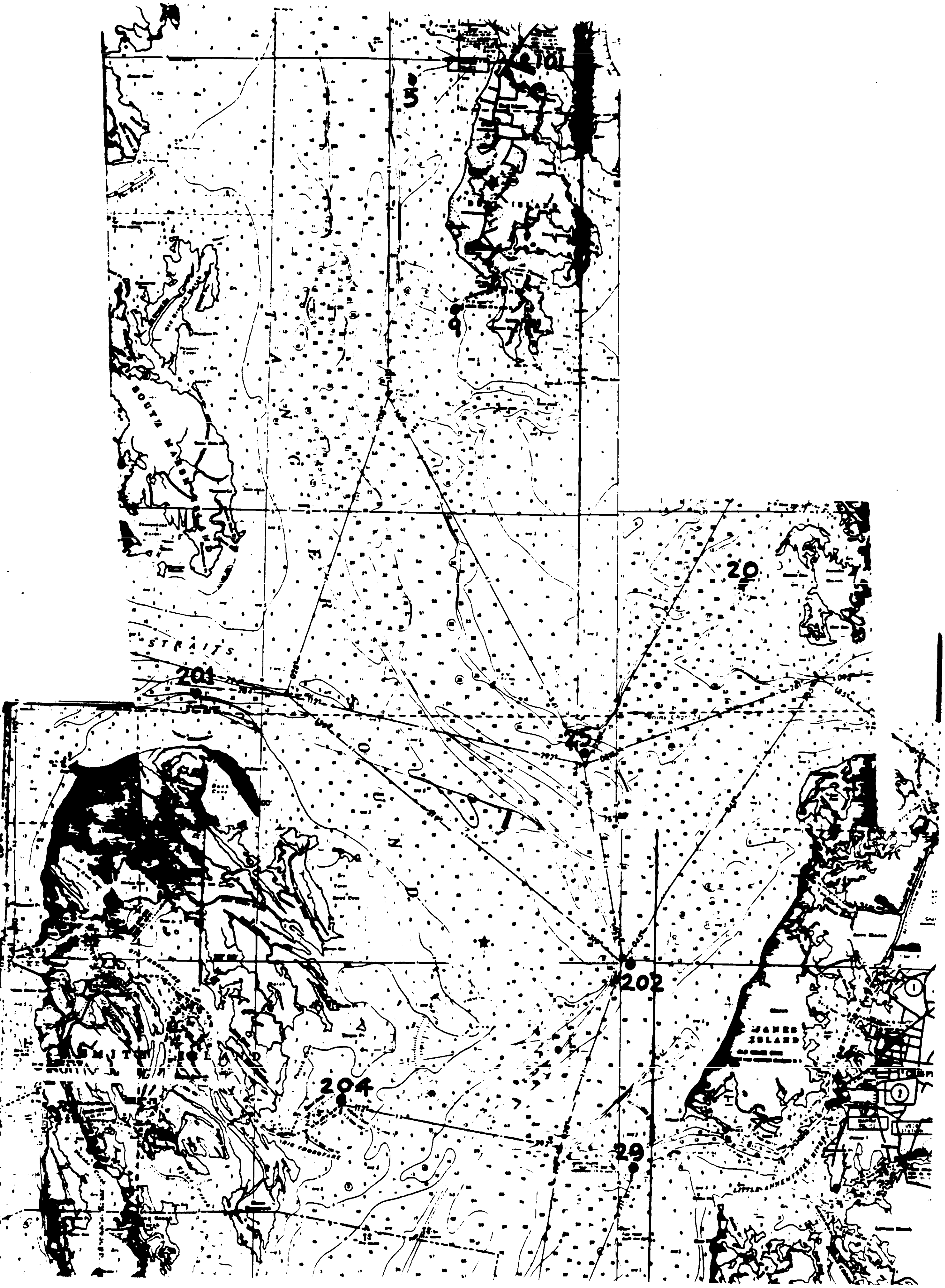
**Tangier Sound**
**(Map 18 Section 2)**

**Active Stations- 9**

| Station Number | Station Location |
|---|---|
| 18-02-005 | Nun "18" 1 mile southwest of entrance to Upper Thorofare (38°10'00" North Latitude, 75°58'24" West Longitude) |
| 18-02-009 | Nun "2" southwest of entrance to Lower Thorofare (38°07'04" North Latitude, 75°58'08" West Longitude) |
| 18-02-020 | 300 yards southwest of Flashing Red "2" off Rumbly (38°04'09" North Latitude, 75°53'22" West Longitude) |
| 18-02-025 | 1 Quick Flashing Red Bell (northwest of Flatcap Point) (38°02'14" North Latitude, 75°55'28" West Longitude) |
| 18-02-029 | Can "1" at entrance to Little Annemessex (37°57'36" North Latitude, 75°54'50" West Longitude) |
| 18-02-201 | Solomons Lumps Lighthouse (38°02'52" North Latitude, 76°00'55" West Longitude) |
| 18-02-202 | Quick Flashing Black Bell "9" (38°00'01" North Latitude, 75°54'58" West Longitude) |
| 18-02-204 | Quick Flashing Light "1" at entrance to Big Thorofare (37°58'22" North Latitude, 75°58'47" West Longitude) |
| UPPER THOROFARE | |
| 18-02-101 | 200 yards inside Deale Island Bridge (38°10'02" North Latitude, 75°56'35" West Longitude) |

Stations to be sampled for temperature, salinity, dissolved oxygen, and pH:

18-02-005
18-02-025
18-02-204


101
5
9
20
STRAITS
201
202
204
29
JANES ISLAND

# MEMORANDUM FOR THE RECORD

**Smith Island Environmental Restoration and Protection, Maryland**

**Public Involvement Meeting in Tylerton, August 13, 1996**

16 August 1996

**Attendees:**

| | |
|---|---|
| Carol Anderson-Austra | Pete Noy |
| Dan Bierly | Mike Harrison (USFWS) |
| Elaine Johnson (USFWS) | John Gill (USFWS) |
| Residents of Tylerton | |

1. The Corps of Engineers representatives met with the residents of Tylerton in the crab picking co-op. The meeting commenced at about 10:30 am.

2. Carol Anderson-Austra opened the meeting by introducing the team members and discussing the purpose for the visit. Dan Bierly then spoke in more detail about the study and the problem identification process. The meetings in Rhodes Point and Ewell were discussed, as well as the upcoming meeting in Rhodes Point to which the whole island is invited. Previous and upcoming Corps activities were discussed. These include the Hog Neck geotube placed almost two years ago, the anticipated jetty repair near Ewell, and the upcoming geotube placements on Hog Neck and at the entrance to Sheep Pen Gut.

3. Mr. Bierly spoke next about the reconnaissance study that had begun in June. The funding aspects of the study were mentioned briefly along with the concept of local sponsorship and study phases. Mr. Bierly provided a review of the types of problems being researched and the types of solutions that may be applicable. The map of the island which shows problems identified during the meeting in Ewell was laid out on a table and discussed. Those in attendance agreed that the map represented the problems of Ewell and Rhodes Point. The study team encouraged input from the locals and after a while they became very forthcoming. The locals were told to give any ideas no matter how unrealistic they seemed.

4. Mr. Bierly distributed information and maps for the people to fill out as they saw fit. Mr. Bierly invited some men to draw on the displays in order to better demonstrate their concerns. The team came away with many excellent ideas for Tylerton

5. The meeting ended at approximately 11:30. Mr. Lindsay Bradshaw was kind enough to take the team on a walking tour of Tylerton in order to show the problems first hand. The team was lucky to be on the island during an extremely high tide event. This allowed the team to more easily visualize the problems that were explained. The main problems seemed to occur along the main road from the sanitary pump station south. The

water is right up against the road in some parts. Old bulkheading is deteriorating and useless. There is some newer bulkheading but there is no continuity and, therefore, provides only limited effectiveness. Under the road there is a sanitary sewer line and a water main. The benefits seem to be there for an inexpensive solution such as geotubes. Breakwaters to the south and along the naturally deep channel out of Tylerton were also discussed.

6. The team departed Tylerton and ate lunch in Ewell. Following lunchtime conversation with the USFWS representatives, the team was escorted to the Martin Wildlife Refuge office where the team met Mr. Michael Haramis, who is a research wildlife biologist. Over head photos were used to show problem areas in the refuge. Among the biggest problems are breaches north of the jetties and disappearing spits on the north and north-east shore. Once the spits are gone, the quiescent coves will turn to open water and no longer be of value as a waterfowl breeding area. There was also discussion of creating upland areas for use as rookeries.

7. The team was taken on a jon-boat tour of the eastern portion of Big Thorofare. The weather did not allow for further site seeing. The northern jetty was visited as well as the eroded areas to the north. The team returned to Ewell and then back to Crisfield. The next trip to Smith Island will include a large, nighttime meeting with the whole island in Rhodes Point which is tentatively scheduled for August 27.

Dan Bierly
Study Manager

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway ● Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

August 21, 1996

Colonel Randall R. Inouye
U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore MD 21203-1715

Dear Colonel Inouye:

Governor Parris N. Glendening received your recent letter informing him about the initiation of the Smith Island - Maryland and Virginia Environmental Restoration and Protection Reconnaissance Study, and requested that I respond directly to you.

The Maryland Department of the Environment (MDE) has received a similar letter from Dr. James F. Johnson, Chief, Planning Division, Baltimore Army Corps of Engineers, informing MDE about the project, requesting environmental and biological resources data and asking for a point of contact for the above mentioned project. Mr. Visty Dalal, of my staff, has been designated point of contact for this project, and will be working closely with your staff in providing the information requested.

Thank you for inviting the Maryland Department of the Environment to participate in the Smith Island Environmental and Protection Reconnaissance Study. If you have any questions regarding this project, please do not hesitate to contact me at (410) 631-3680, or contact Mr. Dalal at (410) 631-3689.

Sincerely,

MS Haire / vd

Michael S. Haire
Director
Technical & Regulatory Services Administration

MSH/vd

cc: Governor Parris N. Glendening
Jane T. Nishida, Secretary, Maryland Department of the Environment

Parris N. Glendening
*Governor*

**Maryland Department of Natural Resources**

Tawes State Office Building
Annapolis, Maryland 21401

John R. Griffin
*Secretary*

Carolyn D. Davis
*Deputy Secretary*

August 22, 1996

Dr. James F. Johnson
Chief, Planning Division
Baltimore District, U. S. Army Corps of Engineers
P. O. Box 1715
Baltimore, Maryland 21203-1715

Dear Mr. Johnson:

This letter is in response to your letter dated August 12, 1996 requesting that I appoint a representative from the Department to participate on the Smith Island Reconnaissance Study Steering Committee investigating possibilities for improving navigation, flood control, erosion control, environmental restoration, wetlands protection, and other purposes. I am designating Mr. Ray Dintaman as the Department's representative on this committee. Ray is the Director of the Department's Environmental Review Unit. He can be contacted at: 580 Taylor Avenue, Tawes State Office Building B-3, Annapolis, Maryland 21401; Phone: (410) 974-2788. I am confident that this selection will serve both our needs quite well.

Sincerely,

Carolyn Davis for

John R. Griffin

JRG:RCD

Telephone: (410) 974-3041

# MEMORANDUM FOR THE RECORD

**Smith Island Environmental Restoration and Protection, Maryland**

**Public Workshop in Rhodes Point, August 27, 1996**

16 September 1996

**Attendees:**

| | |
|---|---|
| Carol Anderson-Austra | Pete Noy |
| Dan Bierly | Sharon Wagner |
| Elaine Johnson (USFWS) | Mike Harrison (USFWS) |

Residents of Tylerton, Ewell, Rhodes Point (list attached)

1. The Corps of Engineers held the first Public Workshop for the Smith Island reconnaissance study in Rhodes Point. Forty-two participants attended. USFWS was represented, however, no other agencies or interest groups were invited to attend. The purpose of the meeting was to review the recommendations obtained so far from smaller meetings with the residents of the island, and to collect further ideas and "values" type input for the good of the study. The attached information is a summary of the islanders' input during the meeting.

2. As the people entered the Rhodes Point community hall, they were asked to sign in and then were invited to look at aerial photographs of the island from 1938, 1958 and 1977. The pictures were very popular and spurred a tremendous amount of discussion and valuable input for the team members. The meeting commenced at 7p.m. Mr. Bierly spoke to the crowd for approximately 30 minutes. He explained the Corps study process briefly, but made a point of explaining local sponsorship and the importance of non-Federal funding sources. Mr. Bierly also discussed project authorization and the funding mechanism of the Federal government. Finally he reviewed for all the identified problem areas and explained that these areas were identified during meeting with smaller groups of citizens in each of the three towns.

3. Following Mr. Bierly's talk, Everett Landon of Rhodes Point showed a video that he put together. The video contained scenes of Rhodes Point during recent highwater events, and clips from television documentaries on the island. Mr. Landon gave the study team the video for their use.

4. Ms. Anderson-Austra then directed the attendees to split into three groups. Each group was led by a Corps representative and was posed 4 questions. The questions were: What is good about the island? What is bad about the island? What would make the island better? What concerns do you have about this study? The participants were very forthcoming with their responses. Definite themes were established. See the enclosed "Results" packet.

5. Following the group activities, each person was given green stickers that were used to "vote" on the most important items on the lists. The number of vote garnered can be seen in the results packet in parentheses. Erosion was obviously the biggest concern of most of the attendees.

6. The meeting adjourned at just after 9p.m. The team announced that the next meeting would likely be in October, at which time potential projects for further study in the reconnaissance phase would be announced and discussed.

Dan Bierly
Study Manager

# MEMORANDUM FOR THE RECORD

**Smith Island Environmental Restoration and Protection, Maryland**

**Steering Committee Meeting in Crisfield and Ewell, September 18, 1996**

19 September 1996

**Attendees:**

| | |
|---|---|
| Carol Anderson-Austra (BCOE) | Pete Noy (BCOE) |
| Dan Bierly (BCOE) | Jim Johnson (BCOE) |
| John Wolflin (USFWS) | Pete Tinsley (MDE) |
| Carl Zimmerman (NPS) | Tim Goodger (NMFS) |
| Ray Dintaman (MDNR) | Phil Gerald (Somerset Co.) |
| Eddie Evans (Ewell) | Janice Marshall (Tylerton) |
| Charlie Marsh (Tylerton) | Maxine Landon (Rhodes Point) |
| Perry Weed (Cong. Gilchrest) | |

1. The Corps of Engineers held the first Steering Committee meeting for the Smith Island reconnaissance study in Crisfield and Ewell. The original agenda called for departure from Crisfield at 1100 hrs. Due to engine troubles on the ferry, our departure was delayed until 1230 hrs. The hour and a half of extra time in Crisfield was spent holding an informational meeting aboard the ferry. The islanders and Mr. Gerald were not present, but all of the agency representatives were in attendance. Mr. Gerald showed up just before the ferry's departure at 1230hrs.

2. Dr. Johnson began the meeting by talking a little bit about the study effort and discussing the Chesapeake Bay Restoration authority that will likely be in WRDA 1996. Dr. Johnson also spoke of cooperation, cost sharing, and other funding sources. Mr. Bierly then briefed the committee as to the progress to date.

3. The Committee was briefed using a packet that was assembled for the meeting. The first issue involved the change in the agenda for the day. The revised agenda included a meeting without the locals on the boat in Crisfield, and a meeting with the locals in Ewell. The committee members who could not be present were acknowledged and the Congressional authority for the study was read. The package also included the plan of study and the vicinity map. Next Mr. Bierly summarized the study efforts to date and the coordination efforts in particular. It was explained that the coordination efforts have been extensive due to the need for local input to problem identification and plan formulation. It was stressed that our study and its recommendations must aid in preservation of the island's culture, be appropriate to the way of life, and be acceptable to island residents. Mr. Bierly presented the problems identified to date and explained that all of the identified problems came from the local citizens or the Martin Wildlife Refuge representatives.

4. During the presentation there were many questions and comments which added greatly to the meeting. There seemed to be much interest in the study. Conversations among various committee members continued as the ferry made its way to Ewell.

5. In Ewell, the committee members had lunch and then went for a bus tour of the island. The bus ran from Ewell to Rhodes Point and back again. Tylerton, of course, is inaccessible by automobile. The governmental steering committee members then convened in the Tourist Center with the committee members representing the three towns on the island. The group was shown the 20 minute movie that was put together for every day use in the Tourist Center. The movie presents an excellent view of the life of the islanders and adds to the understanding of their unique culture.

6. Following the meeting, Mr. Bierly and Ms. Anderson-Austra led the group in discussion with the islanders. Each team member introduced himself to the locals and explained what they did in their particular position. The islanders then spoke one at a time and told what to them was good about the island, what they envision for the future, and why our study effort is important to them. Each of the four gave wonderful, well thought out, and moving testimonies. The committee was very receptive to them, and their comments seemed to energize some of the members toward the effort. The meeting maintained a very positive tone.

7. The "mainlanders" then departed on the 1600 hrs ferry to Crisfield. Once in Crisfield, Mr. Weed ran into Duke Marshall, formerly of Tylerton now of Crisfield. Mr. Marshall pledged his support of the study effort and commented positively about what he heard of the public meeting held 27 August in Rhodes Point.

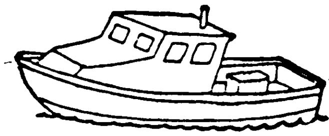
8. The members dispersed from Crisfield at approximately 1645 hrs. The team will keep in close contact with each of the agencies.

Dan Bierly
Study Manager

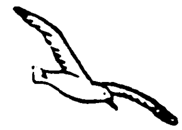
Smith Island TIMES

September 1996

T.Swann, Editor



## ARMY CORPS OF ENGINEERS VISIT SMITH ISLAND



A meeting with the Army Corps of Engineers was held on Tuesday, August 27th at the Rhodes Point Community Center to discuss the problem of erosion on Smith Island. About fifty of the combined residents of Ewell, Rhodes Point, and Tylerton were in attendance, along with Ms. Carol Anderson Austra and her associates. Their mission was to gather facts about what the people of Smith Island would like to see done to help combat the erosion of the island.

After a brief discussion of government red tape and funding priorities, we viewed a home video compiled by Everett and Maxine Landon showing Rhodes Point virtually underwater during the storms of 1/4/92 and 3/13/93. The residents then broke up into three mixed groups and were requested to answer the following questions. The answers most commonly given follow each question.

1. What are the good points of living on Smith Island?

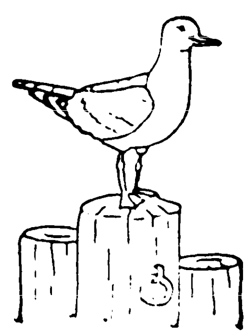
   Freedom
   No Crime
   Independence
   The People
   Family Heritage
   Peace and Quiet
   Seafood
   Beauty
   Separation from the Rest of the World

2. What are the bad points of living on Smith Island?

   Erosion
   School Cuts
   Roads
   Declining Population
   No Jobs
   Trash

3. What would improve Smith Island?

   Erosion Control
   Clean Up Island
   Save Our Schools
   More Recreation
   Lose Save The Bay



4. What are your concerns about this study?

   Will Anything Be Done
   How Will It Affect The People
   Wasting Money
   Lack of Sponsorship at Local Levels

Each person present responded to these questions. All answers were written down and are to be included in the Corps report to Washington D.C. In addition, each person received several stickers to place next to the responses they felt were most important.

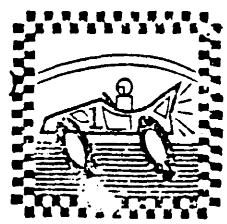
The Army Corps also made known their intentions of placing a GEO Tube at Hog Neck this winter. They will return in the future for further discussions.Let's hope we will have more folks in attendance at these meetings. Erosion affects each and every one of us on the island. If you have any questions or comments you may contact

Ms. Carol Anderson Austra
CENAB-PL PC
10 S. Howard St.
BOX 1715
Balto., MD. 21203

*******************************************************************

UPCOMING EVENTS

A Bike-A-Thon to benefit St. Jude Childrens Hospital will be held on Saturday, Sept. 7(Raindate Sept. 14) The hospital battles cancer and other catastrophic childhood diseases. In the past, the children have raised $1500 for this worthy cause. Please support the children when they request your sponsorship.



The PTA will be holding its first CAR WASH at the school on Saturday Sept. 14 from 1-3 p.m.(Raindate Sept. 21) The prices will be $5 exterior only, $8 interior and exterior, $10 interior, exterior and windows.
Please help us make this new venture a big success!

The Ewell School PTA will sponsor its first BINGO night on Friday, Nov. 2nd. Enjoy an evening out, and win some luscious cakes and wonderful prizes!

The Ewell Childrens Choir will be holding its first practice on Sunday, Sept. 22nd at 6 p.m. All children K thru 7th grade are encouraged to attend.

The PTA will hold its next meeting on Tuesday, Sept. 10th at 7 p.m.

The HOMECOMING in Tylerton is scheduled for September 22nd. This will be their 100th Anniversary Celebration

BARBARA A. MIKULSKI
MARYLAND

COMMITTEES:
APPROPRIATIONS
LABOR AND HUMAN RESOURCES

# United States Senate

WASHINGTON, DC 20510-2003

IN REPLY PLEASE REFER
TO OFFICE INDICATED:

☐ WORLD TRADE CENTER, SUITE 253
401 E. PRATT STREET
BALTIMORE, MD 21202-3099
(410) 962-4510
VOICE/TDD: (410) 962-4812

☐ 60 WEST STREET, SUITE 202
ANNAPOLIS, MD 21401-2448
(410) 263-1805
BALTIMORE: (410) 269-1680

☐ 9658 BALTIMORE AVENUE, SUITE 207
COLLEGE PARK, MD 20740-1346
(301) 345-5517

☐ 82 WEST WASHINGTON STREET, SUITE 301
HAGERSTOWN, MD 21740-4804
(301) 797-2826

☑ SUITE 1E, BUILDING B
1201 PEMBERTON DRIVE
SALISBURY, MD 21801-2403
(410) 546-7711

September 3, 1996

Colonel Randall Inouye
District Engineer
Army Corps of Engineers
P.O.Box 1715
Baltimore, Md. 21223-2824

Dear Colonel Inouye:

I am forwarding a letter from one of my constituents, Harvey Corbin, who is concerned about construction of dykes around the South half of Tylerton on Smith Island.

I believe this is a very serious issue, and I hope that you will take every appropriate action to address it as soon as possible. Please send your response to my Eastern Shore Representative, Ms. Cindy Betts, at the above address.

Thank you for your attention. I look forward to hearing from you.

Sincerely,

Barbara A. Mikulski

Barbara A. Mikulski
United States Senator

Tues - Aug 13-96.

Dear Mrs Mikulski

The Corps of Engineers were here on Tylerton today about helping us to get a dyking around the South half of Tylerton They Said they are going to do all they Can for us but to get the help we really need is from our Senators & Congressman and I dont know of anyone better to help us than you. You have showed more willingness to help the watermen than anyone I know. and I am 65 years old and I have seen oysters & Crabs slowly disapear. But you have great Ideias & I know they are working and I thank you for all you are doing. Please do what you Can to help us get this dyking before it is to late. The way erosion is Cutting away our marshes in only a very few years my home will be to the waters edge. Its only 300 feet away from the water on the East side 300 feet from South side & 50 feet from the West side. A Bulkhead of some type is very well needed and I beleive you are the best person to ask help from. You know the right people to see for helping us. Our new Coop building is to be dedacated Oct 21st or later. I think its to be this month. I hope you and Senator Sarbanes will Come maybe Pres Cliton will Come to & see how Close the Tangier Sound is to us from east & South & the Chesapeake Bay from West to South. The Chesapeake Bay meets with the Tangier Sound 300 feet of my home & Tylerton, Md. All I Can do is ask for your help and hope you try. Thank you

Sincerly yours
Harvey W Corbin
& family.

P.S. The dedacation for the Coop has been Changed twice so please get the right date from Janice Marshall at the Coop building 1-410-425-2035.

Parris N. Glendening
*Governor*

John R. Griffin
*Secretary*

Carolyn D. Davis
*Deputy Secretary*

**Maryland Department of Natural Resources**
Environmental Review
Tawes State Office Building
Annapolis, Maryland 21401

September 17, 1996

Dr. James F. Johnson
Chief, Planning Division
U.S. Army Corps of Engineers, Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715

RE: Smith Island, Maryland Environmental Restoration and Protection Reconnaissance Study; Chesapeake Bay Area; Somerset County

Dear Dr. Johnson:

In response to your request for baseline environmental information on the area of the above referenced project, we have coordinated a review of the project by the Department of Natural Resources. The lands and waters of Smith Island offer a diverse array of habitats which are reflected in the abundance of natural resources found in the area and the integral part these resources play in the livelihood of the residents of Smith Island.

The waters surrounding Smith Island contain 9 areas designated as natural oyster bars (NOB). NOBs 32-5, 32-7, 32-8 and 36-2 are found to the north and west of Smith Island; NOBs 33-10, 33-11, and 33-12 are found to the north and east of Smith Island; NOBs 36-3 and 36-4 are found to the east of Smith Island just above the Maryland-Virginia line. While these bars were commercially productive in the past, currently a severe disease problem limits their commercial viability. However, these bars do experience good to excellent spat sets when conditions are favorable for oyster reproduction.

The waters in and around Smith Island have consistently supported extensive beds of submerged aquatic vegetation (SAV), primarily eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*). The 1994 *Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and Chincoteague Bay* (Orth et al., 1995) reported that the four USGS 7.5 minute quadrangles that cover Smith Island had 4,993.78 hectares of SAV in 1993 and 3,656.67 hectares of SAV in 1994.

The Smith Island area is a center of commercial crabbing and crab shedding activity in the Bay. The commercial harvest of blue crabs is an important source of income for the residents of Smith Island. Generally, the active period for crabbing is April through December; crab shedding activity is generally conducted during April through September. Excessive turbidity during this period can cause increased

Telephone: (410) 974-2788
DNR TTY for the Deaf: (410) 974-3683

mortality in crab shedding operations. To protect crab shedding operations, oyster and submerged aquatic vegetation resources from potential impacts, we would request that no instream work be conducted during the period April 15 through October 15.

Smith Island contains the highest density of mixed species heron colonies found anywhere in Maryland in addition to other species of colonially nesting waterbirds. Attached is list of the colonial waterbird sites that are known to exist on Smith Island. In addition to the colonial waterbirds, Smith Island is known to support two active Peregrine Falcon (*Falco peregrinus*) nests located on nesting towers within the Martin National Wildlife Refuge in the northern end of Smith Island. Among other nesting bird species, the Department has records of nesting by the Northern Harrier (*Circus cyaneus*) which is considered to be a State Rare species and a local breeder on Smith Island and the Black Skimmer (*Rynchops niger*), a State Threatened species has been observed in the Smith Island area. In addition to the nesting activity, the waters around Smith Island serve as an important concentration and staging area for a multitude of wintering and migrating waterfowl species during the period from approximately October through April inclusive.

The Department currently has two water quality monitoring stations which measure physical and chemical parameters located in the vicinity of Smith Island. These sites are a Chesapeake Bay mainstem station (MCB5.3) located to the southwest of the Island and a Tangier Sound station (MEE3.2) located to the east of the Island. Monitoring data from 1985 through the present are available from these stations in either a written or digital format. For further information concerning this database you may contact Mr. Bruce Michael in our Tidewater Ecosystem Assessment Division at (410) 974-2951.

The Department is also involved in the planning for the Smith Island Visitor Center and boardwalk by providing funding through Program Open Space and technical assistance with the engineering and construction. There is an active community group, the Smith Island Cultural Alliance, that is working with the Somerset County Director of Tourism on this project.

Thank you for the opportunity to provide comments on this project. Should you require additional information regarding these comments, please feel free to contact Roland Limpert of my staff at (410) 974-2788.

Sincerely,

Ray C. Dintaman, Jr.

Ray C. Dintaman, Jr., Director
Environmental Review Unit

RCD:RJL

cc: E. Ghigiarelli, MDE
D. Leonard, DNR-FS
P. Slunt, DNR-RAS
M. Slattery, DNR-FWHS
G. Cheers, DNR-LWCS

## Colonial Waterbird Colonies on Smith Island:

| MD-SIN | COLONY NAME | SPECIES | YEARS KNOWN ACTIVE |
|---|---|---|---|
| SOM002 | Cherry Island | GTBH | 1995 |
| | | GREG | 1994 |
| | | SNEG | 1993 |
| | | LBHE | 1992 |
| | | TRHE | 1991 |
| | | CAEG | 1990 |
| | | GNBH | 1989 |
| | | BCNH | 1988 |
| | | YCNH | 1987 |
| | | GLIB | 1986 |
| | | | 1985 |
| | | | 1977 |
| | | | 1976 |
| | | | 1975 |
| SOM003 | Noah Ridge | GREG | 1975 |
| | | SNEG | 1963 |
| | | TRHE | |
| | | GNBH | |
| | | YCNH | |
| | | HERG | |
| SOM005 | Wop Island | YCNH | 1988 |
| | | | 1987 |
| | | | 1986 |
| | | | 1985 |
| SOM006 | West Troy Island | COTE | 1975 |
| | | | 1973 |
| SOM010 | Otter Creek | GTBH | 1977 |
| | | YCNH | |
| SOM013 | Rhodes Point South | GREG | 1995 |
| | | SNEG | 1994 |
| | | LBHE | 1992 |
| | | TRHE | 1991 |
| | | GNBH | 1990 |
| | | BCNH | 1989 |
| | | YCNH | 1988 |
| | | GLIB | 1987 |
| | | HERG | 1986 |
| | | GBBG | 1985 |
| | | | 1977 |

| | | |
|---|---|---|
| SOM014 Easter Point | GREG | 1993 |
| | SNEG | 1992 |
| | TRHE | 1991 |
| | CAEG | 1990 |
| | GNBH | 1989 |
| | BCNH | 1988 |
| | GLIB | 1987 |
| | HERG | 1986 |
| | GBBG | 1985 |
| | | 1977 |
| | | 1975 |
| | | 1973 |
| SOM015 Hog Neck | GTBH | 1995 |
| | GREG | 1994 |
| | SNEG | 1993 |
| | LBHE | 1992 |
| | TRHE | 1991 |
| | CAEG | 1990 |
| | BCNH | 1989 |
| | YCNH | 1988 |
| | GLIB | 1987 |
| | | 1986 |
| | | 1985 |
| | | 1977 |
| | | 1976 |
| | | 1975 |
| SOM016 Chaisey Point | GREG | 1991 |
| | SNEG | 1990 |
| | TRHE | 1989 |
| | GNBH | 1988 |
| | BCNH | 1987 |
| | YCNH | 1986 |
| | GLIB | 1977 |
| | HERG | 1976 |
| | GBBG | |

| | | |
|---|---|---|
| SOM017 Point Comfort | GREG | 1995 |
| | SNEG | 1994 |
| | LBHE | 1993 |
| | TRHE | 1992 |
| | CAEG | 1991 |
| | GNBH | 1990 |
| | BCNH | 1989 |
| | YCNH | 1988 |
| | GLIB | 1987 |
| | HERG | 1986 |
| | GBBG | 1985 |
| | | 1977 |
| | | 1976 |
| | | 1975 |
| SOM018 Ewell | GTBH | 1995 |
| | GREG | 1994 |
| | SNEG | 1977 |
| | LBHE | 1976 |
| | TRHE | 1975 |
| | CAEG | 1973 |
| | GNBH | |
| | BCNH | |
| | YCNH | |
| | GLIB | |
| SOM019 Rhodes Point Road | GTBH | 1995 |
| | GREG | 1994 |
| | SNEG | 1993 |
| | LBHE | 1992 |
| | TRHE | 1990 |
| | GNBH | 1988 |
| | BCNH | 1987 |
| | YCNH | 1986 |
| | GLIB | 1985 |
| | HERG | 1977 |
| | GBBG | 1976 |
| | | 1975 |
| SOM020 Pines Hammock | GTBH | 1995 |
| | GREG | 1994 |
| | SNEG | 1993 |
| | LBHE | 1992 |
| | TRHE | 1991 |
| | CAEG | 1990 |
| | GNBH | 1988 |
| | BCNH | 1987 |
| | YCNH | 1986 |
| | GLIB | 1985 |
| | | 1977 |
| | | 1976 |
| | | 1975 |
| | | 1973 |

| | | |
|---|---|---|
| SOM021 Ireland Hammock | GTBH | 1995 |
| | GREG | 1994 |
| | SNEG | 1993 |
| | LBHE | 1992 |
| | TRHE | 1991 |
| | GNBH | 1990 |
| | BCNH | 1989 |
| | YCNH | 1988 |
| | | 1987 |
| | | 1986 |
| | | 1985 |
| | | 1977 |
| | | 1976 |
| | | 1975 |
| SOM025 Wellridge Creek | GTBH | 1995 |
| | GREG | 1994 |
| | YCNH | 1993 |
| | | 1992 |
| | | 1991 |
| | | 1990 |
| | | 1988 |
| | | 1987 |
| | | 1986 |
| | | 1985 |
| | | 1977 |
| | | 1976 |
| | | 1975 |
| SOM026 Sheep Pen Gut | GNBH | 1991 |
| | HERG | 1990 |
| | GBBG | 1989 |
| | | 1988 |
| | | 1987 |
| | | 1986 |
| | | 1985 |
| SOM027 Rhodes Point Gut | GREG | 1995 |
| | HERG | 1993 |
| | GBBG | 1992 |
| | | 1990 |
| | | 1989 |
| | | 1988 |
| | | 1987 |
| | | 1986 |
| | | 1985 |

| | | |
|---|---|---|
| SOM028 Jean's Gut | GREG | 1995 |
| | GNBH | 1994 |
| | GLIB | 1993 |
| | HERG | 1992 |
| | GBBG | 1991 |
| | | 1990 |
| | | 1989 |
| | | 1988 |
| | | 1987 |
| | | 1986 |
| | | 1985 |
| SOM030 Sawney Cove | HERG | 1995 |
| | GBBG | 1994 |
| | | 1993 |
| | | 1992 |
| | | 1991 |
| | | 1990 |
| | | 1989 |
| | | 1988 |
| | | 1987 |
| | | 1986 |
| | | 1985 |
| SOM038 Levering Creek | HERG | 1995 |
| | GBBG | 1994 |
| | | 1993 |
| | | 1992 |
| SOM039 South Ewell | HERG | 1995 |
| | GBBG | 1994 |
| | | 1993 |
| | | 1992 |
| SOM041 Lookout Tower | GREG | 1995 |
| | GLIB | 1994 |
| | SNEG | 1993 |
| | CAEG | |
| | TRHE | |
| | LBHE | |
| | BCNH | |
| | YCNH | |
| SOM044 Terrapin Sand Point | HERG | 1995 |
| | GBBG | 1975 |
| | COTE | |
| SOM045 Great Pond | HERG | 1995 |
| SOM048 Drum Point Island | HERG | 1995 |
| | GBBG | |

Four-letter Species Codes:

| | |
|---|---|
| GTBH | Great Blue Heron |
| GREG | Great Egret |
| GLIB | Glossy Ibis |
| CAEG | Cattle Egret |
| SNEG | Snowy Egret |
| TRHE | Tricolored Heron |
| LBHE | Little Blue Heron |
| YCNH | Yellow-crowned Night-Heron |
| BCNH | Black-crowned Night-Heron |
| GNBH | Green-backed Heron |
| GBBG | Great Black-backed Gull |
| HERG | Herring Gull |
| LAGU | Laughing Gull |
| BLSK | Black Skimmer |
| ROYT | Royal Tern |
| COTE | Common Tern |
| FOTE | Forster's Tern |
| LETE | Least Tern |
| BRPE | Brown Pelican |
| DCCO | Double-crested Cormorant |

# MEMORANDUM FOR THE RECORD

**Smith Island Environmental Restoration and Protection, Maryland**

**Steering Committee Meeting in Crisfield and Ewell, September 18, 1996**

19 September 1996

**Attendees:**

| | |
|---|---|
| Carol Anderson-Austra (BCOE) | Pete Noy (BCOE) |
| Dan Bierly (BCOE) | Jim Johnson (BCOE) |
| John Wolflin (USFWS) | Pete Tinsley (MDE) |
| Carl Zimmerman (NPS) | Tim Goodger (NMFS) |
| Ray Dintaman (MDNR) | Phil Gerald (Somerset Co.) |
| Eddie Evans (Ewell) | Janice Marshall (Tylerton) |
| Charlie Marsh (Tylerton) | Maxine Landon (Rhodes Point) |
| Perry Weed (Cong. Gilchrest) | |

1. The Corps of Engineers held the first Steering Committee meeting for the Smith Island reconnaissance study in Crisfield and Ewell. The original agenda called for departure from Crisfield at 1100 hrs. Due to engine troubles on the ferry, our departure was delayed until 1230 hrs. The hour and a half of extra time in Crisfield was spent holding an informational meeting aboard the ferry. The islanders and Mr. Gerald were not present, but all of the agency representatives were in attendance. Mr. Gerald showed up just before the ferry's departure at 1230hrs.

2. Dr. Johnson began the meeting by talking a little bit about the study effort and discussing the Chesapeake Bay Restoration authority that will likely be in WRDA 1996. Dr. Johnson also spoke of cooperation, cost sharing, and other funding sources. Mr. Bierly then briefed the committee as to the progress to date.

3. The Committee was briefed using a packet that was assembled for the meeting. The first issue involved the change in the agenda for the day. The revised agenda included a meeting without the locals on the boat in Crisfield, and a meeting with the locals in Ewell. The committee members who could not be present were acknowledged and the Congressional authority for the study was read. The package also included the plan of study and the vicinity map. Next Mr. Bierly summarized the study efforts to date and the coordination efforts in particular. It was explained that the coordination efforts have been extensive due to the need for local input to problem identification and plan formulation. It was stressed that our study and its recommendations must aid in preservation of the island's culture, be appropriate to the way of life, and be acceptable to island residents. Mr. Bierly presented the problems identified to date and explained that all of the identified problems came from the local citizens or the Martin Wildlife Refuge representatives.

4. During the presentation there were many questions and comments which added greatly to the meeting. There seemed to be much interest in the study. Conversations among various committee members continued as the ferry made its way to Ewell.

5. In Ewell, the committee members had lunch and then went for a bus tour of the island. The bus ran from Ewell to Rhodes Point and back again. Tylerton, of course, is inaccessible by automobile. The governmental steering committee members then convened in the Tourist Center with the committee members representing the three towns on the island. The group was shown the 20 minute movie that was put together for every day use in the Tourist Center. The movie presents an excellent view of the life of the islanders and adds to the understanding of their unique culture.

6. Following the meeting, Mr. Bierly and Ms. Anderson-Austra led the group in discussion with the islanders. Each team member introduced himself to the locals and explained what they did in their particular position. The islanders then spoke one at a time and told what to them was good about the island, what they envision for the future, and why our study effort is important to them. Each of the four gave wonderful, well thought out, and moving testimonies. The committee was very receptive to them, and their comments seemed to energize some of the members toward the effort. The meeting maintained a very positive tone.

7. The "mainlanders" then departed on the 1600 hrs ferry to Crisfield. Once in Crisfield, Mr. Weed ran into Duke Marshall, formerly of Tylerton now of Crisfield. Mr. Marshall pledged his support of the study effort and commented positively about what he heard of the public meeting held 27 August in Rhodes Point.

8. The members dispersed from Crisfield at approximately 1645 hrs. The team will keep in close contact with each of the agencies.

Dan Bierly
Study Manager

The College Of
WILLIAM & MARY

Chartered 1693

School of Marine Science
Virginia Institute of Marine Science

P O Box 1346
Gloucester Point, VA 23062-1346
804/642-7000 Fax 804/642-7097

September 30, 1996

Dr. James F. Johnson
Chief, Planning Division
Department of the Army
Baltimore District, U.S. Army Corps of Engineers
P. O. Box 1715
Baltimore, MD 21203-1715

Dear Dr. Johnson:

In response to your letter to Dr. Robert Byrne, our former Director for Research and Advisory Services, this is to inform you that I will be the contact point for the Virginia Institute of Marine Science's participation in the Smith Island, Maryland Environmental Restoration and Protection Reconnaissance Study.

The study area, as indicated on the vicinity map which accompanied your letter, has been mapped by VIMS scientists for SAV since 1978 and VIMS' Department of Biological Sciences maintains that information on digital files. We have also sampled for blue crabs in that area as part of a baywide effort.

At your convenience, we would be happy to make this information available for your review.

Sincerely,

E. M. Burreson

Dr. E. M. Burreson
Interim Director for Research
and Advisory Services

EMB:dfp

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

NOV 6 1996

Mr. Charles Marsh
P.O. Box 662
Tylerton, MD 21866

Dear Mr. Marsh:

Governor Glendening has asked me to respond to your recent letter concerning the shoreline erosion problems in and around the community of Tylerton. The Maryland Department of the Environment (MDE) greatly appreciates the concern of the residents of Tylerton for the ecological health of the Chesapeake Bay, and for the loss of marshlands resulting from Smith Island's erosion problem.

There are several efforts being undertaken which will help in addressing this problem. First, the U.S. Army Corps of Engineers is conducting a study of Smith Island which will identify problems, recommend solutions and plans for improvement. MDE, the Department of Natural Resources, and federal resource agencies are participating in this important study effort. Certainly the erosion problems identified in your letter will be a major issue addressed in the study. We urge the citizens of Smith Island to work closely with local, State, and federal government agencies in an attempt to identify long term solutions to this problem.

Second, this winter the Corps will perform maintenance dredging of the Federal navigation channels in Twitch Cove and the Big Thorofare River. My staff has discussed the project with the Corps and has requested that they consider placing some of the material along the shoreline at Tylerton. Although the Corps has agreed to consider this option, it will have to be reviewed by State and federal resource agencies to determine its environmental acceptability.

Regarding the Woodrow Wilson Bridge project, you must realize that a tunnel is just one of several alternatives being considered. If a tunnel improvement alternative is selected, I am sure that the State and federal transportation agencies will examine all possible options for the disposal of the material that is generated.

Thank you for taking the time to share your views and concerns. The residents of Smith Island will be kept informed as these efforts progress. If you have any questions, please contact Mr. Gary Setzer, of my staff at (410) 974-2236

Sincerely,

J.L. Hearn

J.L. Hearn, Director
Water Management Administration

JLH:cma

cc: Governor Parris N. Glendening
Secretary Jane T. Nishida
Secretary John R. Griffin

bc: Gary Setzer

J. LOWELL STOLTZFUS
DISTRICT 38
SOMERSET, WICOMICO & WORCESTER

MEMBER:
ECONOMIC & ENVIRONMENTAL AFFAIRS
COMMITTEE

EXECUTIVE NOMINATIONS COMMITTEE

MARYLAND TOURISM DEVELOPMENT BOARD

CHESAPEAKE BAY CRITICAL AREAS
OVERSIGHT COMMITTEE

GOVERNOR'S PESTICIDE COUNCIL

SENATE OF MARYLAND

ANNAPOLIS, MARYLAND 21401-1991

LEGISLATIVE OFFICE:
ROOM 409 SENATE OFFICE BUILDING
ANNAPOLIS, MARYLAND 21401-1991
(410) 841-3645

DISTRICT OFFICE:
30487 BROAD STREET
PRINCESS ANNE, MARYLAND 21853-1211
(410) 742-3999
(410) 651-3886

February 25, 1997

Mr. and Mrs. Alan Smith
Smith Island
Tylerton, MD 21866

Dear Mr. and Mrs. Smith,

Thank you for your fine letter regarding the erosion problem on Smith Island. We certainly share your concerns on this issue and understand the consequences of erosion on your community.

We are encouraged with the efforts of the Army Corps of Engineers to study the problem and to provide recommendations. Discussions are currently underway between Federal and State officials to review and provide funding for the Corps' initiatives. You will be pleased to know that we are presently organizing an important meeting on March 14 here in Annapolis.

The cultural and economic contributions made by the residents of Smith Island are far too important to the State of Maryland to risk losing. Maryland's only inhabited island must be preserved.

Henry T. Armistead
523 East Durham Street
Philadelphia, PA 19119
74077.3176@compuserve.com
215-248-4120 (home)
215-685-1471 (work)

MD address:
"Rigby's Folly"
25124 West Ferry Neck Rd.
Royal Oak, MD 21662
410-745-2764
March 3, 1997

Ms. Carol Anderson-Autila
CEMAB-PL-P
10 South Howard Street
P. O. Box 1715
Baltimore, Maryland 21203-1715

Dear Ms. Anderson-Autila:

My handwriting is so bad I can't read it sometimes...I am afraid I may have done injustice to your compound surname. Please correct me if so.

Attached is a partial list of my publications. I have checked those relevant to Smith Island, Maryland. The major one is in Maryland Birdlife 34:3 (1978) pp. 99-151 as indicated, which also summarizes my field work prior to that date with exhaustive tables, etc.

I hope this is useful. Please add me to your mailing list (always use Philadelphia) and keep me posted on any developments which are relevant. I appreciate this very much.

Thank you for contacting me.

Best regards,

25124 W. Ferry Neck Road,
523 E. Durham Street
Philadelphia, PA 19119
215-248-4120

Rigby's Folly
Royal Oak, MD 21662
~~301~~ 410-745-2764

HENRY T. ARMISTEAD
Amateur Ornithologist

Middle Atlantic Coast Regional Editor, American Birds
Book Review Editor, Birding
Compiler, Cape Charles, VA, Christmas Bird Count
Licensed Federal Bird Banding Cooperator, Permittee 09381

## Education

M.S., Drexel University, 1968 (Library Science)

B.A., University of Pennsylvania, 1963 (English Literature)

## Professional Memberships

American Library Association
Association of College and Research Libraries
Beta Phi Mu
Medical Library Association
North American Serials Interest Group
Philadelphia Regional Group, Medical Library Association
Public Library Association
Special Libraries Association

## Professional Publications (see also under Book Reviews)

In preparation: "Use of handheld barcode scanner data for the evaluation of serials collections," to be submitted to the Bulletin of the Medical Library Association.

## Ornithological Publications

In preparation: "Decline of the Brown-headed Nuthatch in Maryland and Virginia," to be submitted to Maryland Birdlife.

In preparation: Birds of Rigby's Folly: nature, people, and musings from a Chesapeake Farm. A 31 chapter book, 101,000 words written so far. WILL HAVE SEVERAL CHAPTERS ON THE BAY ISLANDS.

In press: Atlas of the breeding birds of Virginia ed. by Roger Clapp (University of Pittsburgh Press). Contributor of species accounts.

"Sowing a wildlife garden resource." Library Journal 121:20 (1996) pp. 65-67. (One of LJ's series on collection development)

"The yard list: satisfaction from a well-tempered place of one's own." Philadelphia Larus 22:2 (1996) pp. 1 & 4.

"An unusual "maritime" Eastern Kingbird nest in Talbot County." Maryland Birdlife 51:2 (1995) pp. 91-94.

"Birding Cape Charles in Virginia." Birding 27:4 (1995) pp. 270-281.

"Some changes in birding and birds from 1970-1995." Audubon Naturalist News, 21:3 (1995) pp. 10-11.

"Systema librorum/bibliotheca universalis: codex onomasticus ornithologicus Armisteadensis." Birding 27:2 (1995) pp. 106-110.

Eastern Birds by John Farrand, Jr. (McGraw-Hill, 1988) Contributor of species accounts.

VIRGINIA → "Smith Island days." the Islands: the official newsletter of the Virginia Coast Reserve (Spring 1986) pp. 3-5.

Audubon Society Master Guide to Birding ed. by John Farrand, Jr. (Knopf, 1983, 3 volumes) Contributor of species accounts.

"Anhinga near Bellevue, Talbot County." Maryland Birdlife 34:4 (1978) pp. 172-174.

"Summer birds of lower Chesapeake Bay islands in Maryland." Maryland Birdlife 34:3 (1978) pp. 99-151.

Chesapeake Bay island breeding season birds (Philadelphia, printed by the author, 1978) 63pp. A SORT OF 1ST DRAFT OF ABOVE CITATION

"Chesapeake Bay islands: eroding wildlife havens." Audubon Naturalist News 3:10 (1977) p. 6.

"American Oystercatcher and Herring Gull breed in Dorchester County." Maryland Birdlife 33:3 (1977) pp. 111-112.

"Black Skimmers in Dorchester County." Maryland Birdlife 32:3 (1976) p. 87.

"Sedge Wren in Talbot County." Maryland Birdlife 32:2 (1976) p. 77.

"Breeding of Greater Black-backed Gull, Herring Gull, and Gadwall at Smith Island." Maryland Birdlife 31:4 (1975) pp. 131-134 plus cover photograph.

"Deal Island, Maryland." Birding 6:3 (1974) pp. 133-134.

"Iceland Gulls, Forster's Tern nests, and breeding herons in Dorchester County, summer 1974." Maryland Birdlife 30:4 (1974) pp. 128-132.

"Lower Chesapeake Bay heronries of Maryland: Smith Island to Barren Island." Maryland Birdlife 30:1 (1974) pp. 9-27.

"Yellowthroat sings like Pine Warbler." Maryland Birdlife 29:1 (1973) p. 34.

"Some notes on birding via Canadian maritime ferries." Birding 4:4 (1972) pp. 181-182.

"A neglected area: Bloodsworth Island and vicinity." Maryland Birdlife 28:3 (1972) pp. 100-103.

"Bellevue, Talbot Co., Md." EBBA News 34:5 (1971) p. 244.

"First Maryland breeding of Green-winged Teal, a "new" heronry, and other Somerset County records." Maryland Birdlife 27:3 (1971) pp. 111-114 plus cover photograph.

Armistead, Henry T. & Chandler S. Robbins, "Black Rail, Maryland, Dorchester County and Delaware, Sussex County." Birding 2:6 (1970) insert page.

"First Maryland breeding of American Coot at Deal Island." Maryland Birdlife 26:3 (1970) pp. 79-81.

"Long-billed Curlew at Cape Charles." Raven 41:3 (1970) pp. 43-45.

"Bellevue, MD., Operation Recovery banding station report." Maryland Birdlife 25:4 (1969) p. 122.

"Virginia's first winter Avocets at Cape Charles and notes on other winter shorebirds of the Delmarva Peninsula." Raven 40:2 (1969) pp. 31-37.

"A winter Robin roost in Philadelphia." Cassinia 51 (1968-1969) pp. 61-62.

"Winter birds at a center city, Philadelphia, location, November 1966-April 1967." Cassinia 51 (1968-1969) pp. 47-52.

"Hooper's Island, Dorchester County, Md., Operation Recovery station report." EBBA News 31:3 (1968) pp. 128-129.

## Public Meeting Responses and Comments from Citizens

Public participation was an essential part of the Smith Island reconnaissance study. Involvement in the study process by island residents was critical because they are the real customer for any project that may be constructed on the island. Initial public involvement efforts included a scoping process as a way of identifying both problems on the island and the perceptions and feelings of island residents. Throughout the study, island residents and other interested individuals made written comments on the island, its problems and opportunities, and the study. Information gained from the scoping workshop were values-level feelings and perceptions. Written comments about the study ranged from offerings to assist, requests for help for the island, and information provided.

### Scoping Meeting

The first public workshop, in August 1996, was an opportunity for island residents to express their views about problems facing the island and what they felt were the most important characteristics of their life style, good and bad. The scoping meeting was held on 27 August 1996, at the Rhodes Point Community Center. After a presentation on the planning process and project status by the study manager, the approximately 40 island residents in attendance participated in a brainstorming exercise to identify positive and negative features of the island, ideas for improving the island, and concerns about the study.

Attendees worked in 3 small groups and listed the good things they could think of about the island, problems related to the island, their ideas for improving or creating an ideal island, and any issues or concerns they had with the study or study process. The product was a list of ideas or items that expressed the islander's thoughts and values about Smith Island. After the small group brainstorming, the entire group assembled and voted on the most important items among all those listed by the 3 small groups. Voting (by placing colored dots next to the 4 items or issues that each person felt were most important) resulted in a preliminary prioritization. The prioritization helped to show the importance of issues such as erosion to the meeting participants. The values, ideas, and issues identified at the workshop became an integral part of the approach guiding the study team through the reconnaissance study.

Following are the lists of responses by the 3 small groups to the questions asked.

Question: What is good about the island?

Responses of GROUP 1:

- lifestyle (1)
- church
- community decision
- freedom (1)
- separate from rest of world
- crime free (1)
- don't lock doors
- beauty
- friends - know each other (1)
- love the people
- diversity of wildlife (1)
- blue crab breeding, world hub

- good wildlife habitat
- fresh air (1)
- good drinking water (1)
- so many good things
- home
- help one another (1)
- being in a boat
- pretty sunsets and sunrises
- soft breezes
- surrounded by water
- freedom to roam
- independent kids
- walking the bayside

Responses of GROUP 2:
- no locked doors - no criminals
- depend on people no matter what
- people always help (2)
- no need for car - can use bikes
- good place for senior citizens
- safe place for children
- no guns
- freedom - sense of independence
- good food!
- one big family!
- kids can go out in boats
- quiet - compared to city life
- most community problems solved by church
- church is center (4)
- can see sunrise and sunset (rise on sound - set on bay)
- no government - we govern ourselves
- volunteer medical and fire service

Responses of GROUP 3:
- values - morality
- freedom
- peace and quiet
- people - close
- know everyone
- help each other
- self employed
- seafood - safety
- good place for family
- education - wildlife, waterman (1)
- habitat
- heritage
- breeding/spawning
- work ethic
- volunteer services - fire, medical
- English spoken here (the King's English)

Question: What is bad/negative about the island?

Responses of GROUP 1:
- bugs
- tide coming in
- erosion (8)
- shrinking population (2)
- pollution
- shrinking oyster beds and crabs
- sea level rise
- bad storms (1)
- not enough jobs
- not enough pregnant women (1)
- young people leaving
- no trees/flowers
- too many drugs/alcohol (1)
- too many bachelors
- not enough bird nest sites
- no road between Ewell and Tylerton
- lack of government

Responses of GROUP 2:
- erosion (16)
- bad roads - low and tide covered, made of bad materials (1)
- no see'ums/bugs that bite!
- crabbing more difficult
- declining populations!
- closure of school (3)
- taking our teachers away
- harder way of living
- property owners who are absent - they do not care for them (houses)
- rising property values - forcing us out

Responses of GROUP 3:
- erosion (15)
- storms
- declining population
- losing grass (4)
- insects (2)
- roads (3)
- being misunderstood
- being misrepresented
- lack of industry
- trash on roads, marsh

Question: What improvements can you think of or what could be done to make Smith Island perfect?

Responses of GROUP 1:
- widen bayshore for tourists
- fishing pier (2)
- tourist rooms
- airport
- dike in whole island (18)
- higher/better roads (9)

- improve oysters
- more good people move in
- (bring in) food processing plants
- create jobs for young people (1)
- open bank
- use dredged material for landfill (2)
- shoot all politicians
- more involvement in government (1)
- teenager (everyone) recreation (2)

Responses of GROUP 2:
- stop erosion
- get rid of "save the bay"
- bad geotubes
- higher roads (3)
- dike in the island
- let us live here! - help us remain on the island
- reopen the schools -get teacher back
- bring back 7th and 8th grades
- more children
- need new ideas for new business - bring jobs (1)
- tourist activities
- spray for biting bugs (2)
- more money for crabs

Responses of GROUP 3:
- jetties - new (4)
- jobs
- more people (children)
- new schools on island
- clean up island
- new, higher roads
- bulkheading
- save habitat, create more
- breakwaters (Ewell harbor, Tylerton, Swan Island) (2)
- tubes (2)
- lower taxes
- public marina (visitors) (2)
- parking in Crisfield
- airport (1)
- health/fitness center
- more money

Question: What concerns do you have about the study?

Responses of GROUP 1:
- studied to death and dies (1)
- want to get what is deserved
- don't waste money
- worried about tubes doing the job
- (worried about) government not doing the job
- (worried about) funds being blocked
- what can citizens do?

Responses of GROUP 2:
- will we do anything?
- worried about environmentalists
- classify Smith Islanders as a Threatened and Endangered species (1)
- lack of local sponsor money (3)
- Hollands Island - will it be repeated? (1)
- If government is involved - will there be more restrictions?
- how much money to determine how much money this will cost?
- Congress!

Responses of GROUP 3:
- how it will affect people
- what will environmental groups do?
- who will be local sponsor? (1)
- finding long-term solutions (1)
- end up doing nothing (2)
- least environmentally damaging solution (1)
- project too expensive
- peoples health
- running out of patience

## RANKED SUMMARY OF ALL RESPONSES

Following is a summary list compiled from responses of the 3 small groups. Duplicate items have been eliminated and closely similar items have been combined in order to clarify the range of responses. The votes received by duplicate or similar items were combined to indicate the total value of that item to the large group. The number includes the dots/votes placed by the item and counts duplicate listings as an additional vote. For example, "freedom" was listed by each of the 3 small groups as a good thing about the island (one group also listed "freedom to roam"); therefore, the summary vote includes 3 votes to indicate duplication plus 1 vote for the "green dot vote" the item received, for a total of 4 votes. Items/ideas which received the most votes are listed first.

### Question: What is good about the island?
- people help, depend on one another (6)
- church is the center of the community (6)
- good wildlife habitat, world hub for blue crab breeding, spawning, diversity of wildlife (5)
- crime free, no guns, don't lock doors (4)
- friends - everyone knows everyone, people are close, love the people (4)
- freedom, to roam - sense of independence (4)
- natural beauty - sunrises and sunsets (3)
- one big family - good place for family (1)
- no government, community/church decision-making and problem/solving (2)
- fresh air, soft breezes (2)
- safe place for children - independent kids, can go out in boat (2)
- walking along bayside, no need for car - use bikes (1)
- volunteer medical and fire service (1)
- lifestyle (1)
- peace and quiet, compared to city life (1)
- good drinking water (1)
- education - wildlife, waterman (1)

- values, morality
- self employed
- separate from rest of world
- so many good things
- home
- being in a boat
- surrounded by water
- good place for senior citizens
- good food!
- seafood - safety
- heritage
- work ethic
- English spoken here (the King's English)

Question: What is bad/negative about the island?
- erosion (41)
- bad roads (5)
- bugs (4)
- shrinking population (4)
- loss of school/teachers (4)
- losing grass/SAV (4)
- bad storms (2)
- not enough jobs, industry (2)
- high water levels - tides, sea level (1)
- too many drugs/alcohol (1)
- pollution, trash (1)
- shrinking oyster beds and crabs (1)
- not enough pregnant women (1)
- young people leaving
- no trees/flowers
- too many bachelors
- not enough bird nest sites
- no road between Ewell and Tylerton
- lack of government
- property owners who are absent - they do not care for them (houses)
- rising property values -forcing us out
- being misunderstood
- being misrepresented

Question: What improvements can you think of or what could be done to make Smith Island perfect?
- dike in whole island (19)
- improve roads (14)
- erosion protection - tubes, breakwaters, bulkheading (7)
- improve tourist facilities - widen bayshore, add fishing pier, rooms, activities (6)
- more jobs - for young people, need ideas for new business (4)
- navigation improvements - new jetties (4)
- airport (3)
- more/reopen schools - get teacher/students back (2)
- public marina for visitors (2)

- use dredged material for landfill (2)
- recreation for teenagers/everyone (2)
- spray for biting bugs (2)
- increase population, more children and good people moving in (2)
- more involvement in government (1)
- (bring in) food processing plants
- improve oysters
- open bank
- shoot all politicians
- get rid of "save the bay"
- bad geotubes
- let us live here! - help us remain on the island
- more money for crabs
- clean up island
- save habitat, create more
- lower taxes
- parking in Crisfield
- health/fitness center
- more money

Question: What concerns do you have about the study?
- (worried about) lack of funds - being blocked, lack of local sponsor (6)
- end up doing nothing (5)
- effect on people of Smith Island, survival (5)
- don't waste money (2)
- government/Congress - will there be more restrictions? will it do its job? (2)
- worried about environmentalists (1)
- finding long-term solutions (1)
- least environmentally damaging solution (1)
- want to get what is deserved
- worried about tubes doing the job
- what can citizens do?
- running out of patience

## Written Comments

The participation of island residents in the public involvement and planning processes was critical because of their experience with and perceptions of erosion problems and environmental restoration needs on the island. Their efforts in drawing attention to the study by communicating the need for action to state and Federal agencies and officials was also valuable. A summary of written comments made by island residents and other citizens with an interest in the island follows.

The following comments were received in response to a request for “ideas, suggestions, and issues of concern” in the Public Notice sent to approximately 100 island residents and other interested parties July 30, 1996:

**Emanuel C. Apostolakis**
3197 Marsh Road
Rhodes Point, MD
ph 410-425-2300

*(1) Rhodes Point channel entrance; a jetty would be nice or help the natural deep water that runs north and south and mark channel for navigation.*
*(2) More sand bags (filled) on top of existing bags and more added.*
*(3) use dredged material to fill in where helicopter lands in emergencies, so when tide is up it doesn't have to land on road.*
*(4) Larger harbor a Rhodes Point. Thank you.*

**Peter A. Bozick, Jr**., Environmental Engineer
206 W. Main Street
Salisbury, MD 21801-4907

*Wastewater treatment and re-use; use dredged material to build "constructed" wetlands to purify treated wastewater.*

**John C. Bruce**
27002 Cash Corner Road
Crisfield, MD 21817
(Also, still own land on Smith Island.)

*Bulkhead Tylerton from one end to the other with stone; jetty at mouth of harbor, also to the west of Tylerton for protection from strong winds.*
*Also, bulkhead at west side of Rhodes Point with stones and galvanized or some other material and bulkheading for northwest side at Ewell.*

**Barbara Dize**
3185 Marsh Road
Rhodes Point, MD 21824

*I'd like to see on the western side of our bayside, sludge and maybe some stone to keep it from eroding. Also, our waterfront needs something done to keep our road from washing in. We need your help. Thank you.*

**Frank Dize**
3185 Marsh Road
Rhodes Point, MD 21824

*We need mud and stones or anything that will stop our bayside from washing in, we need something to keep our waterfront from eroding. Please help us. Thanks.*

**Jennings L. Evans**
4011 Tyler Road
Ewell, MD 21824
ph 410-425-3881

*As a citizen interested in saving a life-style and culture that dates back to 1657, I feel that finally someone is paying attention to Smith Island's erosion problems. We need to put dredged material and geo-tubes near the shorelines of each Island community and a study should include repair of Ewell's 56 year old jetties.*

**Waverly Evans**
ph 410-968-1904

*Erosion on Smith Island is in the critical state. Your help is urgently needed. I think you do a great job. Thank you.*

**Everett Landon**
21135 Tuff Street
Tylerton, MD 21866

*On Tylerton, alongside the road is washing away. This will soon wash away the road and expose the sewer line. At Rhodes Point, the bayside to the west is washing away and on very high tides it is under the water. The inlet to Rhodes Point has filled in so no boat can get in or out.*

**Leon and Shirley Marsh**
3191 Marsh Road
Rhodes Point, MD 21824

*We hope to have something done on the bayside to keep tides away.*

**Dwight Marshall**
Box 665
Tylerton, Md 21866

*Erosion around Tylerton.*

**Haymie T. Marshall**
5 Church Street
Box 687
Tylerton, MD

*We should use dredge fill to build up the shoreline that is eroding away 10 to 15 feet every year. I can show you places [where] the dredged material was deposited and there are lots of trees and vegetation.... There are a lot of species of animals and birds live there now and it helps to stop erosion and saving our wetlands.*

**F. Hoss Parks**
3956 Tyler Road
Ewell, MD 21824
ph 410-425-2520

*All dredge material should be placed on the bay shores, where it is well needed. Also bags should be placed where land has broken through. Like the jetties, they are open at the shoreline. Check it out.*

**J. Thompson**
2413 Sycamore Lane
Edgewood, MD 21040
ph 410-676-4734

*The natural sand [barrier] at the head of Sheep Pen Gut at Rhodes Point has washed away - lets the tide rip into the Gut. The tide hugs the east bank and undercuts the shoreline. The marsh between the county wharf and the church is sinking into the channel. If you could put some tubes at the head of Sheep Pen Gut to slow the tide it might save the marsh. Enclosed are some photos showing the marsh I speak of. Thank you.*

August 8, 1996

*Dear Dan,*

*I wrote you about the erosion of the marsh in front of the church at Rhodes Point, caused by the strong tide entering Sheep Pen Gut at the bay. However, I failed to tell you about the consequences of delaying the work. If the tide entering Sheep Pen Gut is not slowed down we are going to have a very real and serious problem here at Rhodes Point.*

*You will remember, I sent you pictures of the marsh in front of the church. That marsh extends from above the county wharf to below the church. The marsh protects the only road on Rhodes Point. The county sewer line runs along side of the road next to the marsh. Obviously, if this marsh is allowed to wash away, there will be no protection for the road or the sewer.*

*With out the sewer, none of the homes on Rhodes Point would be livable. There are approximately 34 homes and one church on Rhodes Point. If you put an estimated value of $30,000 on each property, you would be talking about a sum of one million dollars. This does not include the value of the church or the boat repair business at the rail way.*

*There are some 52 people living here, not counting those of us here part time. Should erosion cause the sewer to fail, all these people would lose their means of making a living. The loss of taxes would be great, the people would no doubt become a burden on the state.*

*The soil that is being ripped from the marsh is being deposited in the area of Hog Neck. This additional soil has caused the grasses in that area to be smothered. The grasses was home to the peelers (soft crabs) and Hog Neck was a favorite area for the watermen of Smith Island. But now, the grasses and the peelers are gone. There is a loss of income here, but I don't know how to estimate it.*

*As you can see, the temporary work that has been proposed for the head of Sheep Pen Gut is very important. It makes sense to do this job, while working on the tubes at Rhodes Point. I will be following this project very closely and supporting you and your group any way I can. Please feel free to call on me.*

*My phone number on Smith Island is 425-2205. Sincerely.*

**John Winterroth**
20727 Caleb Jones Road
Ewell, MD 21824

*How about giving money to the waterman and let them save their island.*

*Example: Eugene Marshall has a barge boat capable of 100 ton payload. One trip a day from the western shore of the Chesapeake, where the quarries are, and a crane on a barge maintained here on Smith Island could yield 2-3 hundred foot of stone wall, similar to that of Tangier, every day.*

*For the $450,000 study you have been authorized, I estimate conservatively 7,000 foot of dike could be laid, a little less than 1 1/2 miles.*

*I know you will think me full of "s---" but, I am retired having had very successfully started and developed a manufacturing company. I moved here because I love this place and the people, especially their sense of humor.*

*These people are quite capable of handling their own affairs and they are honest. The winter months would be an ideal time for their doing it. Labor costs would be negligible and these people could sure use the money.*

*I know you will not consider this idea because of liability, experience, etc. but the fact is, the Smith Islanders would do a better job than a contractor would for 1/10th of the cost.*

*Sincerely Yours,*

A letter and comment card were received after the August 1996 scoping meeting:

**Elmer L. Evans**
20810 Severn Road
Ewell, MD 21817
ph 410-425-3931

*One thing we need is a heliport for the medi-vac helicopter. They have to land on the road now.*

**LeRoy Friesen, Ph.D.**
**Sharryl Lindberg, Ed. D.**
1822 R Street, N.W.
Washington, D.C. 20009
ph 202-232-3196

*Dear Mr. Bierly,* *8/20/96*

*We are writing you in the aftermath of the Corps visit to Tylerton last week. You may remember us as the couple owning one of the larger houses "down below". Currently residents of Washington, D.C. We anticipate opening a bed and breakfast in Tylerton in May of 1997; we will be moving here.*

*Beyond our specific suggestions to the Corps study (see enclosed map), we wish to speak to the weighting which the Smith Island case receives. We believe that simple population comparisons between Smith Island needs and competing ones fail to get to the central point: there is something at stake here beyond the aggregate of residents or square miles or incomes. A way of life, a culture, is at serious risk. It is a rich and courageous way of life. One which repeatedly causes thoughtful people to ponder the central questions involved in living at the conclusion of the 20th century. The larger society would be the* *poorer if this island's life were no more. Thus we appeal to the Corps to factor into its study the notion of the Smith Island way of life as an endangered species.*

*We all know that Smith Island will not be here forever. Nothing of this sort is forever. At the same time strategic human intervention can significantly impact timetables, and that can make all the difference. Our vocational plans reflect the extent to which we have come to love the people, culture, and natural environment here, an affection we find to be shared by many other people.*

*Please contact us if we can further contribute to this study. And the best to you in this important matter! Sincerely.*

(Notes on map are: "shore stabilization" along Tylerton harbor and "wave-action erosion reduction" at the south end of the community.)

August 22, 1996 - E-mail message from 2 part-time residents of the island:

**Sharon J. Kemmerer**
**Cathy M. McDermott**
15509 Indianola Drive
Derwood, MD 20855
ph 301-309-0955

*Dear Mr. Bierly:*

*This is to express our support of your Reconnaissance Study being conducted for Smith Island. We appreciate the opportunity to provide our thoughts and offer them here, approximately in the format you have requested on your Public Notice announcement.*

*We understand you plan to hold a meeting in the near future on Smith Island and would very much like to attend. Could you please email to the above address, the date, time, and location for this meeting.*

*Number One Concern: the continual erosion and "return" of Smith Island into the Bay. This is not only severely threatening to our personal waterfront property, but is sadly dissolving a piece of American history never to be regained if the island masses are not protected.*

*Suggestion(s):*
*Last year we wrote the Army Corps of Engineers and Congressman Gilchrest in support of the Corps seawall building and surface marsh grass restoration proposal. This proposal recommended recycling the excess dirt from a Rhodes Point project into a seawall at the lower end of Tylerton. Although Tylerton residents were very much supportive of this project, we learned later the project was not to take place because the*

*Fish and Wildlife Commission was against it, and the Corps was required to find another location for depositing the excess soil. We VERY MUCH support the construction of a seawall by any means: retention walls, soil deposit, stone levies, etc.*

*If direct seawall construction around the lower end of Tylerton and other low and threatened areas of Smith Island is not possible, then the following two suggestions are also offered and supported:*
*- building up the barrier islands*
*- building stone levies.*

*Any combination of the above suggestions or ALL in combination, should also be considered.*

*We hope our thoughts can contribute to some meaningful and purposeful Corps response to the needs of Smith Island and its people. We look forward to hear[ing] from you regarding the upcoming meeting, and also, please add us to any mailing list you may be establishing for further information dissemination.*

*Regards,*

September 1996 - Members of the Tylerton community circulated the following letter expressing their support for the study. Approximately 100 signatures were gathered and copies of the petition were sent to several State and Federal government officials.

*We the undersigned constituents from Tylerton, Smith Island, have been meeting with the Army Corps of Engineers and the Nat'l Fish and Wildlife [Service] concerning a problem important to us all -- On going loss of marsh and wetlands on our island, an erosion problem that must be stabilized for the sake of our island and the overall environmental health of the Chesapeake Bay.*

*Loss of marsh not only endangers our property and livelihood (we are waterman), it endangers the health of the bay. Loss of crab habitat creates a major loss in the entire food chain of bay habitat.*

*At a time when crabs are diminishing we must work to re-establish the marshes to their former size and bounty.*

*Although we are investigating numerous solutions through the Army Corps of Engineers and the Nat'l Fish and Wildlife Service, it has come to our attention that our own problem, diminishing marshland, and the tunnel to replace the Woodrow Wilson Bridge can benefit each other. To build that tunnel, large amounts of material will need to be dug and disposed of and transportation of that material will be costly. With some fore-*

*planning, Smith Island, located directly across the bay from the mouth of the Potomac River, could use that fill to re-establish our diminishing marshland.*

*By joining the Smith Island diminishing marsh problem to the tunnel project, you could solve two problems with little if any added cost. You would not only be constructing a tunnel efficiently and environmentally disposing of the tunnel material, you would also be establishing wetlands, a problem that is a national concern and could be a model project.*

*It has been said that when God gives us problems to solve, the solutions are near-by. We realize the problem is somewhat more complicated than we have presented it, but we feel it deserves your time and direct attention.*

*Yours Truly,*
*Concerned Citizens of Tylerton, Smith Island*

September 24, 1996 - Letter from part-time island resident and owner of the Drum Point Market at Tylerton.

**Dwight "Duke" Marshall, Jr**.
2313 Old Snow Hill Road
Pocomoke City, MD 21851

*To: Carol Anderson-Austra, Pete Noy, Dan Bierly, Sharon Wagner*

*I have reviewed your packet of information concerning the workshop in Rhodes Point, August 27, 1996. It was very informative and with the input from my father, Dwight Marshall, Sr., I feel I can be of help to your organizations and the island.*

*Having lived on Tylerton all my life, I know of the "problems" the island faces daily. Although Smith Island is just a tiny spec on the map of Maryland, we play an important part in the realm of tourism, crabbing and the history of Maryland.*

*I have an action plan that the community of Tylerton will be introduced to, during a community meeting in the next few weeks. Before I introduce the plan, I would like to invite your group to spend a weekend with my family in Tylerton. This will allow you an opportunity to experience what makes Smith Island so unique and to see the plan that I will be presenting. If this can fit into your schedule, please call me to schedule a time.*

*I look forward to working with you all. And please know my phone and door is always open if any assistance is needed.*

*Sincerely,*

February 1997 - Several comment cards and notes were received after the public meeting.

**Janice Marshall**
P.O. Box 686
Tylerton, MD 21866
ph 410-425-3701

February 24, 1997 - *I was very encouraged at the Feb. 22 meeting in Rhodes Point. Everything sounded so good to the island people. We can't wait for this to become a reality. Thank you.*

March 10, 1997 - *We are really impressed with the study on Smith Island and are very hopeful on the work that will be started soon.*

**LeRoy Friesen**
2955 Tylerton Road
Tylerton, MD 21866
ph 410-425-3541

*I attended the 2/22 meeting at Rhodes Point. Meeting was both helpful and hopeful. Two suggestions:*
*(1) In future meetings give islanders more time to raise questions and comments. The invitation went out, but the silence was quickly filled with more Corps input. There is much, much more to be heard.*
*(2) In future delineate more sharply projects which are funded and those where funding remains partial or uncertain. Then provide specific suggestions (perhaps on paper?) as to offices in government where pressure can be exerted. Of course, you did some of this, but do it in the future in a way which increases chances that attendees go home having received a "project." Thanks much!*

**Bobby Marshall**
P.O. Box 686
Tylerton, MD 21866-0686
ph 410-425-3701

*Looks like a lot of good planning. We are very hopeful.*

Edmond Covey
1006 Oakwood Street
Fredericksburg, VA 22401

*Dear Mr. Bierly;*

*Thank you for sending me a notice of your workshop to review preliminary alternative plans for the Smith Island Environmental Study. I regretted that I could not attend.*

*I have put together the following pictures as evidence of the extent and degree of erosion that I have witnessed on Smith Island since 1991.*

*The shoreline is on the northwest side of the entrance to the harbor at Tylerton, Maryland. In May of 1991, I restored my pier which began at approximately 5 feet before the shoreline and extended out about 40 feet to deeper water. As the picture will show, in just 5 years, the shoreline has receded about 14 feet at this point.*

*This location is particularly vulnerable to storms and winds that approach from the northeast.*

*The area is also affected by the wakes created by the traffic in and out of the harbor.*

*My shanty is threatened by this process of erosion. The shoreline has eroded 8 feet near the shanty since 1991. The shanty is currently 18 feet from the shoreline. Nothing stands between the houses along Marshall Street in Tylerton and the eroding shoreline.*

*I do not own the land along this shoreline and was denied permission to erect a seawall by the State Resource Management Department in 1991.*

*Anything your organization can do to retard this erosion would be greatly appreciated. Feel free to contact me @ (202) 720-0345, if necessary. Sincerely,*

In addition to comment cards and letters, a number of islanders filled out questionnaires sent from the Corps' Operations Branch and requesting information on navigational conditions in the Thorofare Channel, between the jetties near Ewell, and at Twitch Cove. Other correspondents made notes on maps of the island provided for that use. Comments noted on the maps included issues such as "erosion problem" along the Tylerton shoreline; "gap between stone and shore" at Swan Island; "erosion near the county road" at Ewell; the need for a "barrier protecting boat basin" at Ewell; "sand covering SAV beds"; and "land washing away alongside the road, this will soon wash away the road and expose the sewer line" at Tylerton. Other notes were suggestions for new channels and construction projects to help navigation and "Now I feel that it's a possibility to save Tylerton."

# SMITH ISLAND ENVIRONMENTAL RESTORATION AND PROTECTION, MARYLAND

**RECONNAISSANCE REPORT**

**MAY 1997**

# APPENDIX F

**CULTURAL RESOURCES**

## THE PLANTERS ON SMITH ISLAND

### Background

In the present day, Smith Island in Maryland's Chesapeake Bay is a relatively serene fishing community, composed of three towns (Ewell, Tylerton and Rhodes Point). Outside of these three communities, the remainder of Smith Island is composed of marshes. Former homes, located within the marshlands, attest to the fact that the island has been slowly subsiding for at least a hundred years.

By the third quarter of the 19th century, most of the inhabitants of Smith Island had become concentrated in the three above-mentioned communities. But, life was not always this way on Smith Island. The purpose of this study, then, is to chronicle the development of Smith Island through the 17th and 18th centuries, and to detail the socio-economic changes that occurred over time which resulted in the development of the current fabric of Smith Island.

### Exploration

While it is likely that the Lower Delmarva region was first explored by Giovanni da Verrazzano in 1524, the first meaningful contact did not occur until almost a century later (Power 1970:14). Exploring on behalf of the Jamestown settlement, Captain John Smith reconnoitered the Pocomoke and Nanticoke Rivers in southern and central Somerset County, Maryland, in 1608. Smith describes the islands as uninhabited by native Americans but does call attention to their potential commercial importance for fishing and for gathering of hay. Smith's account referred to the lower part of the chain as "Russell Island", after a physician who accompanied the exploration party, but does not specifically identify the present Smith Island. Maps produced by Smith in 1612 and 1614 included details observed during the investigation and likely served to stimulate interest in the area. As early as 1620, evidence suggests that Europeans had established a lucrative trade along the Manokin River in south central Somerset County (Stiverson 1977:1; Evans 1957:9; Power 1970:18-23). Smith's log has this description of the Chesapeake Isles,

> "These isles which are many in number, but are naught for habitation, falling with high land upon the 'main'. We found great ponds of fresh water. These low broken isles of woods and marshes are a "myle" or two in "bredth" and ten in length are good for hay in summer and to get fish and "foule" in any season. Two days, because of high winds, we were forced to inhabit the lower reaches of these isles. We were hungry for fresh food. I dipped one of the ship's skillets overboard, filling it With several kinds of fish.. This act caused me great misery. A Stingray hit a cutting blow to my arm. By moon up Dr. Russell had relieved my stress and for me I was able to partake of the fresh fish." (Smith 1967).

The history of Maryland dates to 1632, when Sir George Calvert, the first Lord Baltimore, was granted by King Charles I of England a charter to start a proprietary colony in the New World. The boundaries of the land granted to Calvert are approximately the same as those of today: the southern boundary followed the Potomac River from its fountainhead eastward to its mouth on the Delaware Bay, then across the Bay to Watkin's Point and the Atlantic. Maryland's northern boundary ran along the 14th parallel from the Bay to a point north of the Potomac River. This line is now above the present northern border of the state and once included all of Delaware (Craven 1970:190).

The first Lord Baltimore died during the granting of the charter in 1632, but his son and heir, Sir Cecilius Calvert, second Lord Baltimore, sent the first group of colonists over in the fall of 1633. They landed first on St. Clement's Island (now Blakiston) in March of 1634, moving to the site of St. Mary's City a few days later (Craven 1970:193-194). There were numerous traders already living within the colony, but the group at St. Mary's City was the first official attempt at settlement (Scharf 1971:39).

According to the Maryland Charter, the Calvert family was free to dispense with their land in any manner. The system of land distribution which they established in Maryland was feudal in nature. Proprietorship of the land remained in the Calvert family. Land grants were then sold to settlers who had the right to resell their land, but who also had to repay an annual rent, or "quitrent," to the proprietors. Quitrents were payable in cash, or more commonly, tobacco or other agricultural products (Heritage Community 1976:4-6).

**Settlement**

The first land patents and settlements in Maryland were located along the southern coastal waterways. Gradually, settlement extended northwards up the Chesapeake Bay and along the inland waterways. Initial settlements were situated along rivers and streams because the drainages offered the most effective avenue for the transportation of merchandise. The lack of inland roads during the time restricted the intensity of settlement to the interior sections of the country.

The first permanent settlement of Smith Island seems to have occurred in 1657 when settlers from St. Clements Island, located in the lower Potomac River, set sail for the Eastern Shore and landed near the present village of Ewell. When further explorations revealed that the settlers had indeed landed on an island and not on the mainland they bestowed the name "Island of Broken Woodlands" upon their new home. The location of this pioneer community was located according to one local historian across "Levins Creek" from Ewell (Middletown 1967. The name "Island of Broken Woodlands" continued in use until the term "Smith Island" was applied sometime between 1679 and 1725. Smith (1967) further explains the historical reasons for the settlement of Smith Island:

> The Ark and the Dove under the proprietorship of Leonard and Cecelius Calvert brought the few colonizers to settle no farther north than latitude 40 degrees. George Calvert's charter, a masterpiece so far as land grants

go, later on became the Charter for the State of Maryland. To all Marylanders it is nice to know that the small pinnace the Dove was later christened the Dove of Maryland. In the year 1633 these brave colonists touched Point Comfort, Virginia. There Governor Leonard Calvert obtained permission from an Indian Chief to settle just north of Virginia. March 25, 1634 a landing was made on St. Clement's Island up the Potomac River, A cross was erected and the sea worn voyagers gave thanks to God for their new homeland. After a few years elapsed tile colonists knew that the area around St. Clements Island could not give them room enough for farms. Both adventurers and indentured servants moved out from the settlement in order to acquire more acreage. In the year 1657 a small group of men, women and children set sail in a sturdy pinnace from St. Clement to sail due east. Under a taut sail and a choppy sea the group touched land which they thought to be the "main" of the eastern shores of the "Bay of Fishes". In less than a days trip they touched a new shore. An excellent harbor invited them to cast anchor. This area seemed to be within a few sailing hours of other shores. This position encouraged the small group to land and explore the new region. For days the men covered the new land and found it to be an island about ten by eight miles in size. They were pleased to find the terrain was overgrown by the stately loblolly pine, the willow oak, sweet gums and sassafras. The name Woodlands was given to their new homesite. The soil was light and kind and greatly influenced the settlers that their colony was well chosen. This small hand of settlers were of English, Cornish and Dutch descent. Their names in 1657 were and still are: Tyler. Bradshaw and Evans chiefly. They were people of character. It took the strongest of men and women to start Maryland's Right, Tight Isle and encourage the growth of three distinct communities as of today. To undertake the idea of a second home must have been of great significance to them. This significance is evident in the way Smith islanders love their homeland today. To live among them is the only way to appreciate their attitudes toward their island.

The permanent settlement of Smith Island is tied to the development of the plantations at adjacent Crisfield. Settlement was Crisfield was established in 1667, when English settlers adopted the Indian name Annemessex ("bountiful waters") for their community. The settlers can from coastal Virginia, due to the increasing population pressures of the eastern Virginia area and due to the religious intolerance by the leadership loyal to the Church of England.

Among the settlers that arrived in the area was Benjamin Sumers. On February 10, 1666, "Emmesox" (Annemessex), containing 300 acres, was surveyed for him. Sumers settled in the areas of present Crisfield, his home reportedly being located in the vicinity of Cove Street, possibly on the land owned by the Housing Authority of Crisfield. Thereafter, other large tracts were patented in the Little Annemessex watershed, consisting of Musketa Hummock (200 acres, 1693), Prices Conclusion (500 acres, 1694), Dixons Lott (1000 acres, 1694), Littleworth (100 acres, 1701), and Hopestill (1724, 220 acres).

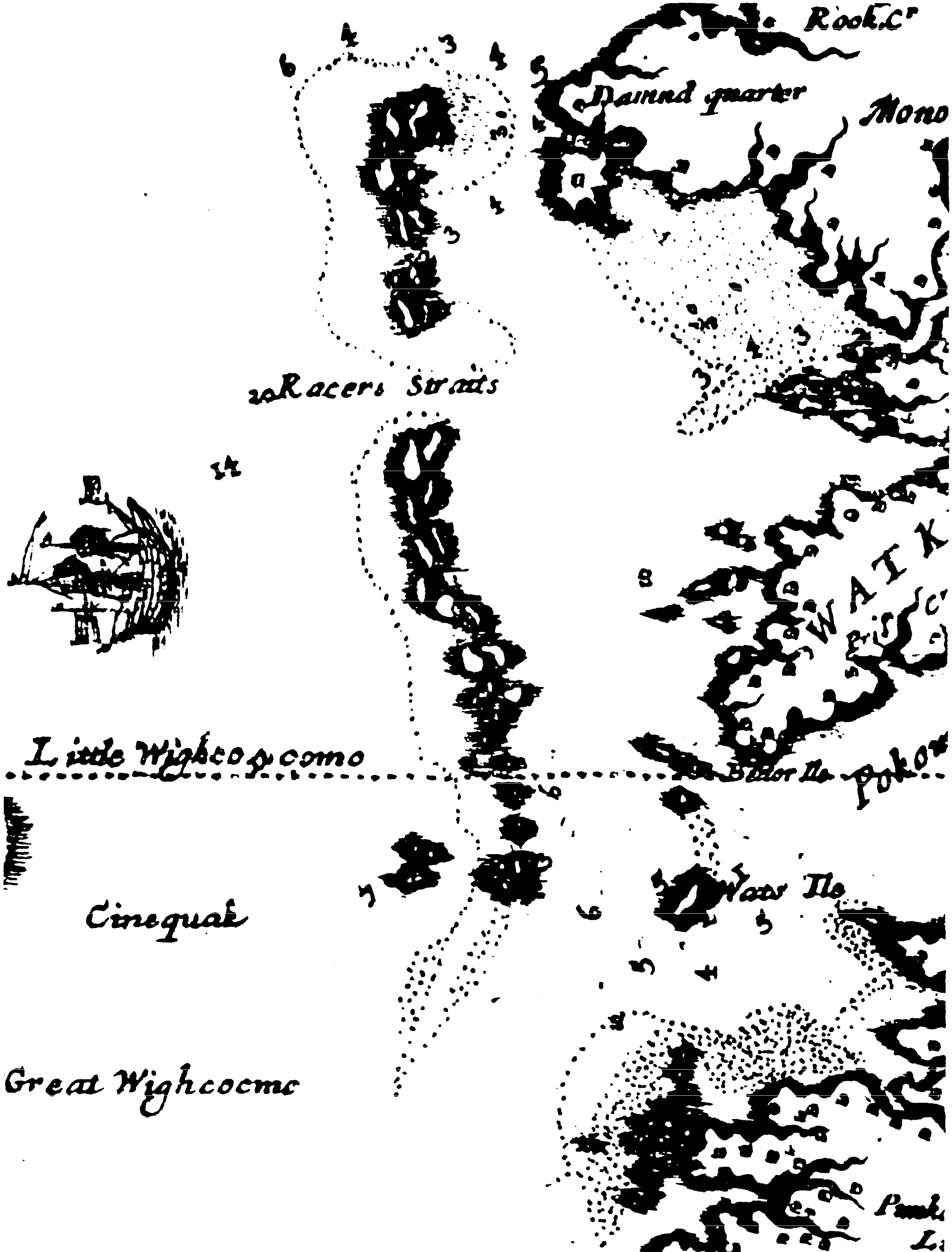



**Figure 1: 1670 Hermann Map of the Chesapeake Bay**

On June 7, 1679 a large plot of land was surveyed for William Stevens. Stevens was a large landowner and speculator who lived at Kingston Hall on the mainland of Somerset County. The land, known as "Pitchcroft" was then deeded to Captain Henry Smith who apparently gave it its present name. The estate founded by Captain Smith was recorded in 1682 as "Pitchcroft" but no mention is made of a residence. The present structure known as Pitchcroft does not appear to have been constructed until after the turn of the 18th century. Henry Smith first appears in county records in 1669 as having relocated from Accomack County , where he was drawn into divorce proceedings by the Virginia court. Despite his marital problem in Accomac, Smith assumed prominent roles in Somerset as justice of the peace, a captain of the militia, and a representative from the county in the Lower House of Maryland General Assembly. Although he owned the large "Pitchcroft" tract, it is thought Smith actually occupied a tract patented as "Smith's Recovery", located on the south side of Manokin River near the confluence of King's Creek.

After the settlement of Stevens on Kent Island, others followed suit. The names of St. Thomas Island, Bluffs Hammocks, Sportsmans Delight, Good Luck and Duck Island were given to separate tracts on the South Marsh Island. The North Marsh was patented as King Richard Garden, The Two Brothers, Seven Brothers, Jones Island, and Terrapin Sand Islands. The various original land divisions are shown on map x. Additionally, Appendix A contains the land tract histories for each of these parcels.

While a few English settlers had already moved into the area prior to the granting of patents by the Lords Proprietary government, initial development was slow (Long 1969:2). It was not until the last decade of the seventeenth century that the Lower Eastern shore was transformed from a frontier to a less hostile environment. An influx of settlers, maritime economic development, and the establishment of roads were characteristic of a general consolidation that produced economic, social, and political structures (Davidson 1982:23-24).

The original settlement of the area followed the patterns established early on in the southern portions of Maryland. Plantations were first established on the Chesapeake Bay and gradually spread into the interior areas following the rivers which served as the principal arteries of transport and communication. The plantation economy was one which was characterized by a high degree of self-sufficiency. Corn and a variety of grains were grown for local consumption though most of the acreage was used for the growing of the principal cash crop. tobacco. The tobacco was traded to the mother country for the manufactured goods which could not be produced locally and for the slaves which were necessary in the growing of this labor intensive crop. The plantation economy persisted until the late eighteenth century when changes occurred, arising largely out of the consequences of the American Revolution. Soil depletion along with changing export markets led to a breakdown in the plantation economy. The plantations were gradually split up into smaller economic units and the growing of tobacco was largely abandoned, to be replaced by other commodities.

Dennis Griffith’s map of Maryland, first drawn in 1794, indicates what was probably an earthen fort at the north end of the island. The presence of the fort as well as the island’s strategic location at the bottom of the bay encouraged British occupation during the Revolution and later during the War of 1812 (Touart 1990).

Most of the structures continued to develop until interrupted by the Revolutionary War. Somerset County was divided to form Worchester County with Snow Hill as the designated county seat. In spite of a steadily expanding population, only three towns - Salisbury, Snow Hill, and Cambridge - developed to support populations in excess of several hundred. Waterways remained the primary transportation routes but the network of roads was improved and bridges constructed. The economy of the Lower Delmarva region developed strong links to Delaware and Pennsylvania in the north while economic and political friction with the western shore communities resulted in competition (Davidson 1982:24).

The Revolutionary War disrupted patterns of trade and commerce. Activities of the British navy and Tory pirates virtually destroyed maritime commerce and provided encouragement for planters and farmers giving up tobacco cash crops in favor of grain and cattle production. The end of hostilities between England and American colonists opened the Chesapeake Bay for trade and the lower Delmarva region developed as a major source of agricultural products during the Federal Period (Power 1970:65-69). The War of 1812 brought the Chesapeake into the sphere of British influence again as vessels blockaded the bay and landed troops dispatched to disrupt trade and capture strategic targets.

In the first settlement known as "Over the Thoroughfare", there were two brothers, Richard and Solomon Evans who were referred to as “King Richard" and "King Solomon" because of their leadership. These men were sure that the islanders could not prosper without having their religious needs nurtured. At the home of King Richard, the first prayer services were held.

**Population**

Tax records indicate the island was occupied during the eighteenth century. The 1783 tax list for Little Annemensex Hundred records lands on Jones Island and Pitchcroft, which had apparently absorbed the other early patented estates. These tax records show a surprising difference between the two estates. Jones Island was, in that year, divided into five separate tracts, each with a house and other improvements. The estates of Mary Horsey and Thomas Robertson had a total of 36 slaves, apparently responsible for the care of the 96 cattle on these two properties. On the same list, the eight landowners on Pitchcroft had a total of only one slave, and 61 cattle.


**Figure 2: 1794 Griffith Map**

Abstract of Little Annamexses Hundred, 1783 Tax List - Residents of Smith Island

| Name of Owner | Acres | Improvements | Male Slaves 0-8 | 8-14 | 14-45 | Females 0-45 | Other | Horses | Cattle |
|---|---|---|---|---|---|---|---|---|---|
| **Jones Island Estate** | | | | | | | | | |
| Mary Horsey | 270 | None | 7 | 1 | 7 | 4 | 4 | 1 | 68 |
| Thomas Roberson | 100 | Young orchard, other impr's middling | 2 | 5 | 3 | 1 | 2 | 7 | 28 |
| George Croswell | 95 | Farm, 2 houses, apple trees | | | | | | | 2 |
| Levi Thomas | 130 | Small farm, dwelling house | | | | | | 2 | 7 |
| John Milbourne | 197 | Houses, other imp's | | | | | | | 2 |
| **Pitchcroft Estate** | | | | | | | | | |
| Richard Bratcher | 50 | Sm. frame house, apple trees | | | | | | 2 | 7 |
| Richard Evans | 200 | Old frame house | | | | | | | 10 |
| Thomas Evans | 100 | Sm. framed house & 4 other buildings | | | | | | 1 | 8 |
| John Evans | 200 | Old framed house, a few other sorry buildings | | | | | | | 10 |
| Elijah Linton | 25 | Small log ordinary house | | | | | | | 9 |
| Marmaduke Mister | 100 | Small framed dwelling, little outhouse | | | | | | | 7 |
| Thomas Tyler | 200 | Framed dwelling house, another outhouse or two | | | | | 1 | | 10 |
| John Parks | 130 | Small Dwelling | | | | | | | 11 |
| Total For Hundred | | | 128 | 66 | 65 | 52 | 59 | 159 | 1275 |

This disparity between the Jones Island and Pitchcroft Estates is also reflected in the 1798 Direct Federal Tax. In that year, there were 23 slaves on Jones Island and 10 on Smith Island. Apparently Thomas Tyler had increased in wealth between 1783 and 1798, as his slave holdings increased from one to ten in that period.

This disparity is also reflective of a presumed difference in the socio-economic status of the individual farms. Looking over the 1783 tax list, we see that with the exception of Mary Horsey and Thomas Roberson, the remainder of the Smith Island planters were apparently close in their economic status, having a small residence of log or frame, several horses, and 5 - 10 cattle. Horsey and Roberson, having a total of 96 cattle and 41 slaves, are reflected of a south, slave-dependent plantation form. Bowen (1984) discussed the class differences in rural America:

> The lower group (economically) had little or no taxable wealth; many were taxed only with a poll tax, and none owned a house. Among those individuals were sons who had yet to receive their inheritance...Many had few or no known kin connections, some rented, boarded with farmers, or owned a house for a brief period. These individuals were mostly day laborers who exchanged general farm labor, like mowing or butchering in return for their basic subsistence needs, the use of oxen, boarding of their horse or cow, grains, vegetables, and animal products like meat, cheese and butter. The middle group made up the bulk of the households. Almost all

> owned a house, some land, possibly a pig, a hose, and one to three cows. Many individuals tended to be what one might call “small farmers”. Others had specialized skills such as blacksmithing, shoemaking, or a profession like medicine, The small farmers tended to exchange a wide range of services and goods, but were farm less reliant on others than the laborers for their subsistence needs. The upper group each owned one or more houses, had substantial amounts of land, and a greater number of horses, pigs and cows. Between these farmers, exchanges were more equilateral, with only occasional exchanges of food products.

**Dwellings**

The 1798 Federal Tax list also records information regarding the early structures on Smith Island. Among the structures described were: “one dwelling twenty feet by eighteen feet, one story high fram’d, one kitchen fifteen feet by twelve feet, saw’d logs”, “1 dwelling house 18 ft by 16 ft, 1 kitchen 16 ft by 15 ft, 1 smoake house, 12 ft square, all of sawn logs”, “1 dwelling house, 18 ft by 16 ft, 1 dwelling house 15 ft by 14 ft, all built of saw’d logs”, “1 dwelling, 18 ft by 15 ft, 1 kitchen 16 ft by 18 ft, 1 corn house, 12 ft by 8 ft - all log”, “one dwelling house, 18 ft by 16 ft, one kitchen 15 ft by 14 ft.”, 1 log house fourteen feet by twelve feet”, “one dwelling house 17 ft by 16 ft, one dwelling 12 ft square”, “one dwelling house 20 ft by 18 ft, one kitchen 15 ft by 14 feet, 1 lumber house, 12 ft square”, “one dwelling house 16 ft by 15 ft and built of saw’d logs”, “one dwelling house, 24 ft by 18 ft, one kitchen, 14 ft by 12 ft, one milk house, 6 foot square, the above houses are old”, “1 dwelling house 20 ft by 18ft, framed”.

Thus, the structures on Smith Island at the turn of the 18th century were uniformly one to a property, generally averaging about 15 by 20 feet, and built a sawn logs. The residence of Thomas Tyler, the sole slave owner at Pitchcroft on the 1783 tax list, and the more prominent one on the 1798 tax list, was also the largest house on Smith Island in 1798 although the tax list records them as “old”.

Horn (1991) discussed the colonial dwellings as recorded in the area of St. Mary’s City, Maryland, which had a close association with Smith Island. Although his description relates to the 17th century in St. Mary’s City, the description is close to that found on Smith Island, and it may be that the conditions on Smith necessitated the continuance of the simpler, 18th century forms that they brought to the island from the mainland. Also, it should be noted that some of the notes on the 1798 tax list recorded the dwellings as “old”, moving them closer in time to the 17th century:

> Typical Chesapeake dwellings were about 20 by 16 feet and, as Walsh points out, very unlike the vernacular buildings in England, Settlers developed a structure appropriate to their needs and available materials. Houses were constructed entirely of wood with the whole of the outside covered with riven oak clapboards. Clapboards not only provided the

> exterior surface but also constituted an essential structural element of the dwelling (Horn 1991:317).

Horn continued to explain that the presence of these typically small dwellings imposed a limit on the types and amount of material wealth that a certain person could possess. The emerging picture of the colonial planter in southern Maryland is one of subsistence, rather than the abject poverty supposed by the paucity of material culture. Few of the early planters in Maryland had extensive material culture, most had only the barest of necessities in furniture in their homes. The following fictional account portrays what like for many of the planters on Smith Island may have been like:

> It is suppertime. A wife, husband, two children, and perhaps a servant are gathered together in the perpetual dusk of their shuttered cottage. This evening, like most evenings, their dinner is cornmeal mush boiled in an iron pot. The food is ladled into five plates or porringers, one for each person. The father sets his down on a large storage trunk which he straddles and sits on. His daughter is perched on the edge of a small chest, the only other piece of furniture in the room. The rest either stand or squat along the walls. They spoon up the food from the plates they must hold in their hands or place on the floor. They drink milk or water from a common cup, tankard or bowl passed around. No candle or lamp is lighted now or later when the room grows completely dark except for the glow of the embers on the hearth. Nightfall puts an effective end to all the day's activities. While someone rinses the bowls in a bucket of water (there being only one pot), someone else drags out a cattail mattress and arranges it in front of the fire. The husband, wife and daughter lie down there, covering themselves with a single canvas sheet and a worn-out old rug. The son and servant roll upon in blankets on the floor. For warmth all sleep in their clothes (Carson and Carson 1976:9-10).

It is also interesting to note the presence on the 1783 tax list of the ordinary (Tavern) owned by Elijah Linton. The Methodists who arrived on the island less than twenty years later were staunch prohibitionists, and due to this, there is little evidence of alcoholic consumption on the island after the 1808. In fact, this has continued as part of the island's cultural mores of the present.

**Socio-Economic**

Bowen (1984) discussed in depth the issues of self-sufficiency and seasonality of colonial farmers. Self-sufficiency was originally thought to be resident within the independent farmer. However, most historians today acknowledge that self-sufficiency is dependent upon rural exchange markets and is based on a community, not individual basis. With seasonal constraints, a self-sufficient farmer had to raise enough animals and preserve the meat to somehow make the supply last the year for his family, even if the diet was a monotonous one of salt pork supplemented by beef. Due to the lack of refrigeration, fresh meat would have only been available during the slaughtering season.

The agriculturally-based society was bound into a complex relationship with its environment; the constraints of the environment, with its natural resources of land, water and climate, restricted agricultural choices and the scheduling of many food related activities. Agricultural and subsistence activities followed the rhythm of the seasons, weaving an intricate cycle of food procurement, availability, and consumption of different meats. They dealt with seasonal variations by carefully scheduling their animal husbandry and meat processing activities according to changing seasons.

In most colonial societies, the agrarian society was dependent upon the interrelationships of a number of farmers and craftsmen, each adding their personal skills to the microcosm of society. A complex network of farmers, craftsmen, and laborers formed fluid, ego-centered units exchanging between themselves agricultural products, goods and services. Through this network, each individual provided for his family by exchanging, depending on his needs, labor, services, and products of his farm or specialized skill. Through this interchange, the problem of providing a subsistence for the community as a whole was solved.

It is likely that this network of labor and products was reflected on Smith Island as elsewhere in early America. Predominately, the early agricultural focus of the island was upon cattle husbandry, with a total of 1275 cattle on Smith Island in 1783. However, the wills and inventories provide a more diverse picture of the lifestyle on Smith Island. Grown also was a variety of vegetable crops, including potatoes, beans, watermelon, apples, etc.

**Smith Island in the Nineteenth Century**

During the first half of the nineteenth century, it is thought no more than 100 people occupied Smith Island, but as in most watermen's communities, the population expanded around the turn of the century. The 1877 map of Somerset County shows the trend toward abandonment of Jones Island and the concentration of the population at Tylerton, Ewell, and Rhodes Point. In that year, there were only fifteen houses remaining on Jones Island, while fifty-four houses are shown on the former Pitchcroft Estate.

It is apparent that during the second quarter of the 19th century, the slow submergence of the land had resulted in the abandonment of the plantation sites across the island. Ethnographic accounts relate that some of the homes were physically relocated to higher ground, forming the basis for the development of the present towns of Ewell, Tylerton and Rhodes Point. A map of 1826, showing a portion of Smith Island near Fog's Point, illustrates the widely dispersed plantation settlements present on Smith Island during that year. Another map, dating to 1849, was drawn prior to the construction of the road between Ewell and Rhodes Point, suggesting the first need for inland transportation between the two communities. Interestingly, it also provides the earliest representation for the Methodist Church in Ewell.

A map of 1877 shows the extent of development by that year. Many of the island plantations had been abandoned and the nucleus for the communities of Ewell, Tylerton and Rhodes Point had been established. With the exception of Pitchcroft, no standing structures on the island appear to date any earlier than the 19th century. Wooded hillocks across Big Thorofare from Ewell, as well as at other places throughout the marshy island, attest to the location of former dwellings and bear historical investigations. As early as 1861, Reverend J. A. Massey described the islanders as having a dominant maritime economy:

> The inhabitants of Smith's and Tangier's Islands may almost be called an amphibious race; for nearly all the men and boys spend fully half their time...on the water. Canoes, skillfully hollowed out of pine logs, and constructed with due regard to the purposes intended, are very numerous. They are rigged with two masts, with sails attached, which can be easily taken down or put up, and can outsail every vessel on these waters, that is not propelled by stream. When there is not sufficient wind for them to sail, the islanders are very dexterous in managing them with paddles.

Discussing the history of education on the island, Smith writes (1967):

> At the upper level of Fogs Point a small school room was erected. The teachers were volunteers until late in the 19th century . The first books used were the Bible, Pilgrims Progress, Shakespeare and such other early books brought over from England. The school term was about four months long. The children learned to read and write. Smith island has had eleven schools, a little 8 by 10 building, others built on puncheons in the marshlands and currently a modern fireproof school which houses grades I through 9. Senior High School pupils are transported to Crisfield High School by a bus boat, the Island Star, which has strict State requirements. The only school bus boat in the State. Many more high school graduates go on to higher educational opportunities each year.

Also important in the 19th century history of Smith Island was the rise of Methodism here. According to Smith (1967):

> The New Society or Wesleyanism was being introduced in America. Several itinerant exhorters visited the old Orchard Church preaching doctrines set up by John Wesley. Young Joshua Thomas, known for his clever canoe sailing was often hired to bring these men from the "main" to visit. At that time Joshua was also in demand at the parties of the day. he was the Shore's best dancer and vocalist. The influence of these ardent itinerants persuaded not only the people on Smith Island but greatly moved Joshua Thomas and he became a staunch believer in the philosophy of the New Society. For years he visited Smith Island as a regular exhorter. He was always on hand during the annual Bush Meeting. One just must read Adam Wallace's "The Parson of the Islands" to appreciate the Parson's influence on these vanishing islands

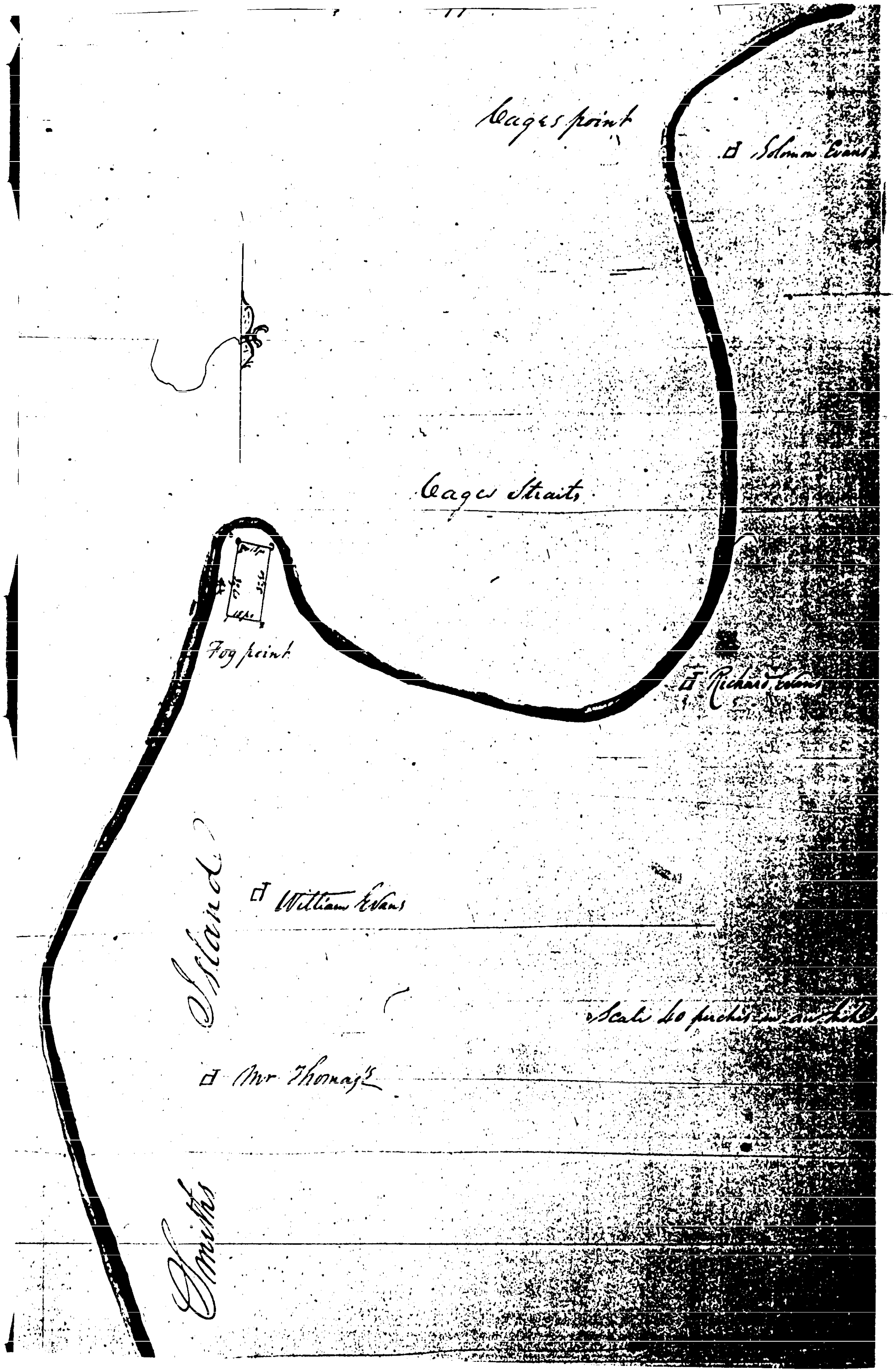



Figure 3: 1826 Land Commission Plat of Land for Fog Point Light

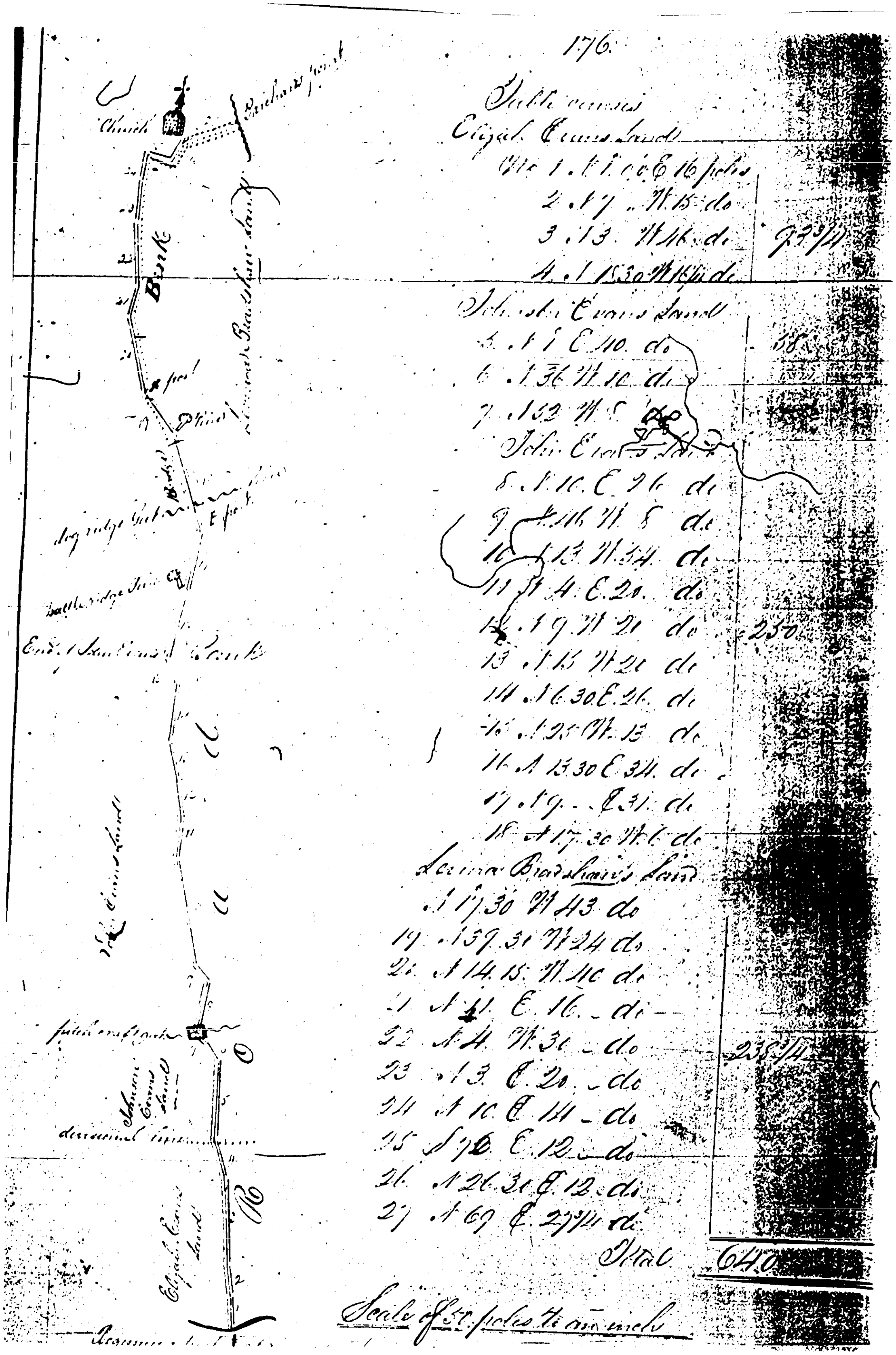


**Figure 4: 1849 Land Commission Plat of Public Road on Smith's Island**

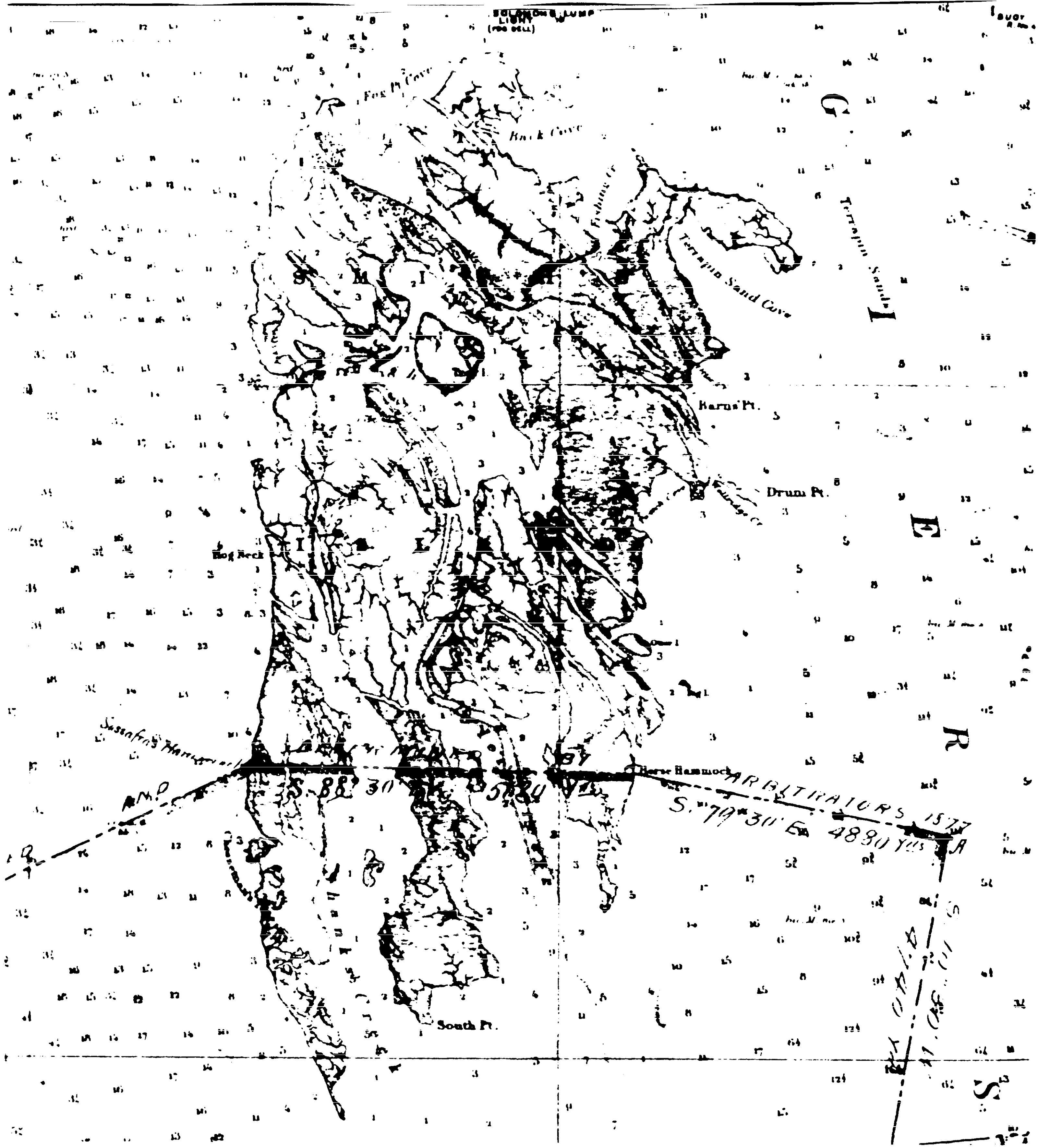



Figure 5: 1863 U.S.C & G. Survey Map

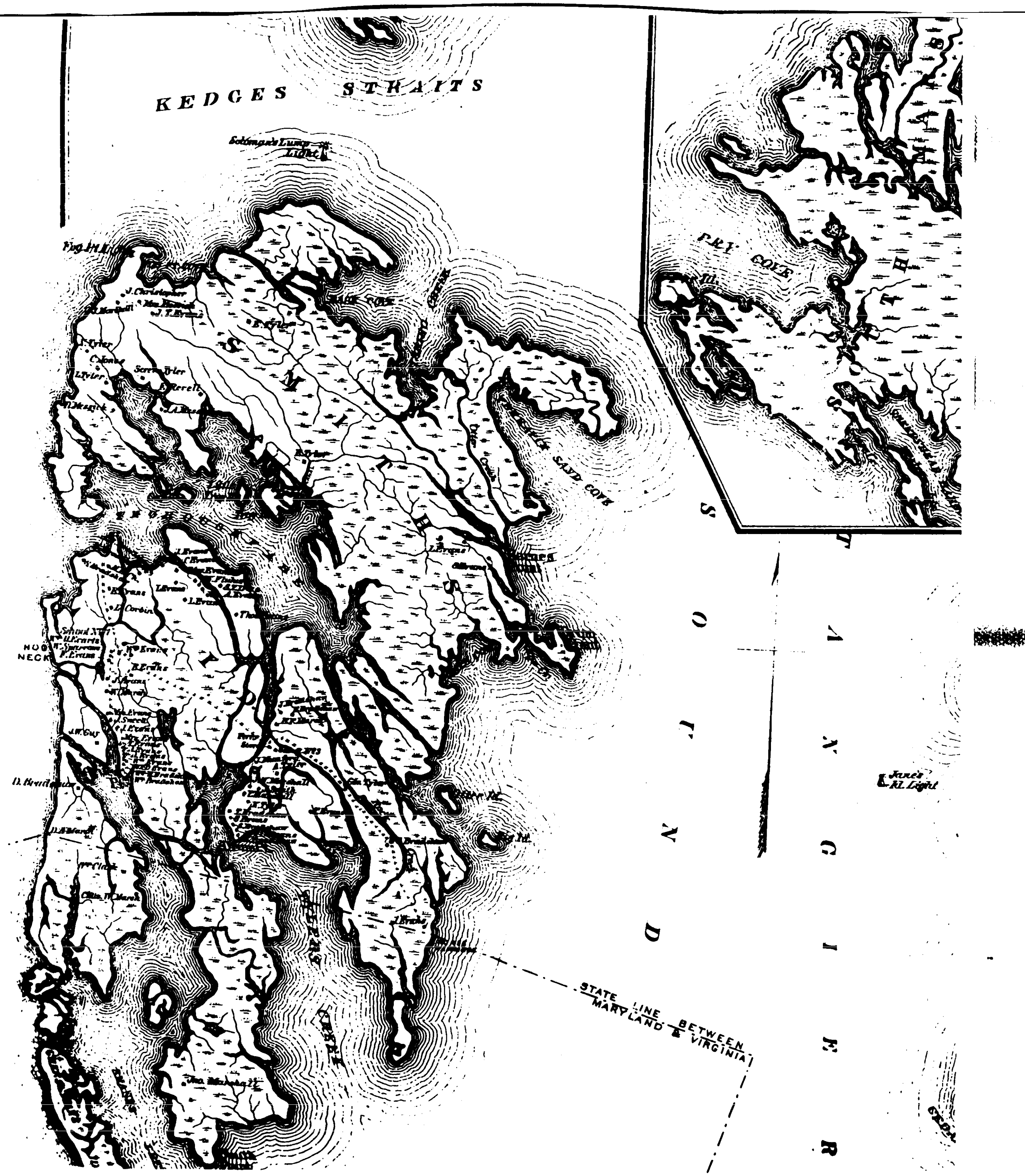



**Figure 6: 1877 Lake, Griffing and Stevenson Map**

of the Chesapeake Bay. He proved to the people that the simple new faith was an answer to their religious life. You may not know that this New Society became the Methodist Religion.

Methodist camp meetings have played an important part in the history of Smith Island. As early as 1808 religious gatherings were held at Tangier and probably shortly afterward on Smith Island. The formal dogma of the Church of England did not fit a pioneer group. Great dissatisfaction among them caused stress because they were weaning away from the rituals and their old church. The New Society or Wesleyanism was being introduced in America. Several itinerant exhorters visited the old Orchard Church preaching doctrines set up by John Wesley. Young Joshua Thomas, known for his clever canoe sailing was often hired to bring these men from the "main" to visit. At that time Joshua was also in demand at the parties of the day. he was the Shore's best dancer and vocalist. The influence of these ardent itinerants persuaded not only the people on Smith Island but greatly moved Joshua Thomas and he became a staunch believer in the philosophy of the New Society. For years he visited Smith Island as a regular exhorter. He was always on hand during the annual Bush Meeting. One just must read Adam Wallace's "The Parson of the Islands" to appreciate the Parson's influence on these vanishing islands of the Chesapeake Bay.

At Ewell the same location has been used continually for such meetings since 1887 and has been incorporated formally as “ the Wilson Butler Camp Ground”. By the early twentieth century the Ewell meeting ground included thirty frame cottages and a 1,000-person auditorium. The camp increased in size until a fire destroyed the church, parsonage, and meeting ground complex in 1937. During the following years these buildings were rebuilt.

From 1820 until the Civil War, the region failed to keep pace with the western shore communities. While the period does not seem to have been one of inordinate economic difficulty, efforts to establish railroad and canal systems to support development proved to be failures. Although railroads were constructed just prior to the Civil War, the effects of that conflict reduced manpower and disrupted trade, thus undermining their immediate impact on the Lower Delmarva region. In the post-war period, the railroad played an important role in the marketing of produce generated by an expanding agricultural economy that continued to develop in the twentieth century.

By the end of the 19th century, Smith Island had become basicially what it continues to be today - a watermen based society concentrated in the three communities of Ewell, Tylerton and Rhodes Point.

**Smith Island in the 20th Century**

The life on Smith Island is modern in many respects. Today each community has electricity, telephones and the best natural water supply east of the Appalachian Mountains.

The water supply comes from the Garrett County water table. Several times a year the supply is tested. It has the minimal fluorine and chlorine content.

The principal occupation is the catching of the Chesapeake Bay blue crab. Each year it proves to be the lucrative business of the island. The people were the first seafood dealers in Maryland to set up a cooperative type of seafood business. Many crab shanties are to be seen bordering the shoreline. Each business is equipped with electricity, therefore, deep-freezers are used to preserve the catch assuring fresh food to the seafood markets.

Access to Smith Island may be had by three ferry boats which ply between the island and the port of Crisfield. These boats usually leave the Port of Crisfield around noon six days a week. The island Star is a convenient tourist boat and may be had by appointment.

**Ewell**

The initial patent for Smith Island dates to 1679, when 1,000 acres surveyed as "Pitchcroft" for Captain Henry Smith, the island's namesake and a prominent figure in early Somerset County history. Henry Smith first appears in county records in 1669 as having relocated from Accomack County , where he was drawn into divorce proceedings by the Virginia court. Despite his marital problem in Accomac, Smith assumed prominent roles in Somerset as justice of the peace, a captain of the militia, and a representative from the county in the Lower House of Maryland General Assembly. Although he owned the large "Pitchcroft" tract, it is thought Smith actually occupied a tract patented as "Smith's Recovery", located on the south side of Manokin River near the confluence of King's Creek.

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The buildings that comprise the small village of Ewell include many two-story, two and three bay frame dwellings, some of which date from before the Civil War. One of the oldest houses to stand until recent times was the house called Pitchcroft, located at the north end of the island.

**Tylerton**

Tylerton is a small watermen's village located on Smith Island in Tangier Sound. One of the three villages on the island, Tylerton is geographically separate from Ewell and Rhodes Point by Tyler Creek, which runs between the island's two principal land masses, Merlin Gut runs east of the high ground on which Tylerton was built. During the nineteenth century a ferry operated between the two land masses, nut now access is provided only by private boat travel.

Tylerton retains a more diverse collection of period dwellings than the other Smith Island villages. Two of the houses appear to date from the ante-bellum period. A group of "telescope" houses with three distinct parts contrasts with the more standard two-story, two or three bay houses. A large percentage of the dwellings retains decorative exterior trim such as eaves brackets or intricately sawn bargeboards. The largest building in Tylerton is the Gothic Revival Methodist Church in the center of the village. Quiet foot paths and large shade trees contribute to the continuing nineteenth century character of the community.

**Rhodes Point**

Rhodes Point is the smallest of the three communities located on Smith Island. Rhodes Point, formerly "Rogues Point", developed along Shanks Creek at the southwest tip of the island and by 1877 included a score of frame houses and a school. The waterman's village consists of approximately two dozen one or two story houses and Calvary United Methodist Episcopal Church. Built in 1921 the L-shapes frame church has Gothic Revival style doors and windows. The houses largely consist of two basic types - the three-part "telescope" dwelling and the two-and a half story, cross-gabled frame house with a rear service wing. The largest structure standing in the village is a turn-of-the-century frame house on the north side of the bridge. Distinguished by a pyramidal roof with multiple gables, this squarish building is surrounded by a Tuscan-columned front porch.. Located on the west side of the village road is a group of singe story watermen's work shanties of board-and-batten construction.

**Compliance with the National Historic Preservation Act**

Several meetings with the staff of the Maryland Historic Trust were conducted by the Corps of Engineers to determine the impact of proposed project solutions to potential National Register sites. It was determined that, with the exception of the wreck of the Island Belle, there are no known National Register properties on Smith Island. The lack of eligible architectural resources was subsequently confirmed by several reconnaissance visits to the island. The communities of Ewell, Tylerton, and Rhodes Point, although culturally unique, are characterized by a structural history of late and high-altered or poorly maintained structures. The poor integrity of the structures is largely dependant upon the exposure of the structures to the elements, and the rather late development of the communities in the history of the island. Therefore, the proposed solutions will have no effect on National Register eligible or listed architectural resources.

When dealing with the archeological resources on the island, it is documented throughout this report that prior to 1850 a plantation economy was present on the island, characterized by widely scattered, independant farm sites. Numerous island residents and written accounts suggest that the wooded hummocks that exist throughout the island contain the remnants of these plantation sites, including building remains and burials. This was confirmed during a visit to the island in May 1997, when the remains of the Bradshaw farm were located in a wooded hullock just west of the Ewell Generating Station. At this site was also recorded three graves of the Bradshaw family. The documentation included in this report suggests that plantations were predominant on Smith Island during the period ca. 1700 - ca. 1820 (or until the island residents relocated to the three population centers with the changing economy), and that the plantation sites containing insitu archeological remains from the 18th century are likley to exist in the marshes. Unlike other places in Maryland, where plantation sites were subsequently reoccupied and altered throughout the 19th and 20th centuries, Smith Island may contain the largest concentration of intact 18th century remains in the state.

It is also likely that the homesites were located in settings and soils preferable to aboriginal settlement, and that some of the remnant plantation sites may also contain aboriginal archeological remains. Currently, the erosion of the island is proposing a continued threat to these archeological resources, and in several cases, have resulted in both archeological remains and burials becoming eroded into the Bay. Without environmental remediation of the erosional problems, most of all of the archeological remains will eventually become submerged. The proposed solutions are unlikely to have any effect on the archeological resources, and will actually benefit the resources by retaining their integirty for future study. However, the locations of the plantation sites are no fully documented. Therefore, for the purposes of avoidance, it is recommended that during the Feasibility Phase, an inventory of the site locations, limited archeological testing, and ethographic recording be conducted to preserve the nature and location of these sites. Additionally, all historical materials collected during this investigation will be copied for use by the Smith Island residents, and provided to the Smith Island Visitors Center for curation. Through these efforts, the proposed solutions on Smith Island will have no effect on archeological resources. Completion of the archeological reconnaissance and implementation of any avoidance measures will complete compliance with the National Historic Preservation Act for this project.

References

American Constitution Sesquicentennial Commission
1938 A Map of Maryland Showing it as it was at the Ratification of the Constitution.

Andrews, Matthew Page
1929 A History of Maryland, Garden City, NY.
1933 The Founding of Maryland. Garden City, NY.

Carson, Cary and Barbara Carson
1976 "Styles and Standards of Living in Southern Maryland" Paper presented to the Southern Historical Association, Atlanta, Ga.

Cresthull, Paul
1971 "Chance (18So5), A Major Archaic Site" Maryland Archeology, Journal of the Archeological Society of Maryland, Vol. 7, No 2.

Davidson, T.E.
1982 A Cultural Resource Management Plan for the Lower Delmarva Region in Maryland. Maryland Historical Trust Monograph, Series No. 2.

Dryden, Ruth T.
1986 Land Records of Somerset County, Maryland. Mss on file at Enoch Pratt Library.

Evans, Cerinda W.
1957 Some Notes on Shipbuilding and Shipping in Colonial Virginia. Booklet No. 22, Jamestown 350th Anniversary Historical Booklets, Williamsburg, VA.

Gardner, William M. and Robert D. Wall
1978 A Partial Cultural Resources Reconnaissance of Smith Island, Somerset County, Maryland. Baltimore District, U.S. Army Corps of Engineers.

Horn, James P.
1991 "'The Bare Necessities' Standards of Living in England and the Chesapeake, 1650-1700", Approaches to Material Culture Research for Historical Archeologists. Society for Historical Archeology, California, Pennsylvania.

Koski-Karrell, Daniel
1979 A Cultural and Environmental Overview of the Prehistory of Maryland's Lower Eastern Shore. Maryland Historical Trust, manuscript.

Kraft, John C.
1971 Geological Society of America, Bulletin 82.

Lake
1877 Atlas of Wicomico, Worchester and Somerset Counties, Maryland.

Long, Myra T.
1969 The Deal Island Story. Marylander and Herald Print, Princess Anne, MD.

Matthews, Earle D. and Richard L. Hall
1966 Soil Survey of Somerset County, Maryland

Messick, Jean
1967 "Early Archaic in Somerset County, Maryland." Maryland Archeology, Journal of the Archeological Society of Maryland, Vol. 3, No. 1.

Middleton, Alice V.
1967 Maryland's Right Tight Isle Smith. Ewell, Maryland.

Power, Garrett
1970 Chesapeake Bay in Legal Perspective. U.S. Department of the Interior, Washington, D.C.

Sherry, James
1850 A History of Maryland, Baltimore.

Stiverson, Gregory A.
1977 History of Deal Island Area, 1607-1877. Salisbury State College, manuscript.

Torrence, Clayton
1935 Old Somerset on the Eastern Shore of Maryland. Richmond

Touart, Paul B.
1990 Somerset, An Architectural History. Maryland Historic Trust, Baltimore, MD.

U.S.G.S.
1942 Ewell Quadrangle
1942 Crisfield Quadrangle
1964 Ewell Quadrangle

# APPENDICES

## ORIGINAL RECORDS RELATING TO THE ANTE-BELLUM HISTORY OF SMITH ISLAND

**APPENDIX A**
**LAND RECORDS ON SMITH ISLAND, 1679-1772**

Information for this appendix was copied from Land Records of Somerset County, Maryland. Ruth T. Dryden, 1986. Mss on file at Enoch Pratt Library.

**Jones Island**

Patented on 19 March 1669 by Leonard Jones for 100 acres on Smiths Island.

12 Oct 1674 Leonard Jones, wife Jane Jones sold to Henry Smith.

3 March 1682 Henry Smith, wife Ann Smith sold all to John Cowan.

Rent Rolls 1666-1723 possessed by George Hopkins in right of Robert Hopkins Sr. Robert Hopkins died in 1701.

20 Nov 1746 George Hopkins and wife Elizabeth Hopkins sold to Peter Parsley of Northumberland Co., VA, Jones Island where George Hopkins now lives, for 99 years.

1747 William Dixon gave to son Ambrose Dixon 100 acres of marsh on Jones Island.

1773 John Riggin gave to son Obadiah Riggin 25 acres of marsh on Jones Island.

1780-2 Isaac White gave to daughter Nancy White, Jones Island Marsh.

1783 Tax
- Mary Horsey
- Thomas Robertson
- George Croswell
- John Milbourne
- Levi Thomas

**King Richard Garden**

Patented in 1805 for 714 acres.

**Pitchcroft**

Patented on 7 June 1679 by William Stevens who assigned to Henry Smith 1000 acres on Smith Island.

17 June 1672 George Smith and wife Martha Smith sold to Edward Price Smith Island, now called Peninsula on the northwest side of said island 150 acres and 1/2 part now called Late to Repent 75 acres.

20 April 1685 Henry Smith and wife Ann Smith sold to John Evans of Accomack County, VA, 200 acres of Pitchcroft at Dogwood Ridge.

Rent Rolls 1666-1723 possessed by
John Evans in Virginia 200 acres
John Taylor 200 acres

1720 John Evans of Accomack County, VA gave to son John 200 acres and to son Mark Evans 200 acres and son Richard Evans the old plantation where Arthur Parks lives on Smith Island.

2 May 1720 Matilda Wise of Accomack County, VA widow and executrix of John Wise deceased and William Pritchett of same sold to John Caldwell 500 acres (whereas the property of Capt. Henry Smith was sold to satisfy a claim in 1707 to John Wise who willed on 27 March 1717 his wife Matilda Wise to sell his part of Smiths Island and Marshes.

5 April 1725 John Caldwell attorney for John Smith and his wife Sarah Smith now deceased sold to John Evans 100 acres on Smiths Island now called What You Please.

13 September 1729 John Evans son of John, wife Arabella Evans sold to William Mister.

14 June 1736 Thomas Summers and wife Sarah Summers sold to William Mister 75 acres that John Smith grandson of Henry Smith conveyed to Arthur Parks and Thomas Summers a total of 150 acres.

1743 Arthur Parks Sr. willed to youngest son Job Parks manor and tract Hog Neck on Smith Island being part of tract Dogwood Ridge Creek 75 acres.

20 August 1746 Mark Evans of Accomack Co. VA and wife Susannah Evans sold 248 acres to Job Evans, on Smith Island.

28 January 1747 Smith Horsey, wife Alice Mister of Dorchester Co., sold 100 acres to William Mister of Accomack County, VA.

3 Nov 1766 Smith Horsey sold to Samuel Lawson and George Croswell 150 acres

10 January 1766 William Mister sold to Job Wilson 25 acres of Hogg Neck that William Mister devised to three sons William Mister, Abraham Mister and Marmaduke Mister.

July 1774 “I Henry Smith of Sussex Co., DE do impower Smith Horsey to execute a deed to Littleton Tyler for 50 acres.

1783 tax - Richard Bratcher 50 acres

- Thomas Evans 100 acres
- Richard Evans 200 acres
- Elijah Linton 25 acres
- Marmaduke Mister 100 acres
- Thomas Tyler 200 acres
- John Parks 130 acres

21 June 1786 John Evans sold 200 acres to Esme Bayley

20 June 1786 Esme Bayley sold to John Evans 200 acres

8 July 1785 Hance Lawson, wife Ann Lawson and George Croswell, wife Mary Croswell sold to Nathan Linton

25 Aug. 1788 John Evans sold to Jesse Evans son of John 100 acres

21 Aug 1789 John Evans gave to son Jesse Evans 100 acres.

14 Mar 1796 Job Parks Jr. sold to John Parks Jr. 25 acres of Pitchcroft & Hog Neck at Smith Island.

28 July 1798 Butler Taylor sold to Thomas Tyler 200 acres

28 July 1798 Thomas Taylor sold to Butler Tyler 200 acres

28 July 1798 Butler Taylor sold to David Tyler 200 acres

25 July 1799 Thomas Evans sold to Solomon Evans 1/4 part surveyed for Spencer Martin Waters of Dorchester Co. land on island called Cajor Streights and Smiths Island thorofare called Smiths Island or Tangier Islands.

1 May 1794 George Gale or Dorchester Co. sold to Nathan Evans, Thomas Evans and Ezekiel Simkins, lower part where they live surveyed for Spencer Martin Waters of Dorchester Co. on Smiths Island.

7 July 1801 William Mister of Virginia sold to Sarah Mister of Maryland, two parcels on Smiths Island devised William by his father Marmaduke Mister, 125 acres.

11 August 1801 Francis Evans sold 100 acres to Thomas Williams, Jr.

4 September 1802 Francis Evans sold 100 acres to Thomas Williams Jr.

4 September 1802 Richard Evans, wife Fanny Evans sold to Elijah Evans 100 acres

18 August 1804 Zachariah Crockett, wife Polly Crokett, Richard Evans, wife Rachel Evans, Thomas Evans, wife Fannie Evans, William Linton, wife Hannah Linton sold to Josiah Evans 100 acres at the north end.

**Seven Brothers**

Patented in 1772 by Samuel Chase and Esther Gale for 784 acres on Smiths Island.

27 April 1792, Samuel Chase, wife Hannah Killy Chase of Baltimore Town sold to Richard Evans, part.

1805 Resurveyed to King Richards Garden 714 acres.

**Terrapin Sand Island**

Patented in 1880 for 140 acres.

**Two Brothers**

Patented in 1722 for 200 acres by John Hopkins on Smith Island.

1 Aug. 1746 John Hopkins sold to George Hopkins Sr. for 5 shillings 100 acres called Oyster Shell Landing at Cagers Island.

20 Nov. 1746 George Hopkins and wife Elizabeth Hopkins sold 100 acres at Cagers Island to Peter Preseley of Northumberland Co., VA.

1752 John Hopkins willed to son John, marsh at Cagers Islands, no name or acreage given.

20 Oct 1746 Hance Lawson and wife Elizabeth of Dorchester Co. sold to William Haynie of Northumberland Co. VA, part of Cagers Island, 52 acres.

1771 Stephen Hopkins willed to sons Stephen Hopkins and Charles Hopkins tract at Cagers Island.

1772 Resurveyed to Seven Brothers Estate 784 acres.

Wills of Smith Islanders

(Marmaduke Mister, May 16, 1790, Will Book EB17, folio 665) In the name of God Amen, I Marmaduke Mister, Somerset County...give and bequeath to my wife Sarah Mister the third part of all my estate, I give my land and marsh unto my wife Sarah Mister till my son Scon Mister come to the age of 21 then to be equally divided between my two sons, William Mister and Scon Mister...

(John Milbourne, May 15, 1792, Will Book EB17, folio 219) In the name of God Amen, I John Milbourne...leave to Jan Milbourne during her natural life and widowhood all my lands, goods and chattels...

(Thomas Evans, June 10, 1793, Will Book EB17, folio 306) In the name of God Amen, I Thomas Evans of Somerset County planter... I give and bequeath to my loving wife Uphame Evans all my lands and marsh as also all my estate during the time of her widowhood and after that then my lands falling to my son Josiah Evans, by taking care to see the raising of his brothers and sisters till they all come of age and after the death of my wife, then all my property to be equally divided among the rest of my children now mentioning their names, Hannah Evans, Polly Broket, Rachel Evans, Thomas Evans, John Evans, Uphame Evans, Peter Evans and Tobias Evans...

(Elijah Linton, June 11, 1794, Will Book EB17, folio 518) In the name of God Amen...I give and bequeath to my loving wife Sarah all my lands, goods, chattels and Effects...and upon her deceasing and then to her disposals but to my children only...

(Jesse Evans, August 5, 1794, Will Book EB17, folio 312). In the name of God Amen, I Jesse Evans...give and bequeath to my wife Priscilla all the remaining part of my estate...

(Thomas Tyler, May 9, 1818, Will Book EB23, folio 170). I Thomas Tyler....give to my son James fifty dollars; I give to my son Solomon fifty dollars and a negro boy by the name of Frank; I give to my daughter Sally Bond a negro girl by the name of Bet; I give to my daughter Betsy seventy dollars; I give all the remaining part of my property to be equally divided between my nine children, John, James, Jacob, Littleton, Solomon, Jenny, and my granddaughter Susan Lawson...

(Richard Bratcher, Will Book EB23, folio 243). I Richard Bratcher...to my wife Annabelle all my estate her natural life, I give to my son Hamilton the south end of my land up to the old fence, I give unto him half of my land where my potato patch is now, I give to my son Littleton the north end of my land up to the old fence except the first part of the potato patch land...

Abstract from 1798 Direct Federal Tax: List of Particular Houses, Wharfs, Etc.

Bratcher, Richard - 1 tract of land called Pitchcroft, containing 50 acres, on which are one dwelling twenty feet by eighteen feet, one story high fram'd, one kitchen fifteen feet by twelve feet, saw'd logs - Value $100.00

Evans, Francis - 1 tract called Pitchfork containing 100 acres, on which are erected 1 dwelling house 18 ft by 16 ft, 1 kitchen 16 ft by 15 ft, 1 smoake house, 12 ft square, all of sawn logs.

Evans, Jesse, 1 tract of land called Pitchcroft, containing 125 acres on which are erected 1 dwelling house, 18 ft by 16 ft, 1 dwelling house 15 ft by 14 ft, all built of saw'd logs.

Evans, John - 1 tract called Pitchcroft containing 100 acres on which are erected 1 dwelling, 18 ft by 15 ft, 1 kitchen 16 ft by 18 ft, 1 corn house, 12 ft by 8 ft - all log.

Evans, Josiah - 2 lands called Pitchcroft and Cow Ridge, containing 175 acres on which are one dwelling house, 18 ft by 16 ft, one kitchen 15 ft by 14 ft.

Evans, Richard - 2 tracts of land called Pitchcroft and Seven Brothers, containing 450 acres, in which is erected 1 log house fourteen feet by twelve feet - Value $450.00.

Evans, Thomas - 1 tract of land called Seven Brothers containing 200 acres, nearly all marsh on which are erected one dwelling house 17 ft by 16 ft, one dwelling 12 ft square - Value $210.00

Mister, Marmaduke (heirs of) - 2 tracts of land called Pitchcroft, 100 acres, Hog Neck, 25 acres, on which are erected one dwelling house 20 ft by 18 ft, one kitchen 15 ft by 14 feet, 1 lumber house, 12 ft square - Value $215.00

Simkins, Ezekiel - 1 tract of land called part Seven Brothers, 50 acres on which is erected one dwelling house 16 ft by 15 ft and built of saw'd logs, the above land is greater part marsh - Value $50.00.

Tyler, Butler - 2 tracts of land called Pitchcroft, 200 acres and 87 acres, on which is one dwelling house, 24 ft by 18 ft, one kitchen, 14 ft by 12 ft, one milk house, 6 foot square, the above houses are old, the land greater part marsh - Value $335.00

Tyler, David - 1 dwelling house 20 ft by 18ft, framed, on the lands of Butler Tyler - No value recorded.

Abstract from 1798 Direct Tax -Particular List of Slaves within Little Annemensex Hundred

| Owner | Whole Number of Slaves | Slaves aged between 12 and 50 |
|---|---|---|
| Benston, Mary | 3 | 2 |
| Benston, Michael | 3 | 2 |
| Bird, Thomas | 5 | 3 |
| Bird, Solomon | 6 | 2 |
| Bell, Josephus | 17 | 8 |
| Bell, Nathaniel | 1 | 1 |
| Bell, Robert | 1 | 1 |
| Colbourne, Robert | 2 | 0 |
| Colbourne, Betty | 2 | 1 |
| Colbourne, Thomas | 1 | 1 |
| Colbourne, Mary | 6 | 3 |
| Colbourne, Sarah | 5 | 1 |
| Colbourne, John | 1 | 0 |
| Cox, John | 10 | 3 |
| Cox, Thomas | 5 | 3 |
| Conner, Benjamin | 17 | 5 |
| Colbourne, William | 3 | 1 |
| Colbourne, Betsy | 2 | 1 |
| Colbourne, Sally | 1 | 1 |
| Daugherty, Nathaniel | 1 | 1 |
| Daugherty, Rhoda | 4 | 1 |
| Davey, George | 1 | 1 |
| **Evans, Thomas** | **1** | **1** |
| Grimby, Nancy | 1 | 1 |
| Grimby, Sally | 2 | 1 |
| Grimby, Elisha | 6 | 4 |
| Holland, Jesse | 4 | 2 |
| Holland, Nancy | 3 | 1 |
| Holland, Mary | 4 | 2 |
| **Horsey, Lazarus** | **4** | **2** |
| Handy, John | 22 | 8 |
| Handy, Henry | 16 | 7 |
| **Horsey, John** | **4** | **2** |
| **Horsey, Stephen** | **7** | **4** |
| Johnson, Isaac | 6 | 3 |
| Johnson, Littleton | 3 | 2 |
| Johnson, Capt. John | 9 | 4 |
| Juett, Nathaniel | 6 | 4 |
| Horsey, Samuel | 3 | 1 |
| Lankford, Jesse | 2 | 0 |
| Miles, William | 2 | 1 |
| McKinney, Ailes | 3 | 1 |
| Miles, Live | 3 | 2 |
| **Milbourne, Jared** | **8** | **5** |
| Miles, Henry | 2 | 1 |
| Miles, John | 3 | 1 |
| Roach, Jonathan | 4 | 1 |
| Roach, William | 7 | 5 |
| Roach, Stephen | 8 | 8 |

| | | |
|---|---|---|
| Sterling, Aron | 9 | 3 |
| Sterling, Travis | 8 | 4 |
| Sterling, Mary | 14 | 6 |
| Summers, Isaac | 10 | 5 |
| Sterling, Capt. Aron | 5 | 1 |
| Summers, Billy | 1 | 1 |
| **Tyler, Thomas** | **10** | **6** |
| Turpin, Orpha | 6 | 2 |
| Ward, Mary | 1 | 1 |
| Ward, William | 8 | 3 |
| Ward, John | 1 | 1 |
| Ward, Stephen | 1 | 0 |
| Ward, John | 1 | 1 |
| Ward, Elijah | 1 | 1 |
| Ward, Ezekiel | 3 | 1 |
| Ward, Hannah | 11 | 3 |
| Ward, Stephen | 1 | 1 |
| Whittington, Southery | 7 | 4 |
| Whittington, William | 6 | 2 |
| Whittington, Isaac | 12 | 7 |
| Whittington, James | 4 | 1 |
| Total for Hundred | 377 | 178 |

**Bold - Resident of Smith Island**

1860 Census of Somerset County, Maryland. Nancy Crockett Tabb, Family Line Publications, Silver Spring, MD 1985.

SMITHS ISLAND DISTRICT --- ROACHVILLE POST OFFICE

| Record | Census Information |
|---|---|
| 1973 | John Marsh 32m, mt, R, Md; Margaret 25f, Md; Rhoda Ann Evans 22f, Md; Benjamin Marsh 19m, cl, Md; David 15m, Md; Tinfinna 9f, Md; John R. 6m, Md; George F. 2m, Md; Elizabeth 7fb, Md |
| 1974 | Charles W. Marsh 21m, sl, R, Md; Mary C. 20f, Md; Charles F. lm, Md |
| 1975 | John Tylor 32m, sl, R, Md; Alice 26f, Md; Thomas M. 22m, sl, Va; Levin 10m, Md; Edwin 8m, Md; Margaret 3f, Md |
| 1976 | William J. Lewis 30m, sl, R, Va; Elizabeth 22f, Md; Mary 6f, Md; Maranda 3f, Md |
| 1977 | David Bracher 25m, sl, R, Md; Sarah A. 25f, Va; George Bradford 23m, sl, Va; Lovitha Brachor 3f, Md; Margaret 2f, Md |
| 1978 | William Bracher 27m, sl, R, Md; Adeline 20f, Md; Lavinia 68f, Md; Lavinia Por 17f, Md; John E. Bracher Im, Md |
| 1979 | Elizabeth Evans 56f, fr, R, Va; Rachel 42f, Va; Albert 24m, sl, Md; Nelly 23f, Md; Aleca 20f, Md; Eliza 19f, Md; William 18m, Md; Adeline 16f, Md; Maranda 15f, Md; John 0. 14m, Md; Alexander 12m, Md; Thomas 9m, Md; Rachel Douglas 7fb, Md |
| 1980 | Maria Grey 52f, R, Md; John W. 30m, sl, Md; Virginia 20f, Md; Maria 17f, Md |
| 1981 | Johnson Evans 46m, sl, R, Md; Eliza 45f, Md; John W. 23m, sl, Md; Polly Ann 17f, Md; Eliza C. 15f, Md; Statia 12f, Md; Adaline 6f, Md; Andrew 4/mom, Md |
| 1982 | John Huffman 29m, sl, Va; Eliza 23f, Va; David 8m, Md; Sinah 6f, Md; John H. 4m, Md; Griffin W. lm, Md |
| 1983 | William Evans 30m, sl, R, Md; Polly 30f, Md; Margaret Jane 9, Md; Elijah Phillips 28m, sl, Md |
| 1984 | Jobe Evans 35m, sl, R, Md; Eliza 30f, Md; Emily 16f, Md; Mary 15f, Md; Benjamin 10m, Md; Maria 9f, Md; Johnson 8m, Md; George T. 3f, Md |
| 1985 | Francis Evans 50m, fr, R, Md; Julia A. 49f, Md; Catherine 23f, Md; Matilda A. 19f, Md; William H. 18m, Md; John T. 15m, Md; David 10m, Md; Polly J. 9f, Md |
| 1986 | Benjamin Evans 37m, sl, R, Md; Betsy 30f, Md; John 13m, Md; Margaret 11f, Md; George A. 9m, Md; Polly E. 7f, Md; Samuel W. 6m, Md; Benjamin T. 3m, Md |
| 1987 | Levin Bracher 52m, sl, R. Md; Polly 51f, Md; Ann E. 21f, Md; Kiza 18f, Md; Lavinia 16f, Md; William R. 14m, Md; Sardiel 11m, Md; Elisha 9m, Md; Henry Guy 22m, sl, Va |
| 1988 | David Tylor 40m, fr, R, Md; Patirnco 40m, Md; Emeline 21f, Md; Edward F. 19m, Md; Noah A. 9m, Md |
| 1989 | David Mezick 40m, sl, R, Md; Caroline 40f, Md; Lovinia 20f, Md; Betsy 18f, Md; Emma 16f, Md; Arthur 10m, Md; Mary 6m, Md; Charlotte 3f, Md; Adeline lf, Md |
| 1990 | Lorenzo Evans 27m, sl, R, Md; Ellen 25f, Md; Amanda 3f, Md |

1991 Ephraim Douglas 30m, sl, R, Md; Sinor 30m, Md; Maria 10f, Md; Rachel 8f, Md; John 6m, Md; Nannit 4f, Md; Ephraim 2m, Md

1992 John Marshall 35m, bn, R, DC; Keza 33f, Md; Mary llf, Md; John 9m, Md; William 7m, Md; Emily 4f, Md; Edward 2m, Md

1993 Charlotte Mezick 40f, R, Md; Eliza 20f, Md; John 19m, fh, Md; Adeline 12f, Md; Levin B. 9m, Md

1994 John Thomas 35m, sl, R. Md; Margaret 30f, Md; Margaret 4f, Md; John H. 2m, Md

1995 Ephraim Taylor 60m, kl, Md; Mary 40f, Md; Sophia Pruitt 50f, Md; Catherine 17f, Md; Mahala Thomas 8f, Md

1996 Elijah Evans 28m, sl, R, Md; Matilda 34f, Md; Stewart 19m, sl, Md; Coleman 17m, Md; Elijah llm, Md; Lambert 6m, Md; William 1/mom, Md

1997 Walter Marsh 25m, sl, R, Md; Alice 19f, Md; Matilda 4f, Md; William 2m, Md

1998 Peggy Evans 60f, R, Md; Abraham 25m, sl, Md; Solomon 21m, sl, Md; Ruth 18f, Md; Thomas 18m, Md; Trif 14f, Md; Christopher 10m, Md

1999 Edward Reville 40m, sl, R, Va; Leah 35f, Md; Ann 11f, Md; Lucinda 9f, Md; Julia 7f, Md; Lucy 5f, Md

2000 Levin Taylor 30m, sl, R, Md; Virginia 25f, Md; Andrew 5m, Md; Margaret lfg Md

2001 Albert Evans 28m, sl, R, Md; Sarah 25f, Md; John 6m, Md; Margaret 3f, Md

2002 John Evans 25m, sl, R, Md; Emily 20f, Md; Edward 4m, Md; Catherine If, Md

2003 Levin Fluehart 60m, sl, R, Va; Sarah 50f, Md; William 21m, Md; John 17m, sl, Md; Kitty 12f, Md; Thomas 7m, Md

2004 Henry Brachor 56m, fr, R, Md; Polly 48f, Md; Leonard Evans 32m, sl, Md; Margaret 28f, Md; Aaron Brachor 14m, Md; Mary Evans 3f, Md; Maria Brachor 43f, Md; Jack 8m, Md; Rachel 4f, Md

2005 Benjamin Evans 64m, fr, R, Md; Charity 60f, Md; Jesse 25m, sl, Md; George W. 20m, sl, Md; Sarah Dize 11f, Md

2006 Joseph Ashmead 33m, cp, R, Md; Nancy 27f, Md; Mary 9f, Md; Sarah 7f, Md; Margaret 4f, Md; John 2m, Md; Kelzie 75f, Md

2007 Laben Evans Sr. 70m, fr, R, Md; Mary 30f, Md; David 20m, sl, Md; John 18m, Md; Martha 16f, Md; Litha 14f, Md; Caleb W. 8m, Md

2008 Laben Evans Jr. 33m, sl, R, Md; Betsy 23f, Md; Andrew F. 5m, Md; Lewis 3m, Md; Cornelia 2/mof, Md

2009 Benjamin Brachor 38m, sl, R, Md; Eliza 30f, Md; Mary 12f, Md; Kelup 10m, Md; Thomas 8m, Md; Aarrip 4m, Md

2010 Michael Evans 40m, sl, R, Va; Adeline 35f, Md; Lovitha Healing 13, Md; Terfrenia Marsh 9f, Md; Robert Jones 40m, sl, Md

2011 Thomas Brachor 45m, mt, R, Md; Polly 30f, Md; William 19m, cl, Md; John 17m, Md; Thomas 5m, Md; Lewis 3m, Md

2012 Thomas Taylor 81m, fr, R, Md; Polly 35f, Md; Zipporah 14f, Md; Thomas 12m, Md; Christina 10f, Md; James 8m, Md; Melinda 2f, Md; Phillis 10fb, Md; George 8mb, Md

2013 Tubman Evans 45m, sl, R, Md; Elizabeth 35f, Md; John A. 10m, Md; William C. 7m, Md; Adeline A. 4f, Md; Stewart Im, Md; Mary A. 23f, Md

2014 Alexander Tylor 30m, sl, R, Md; Sarah 25f, Md; Ann 60f, Md; Edward 4m, Md; Laura 2f, Md; Maria If, Md; George Lord 9m, Md

2015 Josiah Taylor 50m, sl, R, Md; Rerta 35f, Md; Polly Evans 21f, Md; John Tyler 20m, sl, Md; Margaret 18f, Md; Thomas 12m, Md; David 15m, Md; James 10m, Md; Jazar 7m, Md; Elijah 3m, Md; John Evans 25m, sl, Md; Polly 1f, Md

2016 Frank Revill 60mm, sl, R, Va; Easter 50fm, Md

2017 Hemlen Brachor 78m, fr, R, Md; Nelly 65f, Md; William 30m, sl, Md; Ellen 25f, Md; Alca 6f, Md; Margaret 4f, Md; Robert Handy 15m, sl, Md

2018 William Brachor 30m, sl, R, Md; Sarah 23f, Md; Mary Wilson llf, Md; Thomas Brachor 6m, Md

2019 Nathan Richards 35m, sl, R, Me; Matilda 25f, Md

2020 William Tylor 68m, sl, R, Md; Alcea 55f, Md; Peggy Crockett 70f, Md

2021 James T. Evans 48m, sl, R, Md; Rachel 46f, Md; Mary Ann 23f, Md; Elizabeth 20f, Md; William C. 19m, sl, Md; Shada 17f, Md; Virginia 14f, Md; Margaret 12f, Md; James 10m, Md; Rachel 8f, Md; Lewis A. 6m, Md

# SMITH ISLAND ENVIRONMENTAL RESTORATION AND PROTECTION, MARYLAND

**RECONNAISSANCE REPORT**

**MAY 1997**

# APPENDIX G

## OVERVIEW OF FEASIBILITY PHASE
## FEASIBILITY COST-SHARING AGREEMENT

# Appendix G-1

## Overview of Feasibility Phase

### 1.1 FEASIBILITY COST-SHARING POLICY

All water resources studies undertaken by the Corps of Engineers are conducted in two phases - a reconnaissance phase and a feasibility phase - unless special Congressional legislation dictates otherwise. The two phase study procedure is designed to encourage non-Federal participation throughout the study process and to increase the certainty that planned projects wil be implemented.

Administration policy permits the esxpenditure of Federal funds for all cost associated with the reconnaissance phase. Section 105(a)(1) of the Water Resources Development Act of 1986, however, requires that the cost of a subsequent feasibility phase be shared equally (50/50 split) between the Federal government and a non-Federal sponsor(s).

Up to one-half of the non-Federal contribution, or one-quarter of the total cost of the feasibility phase, may be in the form of in-kind services. In-kind services are those tasks performed and paid for by the non-Federal sponsor which are in direct support of the feasibility study effort. An example of an in-kind service by the sponsor might be obtaining survey data, or other mapping. While all in-kind services should be in support of the particular study, it is permissible for non-Federal sponsors to reorient existing programs and on-going work to complement the Corps feasibility study. It is not permissible, however, to use funds or services from other Federal programs to match the costs of the feasibility study.

### 1.2 PURPOSES

The purposes of the feasibilty phase are:

1. To conduct detailed engineering, economic, environmental and cultural investigations to support plan formulation and evaluation;
2. To identify the National Economic Development (NED) plan;
3. To estimate costs and benefits (environmental, cultural, and economic) to a level of detail suitable for project justification, if applicable;
4. To determine the appropriate construction cost-sharing arrangements and obtain non-Federal support, as necessary;
5. To prepare appropriate documentaion for Federal project authorization; and

6. To recommend favorable projects for authorization and construction, if appropriate.

## 1.3 ANTICIPATED PRODUCT

The anticipated product would be a feasibility report for Smith Island, accompanied by an Environmental Assessment to comply with the National Environmental Policy Act (NEPA). The feasibility report would provide all necessary documentation to permit project authorization by the U.S. Congress for detailed design and construction of a Federal project, if justified. The Feasibility report would build upon the information contained in this reconnaissance report and would include:

1. A detailed explanation of the problems and opportunities on Smith Island concerning environmental restoration, erosion control, navigation and storm protection;
2. More detailed investigation of site characteristics, including bathymetric mapping and sediment analysis;
3. Formulation of practical alternatives, considering the nature of the problem, site characteristics, and area resources;
4. Assessment of the environmental benefits and effects of the possible solutions, and preparation of an Environmental Assessment;
5. Assessment of the cultural benefits and effects coordinated in accordance with Section 106 (Public Law 89-665, as amended) responsibilities;
6. Coordination with the USFWS including receipt of a Fish and Wildlife Coordination Act Report;
7. Preparation of typical design drawings and quantity estimates;
8. Estimation of project costs and benefits;
9. Evaluation and ranking of feasible solutions;
10. Identification of the National Economic Development (NED) plan;
11. Analysis of project implementation arrangements, including construction cost-sharing requirements and an ability-to-pay analysis of the non-Federal sponsor's project financing plan; and
12. Recommendation for authorization and construction, if a project is justified and supported by non-Federal sponsors.

## 1.4 FEASIBILITY COST-SHARING AGREEMENT

To proceed beyond the reconnaissance phase, the Federal government and the non-Federal sponsor must agree that the proposed project is in the Federal and non-Federal interest and then negotiate a feasibility cost-sharing agreement (FCSA) that commits both parties to equally sharing 50-percent of the feasibility phase cost. The FCSA is intended to promote partnership for conduct of the feasibility phase. It sets forth the management structure, obligations of the signatiries, methods of payment, resolution of disputes, methods for termination or suspension of the feasibility study, and other general contractual matters. A draft FCSA is contained in Section 4 of this Appendix.

Federal funds to initiat the fesiblity phase may be allocated only after a negotiated FCSA has been prepared, a letter-of-intent to sign the negotiated FCSA has been furnished by the non-Federal sponsor, and all documents have been certified by the Corps of Engineer's higher authority. The feasiblity phase can then begin after execution of the FCSA and receipt of both Federal and non-Federal funds.

## 1.5 PROJECT STUDY PLAN

As part of the FCSA, a project study plan (PSP) is prepared and negotiated. The PSP documents specific Federal and non-Federal efforts which will be required to conduct a particular feasibility phase. The PSP is appended to the FCSA and lays out the work tasks and costs for the feasiblity phase. It also furnishes a basis for identifying the in-kind services to be provided by the non-Federal sponsor and for negotiating the value of these services. Significant changes to the PSP during the feasibility study will require a modification of the FCSA. The draft PSP for the Smith Island Environmental Restoration and Protection study is contained in Section 4 of this Appendix.

### 1.5.1 Work Tasks

Major work tasks for a feasibility phase are identified in terms of the general activities which are included in the Corps of Engineers standard Study Cost Estimate for General Investigations. These tasks are discussed to detail the specific applicability to the Smith Island study. The tasks include: further refinement of the information already gathered; development of new information where data was not previously available; detailed assessments and evaluations of proposed plans; managmeent and coordination activities; and report preparation and processing.

### 1.5.2 Cost Estimate

Once the work effort is identified, a cost estimate is then developed for each of the individual tasks. A preliminary total estimate for the feasibility phase of the Smith Island Environmental Restoration and Protection study is $______. This amount depends on the exact scope of activities which are agreed upon by the Corps and the non-Federal sponsor. The cost of the feasiblity phase would be shared equally between the two partners.

### 1.5.3 Schedule

The schedule for a typical feasibility phase covers 30 to 36 months, including a public review period. It is estimated that due to the scope of the Smith Island study the fesaibility phase can be completed in 24 months. Development of a firm schedule would be part of the negotiations leading to a final FCSA.

The feasibility phase study initiation date is tentatively scheduled for October 1997. The feaibility phase can begin only ofter approval aand certification of the reconnaissance report and signature of the FCSA, and receipt of both Federal and non-Federal funds.

### 1.5.4 Management Structure

Negotiations, general study guidance, study conduct, and policy questions would be handled through a formal management structure composed of representatives form both the Federal government and the non-Federal sponsor. A study management team composed of Federal and non-Federal paticipants would perform the routine activities involving problem identification, plan formulation, and project evaluation. An executive committee will also be organized to provide overall study guidance, to participate in issue resolution conferences, and to resolve any disputes that may arise. Membership on the executive committee would be expected to include the District Engineer, his chief planner, and personnel of commensurate level representing the non-Federal sponsor.

AGREEMENT
BETWEEN THE DEPARTMENT OF THE ARMY
AND
THE [**SPONSOR**]
FOR THE [**FEASIBILITY STUDY NAME**]

THIS AGREEMENT is entered into this _________ day, of _____, 19__, by and between the Department of the Army (hereinafter the "Government"), represented by the District Engineer executing this Agreement, and the [**SPONSOR NAME**] (hereinafter the "Sponsor"),

WITNESSETH, that

WHEREAS, the Congress (Senate and/or House Committees) has authorized [**OR** requested] the [**INSERT APPROPRIATE ENTITY BASED ON PUBLIC LAW OR STUDY RESOLUTION**] to conduct a study of [**QUOTE LANGUAGE OF PUBLIC LAW OR STUDY RESOLUTION**] pursuant to [**CITE PUBLIC LAW OR STUDY RESOLUTION**]; and

[**FOR A CONTINUING AUTHORITIES PROGRAM (CAP) STUDY, INSERT THE FOLLOWING IN LIEU OF THE ABOVE "WHEREAS":** WHEREAS, the Congress has authorized the [**INSERT APPROPRIATE ENTITY BASED ON CONTINUING AUTHORITY**] to conduct studies of [**IDENTIFY PURPOSE**] pursuant to the authority provided by [**CITE APPROPRIATE CONTINUING AUTHORITY**]; and]

WHEREAS, the U.S. Army Corps of Engineers has conducted a reconnaissance study of [**QUOTE LANGUAGE OF PUBLIC LAW OR STUDY RESOLUTION RELEVANT TO THE PROBLEM OR, FOR A CAP STUDY, CITE SPECIFIC PROBLEM AND LOCATION OF STUDY**] pursuant to this authority, and has determined that further study in the nature of a "Feasibility Phase Study" (hereinafter the "Study") is required to fulfill the intent of the study authority and to assess the extent of the Federal interest in participating in a solution to the identified problem; and

WHEREAS, Section 105 of the Water Resources Development Act of 1986 (Public Law 99-662, as amended) specifies the cost sharing requirements applicable to the Study;

WHEREAS, the Sponsor has the authority and capability to furnish the cooperation hereinafter set forth and is willing to participate in study cost sharing and financing in accordance with the terms of this Agreement; and

WHEREAS, the Sponsor and the Government understand that entering into this Agreement in no way obligates either party to implement a project and that whether the Government supports a project authorization and budgets it for implementation depends upon, among other things, the outcome of the Study and whether the proposed solution is consistent with the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and with the budget priorities of the Administration;

NOW THEREFORE, the parties agree as follows:

ARTICLE I - DEFINITIONS
For the purposes of this Agreement:

A. The term "*S*tudy *C*osts" shall mean all disbursements by the Government pursuant to this Agreement, from Federal appropriations or from funds made available to the Government by the Sponsor, and all negotiated costs of work performed by the Sponsor pursuant to this Agreement. Study Costs shall include, but not be limited to: labor charges; direct costs; overhead expenses; supervision and administration costs; the costs of participation in Study Management and Coordination in accordance with Article IV of this Agreement; the costs of contracts with third parties, including termination or suspension charges; and any termination or suspension costs (ordinarily defined as those costs necessary to terminate ongoing contracts or obligations and to properly safeguard the work already accomplished) associated with this Agreement.

B. The term estimated Study Costs shall mean the estimated cost of performing the Study as of the effective date of this Agreement, as specified in Article III.A. of this Agreement.

C. The term excess Study Costs shall mean Study Costs that exceed the estimated Study Costs and that do not result from mutual agreement of the parties, a change in Federal law that increases the cost of the Study, or a change in the scope of the Study requested by the Sponsor.

D. The term "study period" shall mean the time period for conducting the Study, commencing with the release to the U.S. Army Corps of Engineers ______ District of initial Federal feasibility funds following the execution of this Agreement and ending when the Assistant Secretary of the Army (Civil Works) submits the feasibility report to the Office of Management and Budget (OMB) for review for consistency with the policies and programs of the President. [**FOR A CAP STUDY, REPLACE ALL AFTER THE WORD "AGREEMENT" WITH THE FOLLOWING:" AND ENDING WITH THE CHIEF OF ENGINEERS' ACCEPTANCE OF THE STUDY**.]

E. The term "PSP" shall mean the Project Study Plan, which is attached to this Agreement and which shall not be considered binding on either party and is subject to change by the Government, in consultation with the Sponsor.

F. The term "negotiated costs" shall mean the costs of in-kind services to be provided by the Sponsor in accordance with the PSP.

G. The term "fiscal year" shall mean one fiscal year of the Government. The Government fiscal year begins on October 1 and ends on September 30.

ARTICLE II - OBLIGATIONS OF PARTIES

A. The Government, using funds and in-kind services provided by the Sponsor and funds appropriated by the Congress of the United States, shall expeditiously prosecute and complete the Study, in accordance with the provisions of this Agreement and Federal laws, regulations, and policies.

B. In accordance with this Article and Article III.A., III.B. and III.C. of this Agreement, the Sponsor shall contribute cash and in-kind services equal to fifty (50) percent of Study Costs other than excess Study Costs. The Sponsor may, consistent with applicable law and regulations, contribute up to 25 percent of Study Costs through the provision of in-kind services. The in-kind services to be provided by the Sponsor, the estimated negotiated costs for those services, and the estimated schedule under which those services are to be provided are specified in the PSP. Negotiated costs shall be subject to an audit by the Government to determine reasonableness, allocability, and allowability.

C. The Sponsor shall pay a fifty (50) percent share of excess Study Costs in accordance with Article III.D. of this Agreement.

D. The Sponsor understands that the schedule of work may require the Sponsor to provide cash or in-kind services at a rate that may result in the Sponsor temporarily diverging from the obligations concerning cash and in-kind services specified in paragraph B. of this Article. Such temporary divergences shall be identified in the quarterly reports provided for in Article III.A. of this Agreement and shall not alter the obligations concerning costs and services specified in paragraph B. of this Article or the obligations concerning payment specified in Article III of this Agreement.

E. If, upon the award of any contract or the performance of any in-house work for the Study by the Government or the Sponsor, cumulative financial obligations of the Government and the Sponsor would result in excess Study Costs, the Government and the Sponsor agree to defer award of that and all subsequent contracts, and performance of that and all subsequent in-house work, for the Study until the Government and the Sponsor agree to proceed. Should the Government and the sponsor require time to arrive at a decision, the Agreement will be suspended in accordance with Article X., for a period of not to exceed six months. In the event the Government and the sponsor have not reached an agreement to proceed by the end of their 6 month period, the Agreement may be subject to termination in accordance with Article X.

F. No Federal funds may be used to meet the Sponsor's share of Study Costs unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

G. The award and management of any contract with a third party in furtherance of this Agreement which obligates Federal appropriations shall be exclusively within the control of the Government. The award and management of any contract by the Sponsor with a third party in furtherance of this Agreement which obligates funds of the Sponsor and does not obligate Federal appropriations shall be exclusively within the control of the Sponsor, but shall be subject to applicable Federal laws and regulations.

**[USE PARAGRAPH H. WHEN, IAW ER 1165-2-132, THE RECONNAISSANCE REPORT DETERMINES THAT THERE IS A POTENTIAL FOR HTRW CONCERNS REGARDING LANDS THAT MAY BE NECESSARY FOR THE PROJECT]**

H. The Sponsor shall be responsible for the total cost of developing a response plan for addressing any hazardous substances regulated under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, Pub. L. No. 96-510, 94 Stat. 2767, (codified at 42 U.S.C. Sections 9601-9675), as amended, existing in, on, or under any lands, easements or rights-of-way that the Government determines to be required for the construction, operation, and maintenance of the project. Such costs shall not be included in total study costs.

ARTICLE III - METHOD OF PAYMENT

A. The Government shall maintain current records of contributions provided by the parties, current projections of Study Costs, current projections of each party's share of Study Costs, and current projections of the amount of Study Costs that will result in excess Study Costs. At least quarterly, the Government shall provide the Sponsor a report setting forth this information. As of the effective date of this Agreement, estimated Study Costs are $_______ and the Sponsor's share of estimated Study Costs is $______. In order to meet the Sponsor's cash payment requirements for its share of estimated Study Costs, the Sponsor must provide a cash contribution currently estimated to be $_________ [**EQUAL TO THE SPONSOR'S SHARE LESS THE VALUE OF IN-KIND SERVICES TO BE PROVIDED BY THE SPONSOR**]. The dollar amounts set forth in this Article are based upon the Government's best estimates, which reflect the scope of the study described in the PSP, projected costs, price-level changes, and anticipated inflation. Such cost estimates are subject to adjustment by the Government and are not to be construed as the total financial responsibilities of the Government and the Sponsor.

[**USE OPTION I (PARAGRAPH B) IF ALL REQUIRED FUNDS ARE TO BE PROVIDED BY THE SPONSOR AT THE BEGINNING OF THE STUDY, OTHERWISE, USE OPTION II (PARAGRAPH B)**]

**OPTION I**

B. The Sponsor shall provide its cash contribution required under Article II.B. of this Agreement in accordance with the following provisions:

1. No later than [**AT LEAST 30**] calendar days prior to the scheduled date for the Government's issuance of the solicitation for the first contract for the Study or for the Government's anticipated first significant in-house expenditure for the Study, the Government shall notify the Sponsor in writing of the funds the Government determines to be required from the Sponsor to meet its share of Study Costs. No later than [**HALF THE ABOVE NUMBER**] calendar days thereafter, the Sponsor shall provide the Government the full amount of the required funds by delivering a check payable to "FAO, USAED, [**APPROPRIATE USACE DISTRICT**]" to the District Engineer.

2. The Government shall draw from the funds provided by the Sponsor such sums as the Government deems necessary to cover the Sponsor's share of contractual and in-house financial obligations attributable to the Study as they are incurred.

3. In the event the Government determines that the Sponsor must provide additional funds to meet its share of Study Costs, the Government shall so notify the Sponsor in writing. No later than [**NORMALLY 60**] calendar days after receipt of such notice, the Sponsor shall provide the Government with a check for the full amount of the additional required funds.

**OPTION II**

B. The Sponsor shall provide its cash contribution required under Article II.B. of this Agreement in accordance with the following provisions:

1. For purposes of budget planning, the Government shall notify the Sponsor by [**SPECIFIC DATE**] of each year of the estimated funds that will be required from the Sponsor to meet the Sponsor's share of Study Costs for the upcoming fiscal year.

2. No later than [**30-60**] calendar days prior to the scheduled date for the Government's issuance of the solicitation for the first contract for the Study or for the Government's anticipated first significant in-house expenditure for the Study, the Government shall notify the Sponsor in writing of the funds the Government determines to be required from the Sponsor to meet its required share of Study Costs for the first fiscal year of the Study. No later than [**HALF THE ABOVE NUMBER**] calendar days thereafter, the Sponsor shall [**SELECT ONE OF THE FOLLOWING MECHANISMS**: [**1**] provide the Government the full amount of the required funds by delivering a check payable to "FAO, USAED, [**APPROPRIATE USACE DISTRICT**]" to the District Engineer. [**2**] verify to the satisfaction of the Government that the Sponsor has deposited the required funds in an escrow or other account acceptable to the Government, with interest accruing to the Sponsor. [**3**] present to the Government an irrevocable letter of credit acceptable to the Government for the required funds.]

3. For the second and subsequent fiscal years of the Study, the Government shall, no later than 60 calendar days prior to the beginning of the fiscal year, notify the Sponsor in writing of the funds the Government determines to be required from the Sponsor to meet its required share of Study Costs for that fiscal year, taking into account any temporary divergences identified under Article II.C. of this Agreement. No later than 30 calendar days prior to the beginning of the fiscal year, the Sponsor shall make the full amount of the required funds available to the Government through the funding mechanism specified in paragraph B.2. of this Article.

4. The Government shall draw from the [**INDICATE MECHANISM:** [**1**] funds [**2**] escrow or other account [**3**] letter of credit] provided by the Sponsor such sums as the Government deems necessary to cover the Sponsor's share of contractual and in-house fiscal obligations attributable to the Study as they are incurred.

5. In the event the Government determines that the Sponsor must provide additional funds to meet its share of Study Costs, the Government shall so notify the Sponsor in writing. No later than [**NORMALLY 60**] calendar days after receipt of such notice, the Sponsor shall make the full amount of the additional required funds available through the funding mechanism specified in paragraph B.2. of this Article.

[**USE PARAGRAPH C WITH EITHER OPTION I OR II**]

C. Within ninety (90) days after the conclusion of the Study Period or termination of this Agreement, the Government shall conduct a final accounting of Study Costs, including disbursements by the Government of Federal funds, cash contributions by the Sponsor, the amount of any excess Study Costs, and credits for the negotiated costs of the Sponsor, and shall furnish the Sponsor with the results of this accounting. Within thirty (30) days thereafter, the Government, subject to the availability of funds, shall reimburse the Sponsor for the excess, if any, of cash contributions and credits given over its required share of Study Costs, other than excess Study Costs, or the Sponsor shall provide the Government any cash contributions required for the Sponsor to meet its required share of Study Costs other than excess Study Costs.

D. The Sponsor shall provide its cash contribution for excess Study Costs as required under Article II.C. of this Agreement by delivering a check payable to "FAO, USAED, [**APPROPRIATE USACE DISTRICT**]" to the District Engineer as follows:

1. After the project that is the subject of this Study has been authorized for construction, no later than the date on which a Project Cooperation Agreement is entered into for the project; or

2. In the event the project that is the subject of this Study is not authorized for construction by a date that is no later than 5 years of the date of the final report of the Chief of Engineers concerning the project, or by a date that is no later than 2 years after the date of the termination of the study, the Sponsor shall pay its share of excess costs on that date (5 years after the date of the Chief of Engineers or 2 year after the date of the termination of the study).

ARTICLE IV - STUDY MANAGEMENT AND COORDINATION

A. To provide for consistent and effective communication, the Sponsor and the Government shall appoint named senior representatives to an Executive Committee. [**THE EXECUTIVE COMMITTEE SHALL NORMALLY INCLUDE THE DISTRICT'S CHIEF, PLANNING DIVISION, AND THEIR COUNTERPARTS FROM THE SPONSOR**.] Thereafter, the Executive Committee shall meet regularly until the end of the Study Period.

B. Until the end of the Study Period, the Executive Committee shall generally oversee the Study consistently with the PSP.

C. The Executive Committee may make recommendations that it deems warranted to the District Engineer on matters that it oversees, including suggestions to avoid potential sources of dispute. The Government in good faith shall consider such recommendations. The Government has the discretion to accept, reject, or modify the Executive Committee's recommendations.

D. The Executive Committee shall appoint representatives to serve on a Study Management Team. The Study Management Team shall keep the Executive Committee informed of the progress of the Study and of significant pending issues and actions, and shall prepare periodic reports on the progress of all work items identified in the PSP.

E. The costs of participation in the Executive Committee (including the cost to serve on the Study Management Team) shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

## ARTICLE V - DISPUTES

As a condition precedent to a party bringing any suit for breach of this Agreement, that party must first notify the other party in writing of the nature of the purported breach and seek in good faith to resolve the dispute through negotiation. If the parties cannot resolve the dispute through negotiation, they may agree to a mutually acceptable method of non-binding alternative dispute resolution with a qualified third party acceptable to both parties. The parties shall each pay 50 percent of any costs for the services provided by such a third party as such costs are incurred. Such costs shall not be included in Study Costs. The existence of a dispute shall not excuse the parties from performance pursuant to this Agreement.

## ARTICLE VI - MAINTENANCE OF RECORDS

A. Within 60 days of the effective date of this Agreement, the Government and the Sponsor shall develop procedures for keeping books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to this Agreement to the extent and in such detail as will properly reflect total Study Costs. These procedures shall incorporate, and apply as appropriate, the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to state and local governments at 32 C.F.R. Section 33.20. The Government and the Sponsor shall maintain such books, records, documents, and other evidence in accordance with these procedures for a minimum of three years after completion of the Study and resolution of all relevant claims arising therefrom. To the extent permitted under applicable Federal laws and regulations, the Government and the Sponsor shall each allow the other to inspect such books, documents, records, and other evidence.

B. In accordance with 31 U.S.C. Section 7503, the Government may conduct audits in addition to any audit that the Sponsor is required to conduct under the Single Audit Act of 1984, 31 U.S.C. Sections 7501-7507. Any such Government audits shall be conducted in accordance with Government Auditing Standards and the cost principles in OMB Circular No. A-87 and other applicable cost principles and regulations. The costs of Government audits shall be included in total Study Costs and shared in accordance with the provisions of this Agreement.

## ARTICLE VII - RELATIONSHIP OF PARTIES

The Government and the Sponsor act in independent capacities in the performance of their respective rights and obligations under this Agreement, and neither is to be considered the officer, agent, or employee of the other.

## ARTICLE VIII - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, nor any resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom.

ARTICLE IX - FEDERAL AND STATE LAWS

In the exercise of the Sponsor's rights and obligations under this Agreement, the Sponsor agrees to comply with all applicable Federal and State laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) and Department of Defense Directive 5500.11 issued pursuant thereto and published in 32 C.F.R. Part 195, as well as Army Regulations 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army".

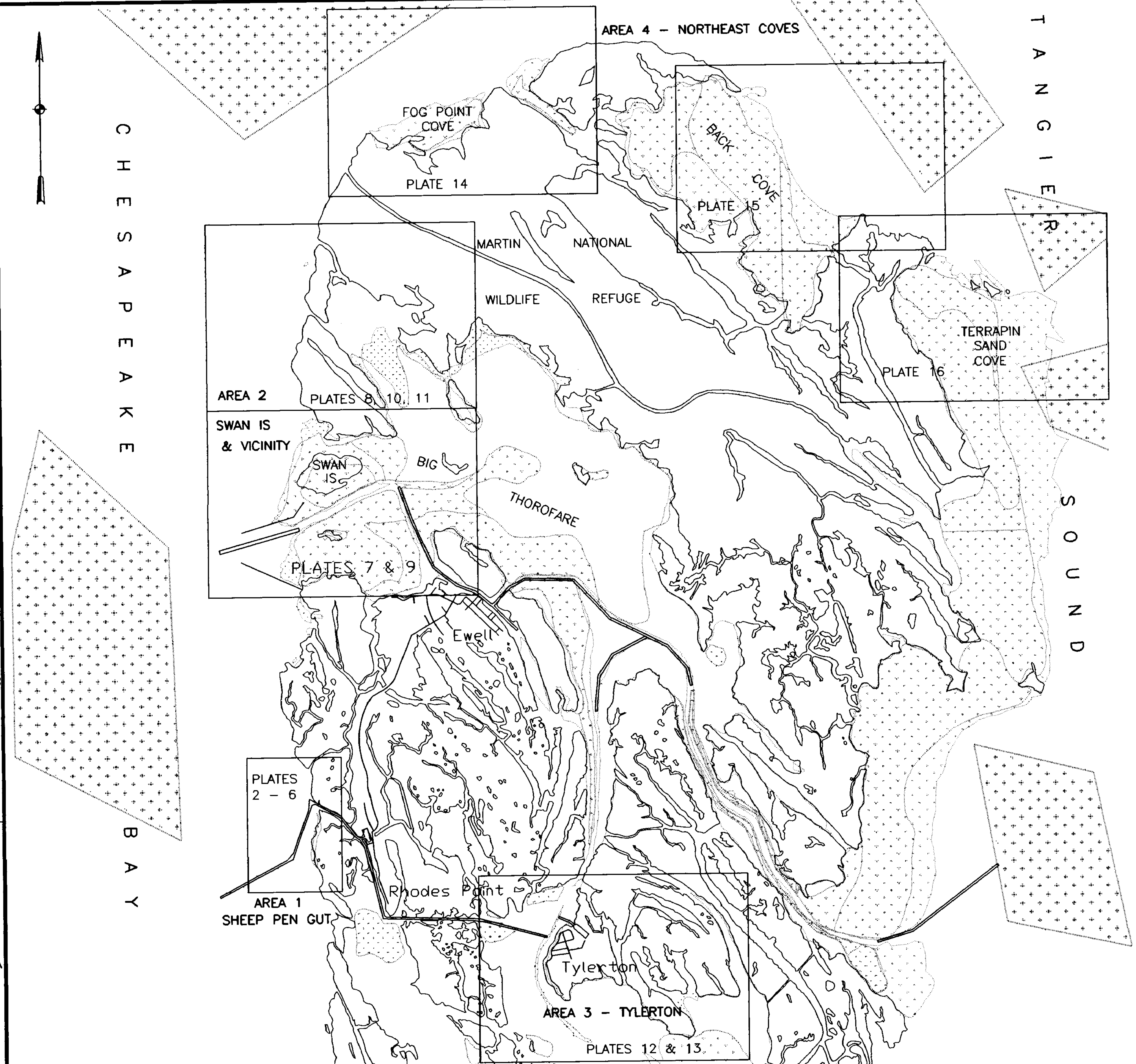
ARTICLE X - TERMINATION OR SUSPENSION

A. This Agreement shall terminate at the conclusion of the Study Period, and neither the Government nor the Sponsor shall have any further obligations hereunder, except as provided in Article III.C.; provided, that prior to such time and upon thirty (30) days written notice, either party may terminate or suspend this Agreement. In addition, the Government shall terminate this Agreement immediately upon any failure of the parties to agree to extend the study under Article II.E. of this agreement, or upon the failure of the sponsor to fulfill its obligation under Article III. of this Agreement. In the event that either party elects to terminate this Agreement, both parties shall conclude their activities relating to the Study and proceed to a final accounting in accordance with Article III.C. and III.D. of this Agreement. Upon termination of this Agreement, all data and information generated as part of the Study shall be made available to both parties.

B. Any termination of this Agreement shall not relieve the parties of liability for any obligations previously incurred,
including the costs of closing out or transferring any existing contracts.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the District Engineer for the U.S. Army Corps of Engineers, __________ District.

| | |
|---|---|
| DEPARTMENT OF THE ARMY | [SPONSOR] |
| BY____________________________ | BY_________________________ |
| Colonel, Corps of Engineers<br>District Engineer<br>___________ District | (Title) |




## INDEX OF DRAWINGS

| PLATE NO. | TITLE |
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| 1 | SITE MAP & INDEX OF DRAWINGS |
| 2 | SHEEP PEN GUT PLAN 1 SHORELINE PROTECTION |
| 3 | SHEEP PEN GUT PLAN 2 JETTY ALTERNATIVE 1 |
| 4 | SHEEP PEN GUT PLAN 2 JETTY ALTERNATIVE 2 |
| 5 | SHEEP PEN GUT PLAN 2 JETTY ALTERNATIVE 3 |
| 6 | SHEEP PEN GUT PLAN 2 JETTY ALTERNATIVE 4 |
| 7 | SWAN IS & VICINITY PLAN 1 BREACHES |
| 8 | SWAN IS & VICINITY PLAN 1 BREACHES |
| 9 | SWAN IS & VICINITY PLAN 2 BREAKWATERS ON LOWER NW COAST |
| 10 | SWAN IS & VICINITY PLAN 2 BREAKWATERS ON LOWER NW COAST |
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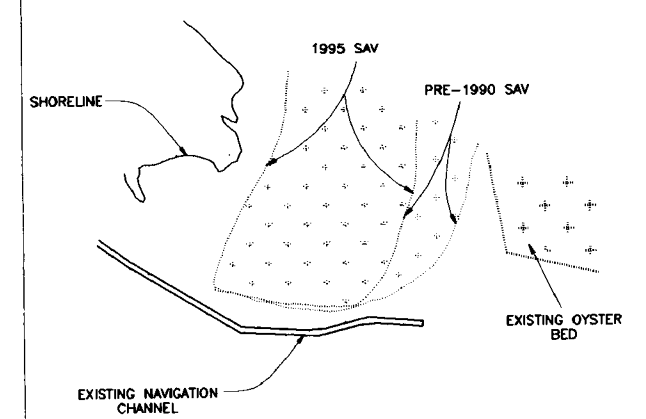
| 15 | NORTHEAST COVES BREAKWATERS |
| 16 | NORTHEAST COVES BREAKWATERS |
| 17 | TYPICAL SECTIONS |

## LEGEND FOR PLATES 1 – 16




NOTE: SAV – SUBMERGED AQUATIC VEGETATION

NOTES:

1. MAPPING SHOWN ON THIS PLATE AND PLATES 7 – 16 WAS BASED ON 1:24,000 SCALE MAPPING OBTAINED FROM THE MARYLAND DEPARTMENT OF TRANSPORTATION, DATED 1993. EXISTING FEATURES SHOWN ON PLATES 7 – 16 ARE APPROXIMATELY LOCATED, SINCE THESE LARGE SCALE MAPS WERE BASED ON THE SMALL SCALE MD DOT MAPPING.
2. BATHYMETRIC POINTS SHOWN ON PLATES 7 – 16 WERE DERIVED FROM NOAA NAVIGATION CHART DATED 1993. SCALE OF CHART WAS 1:63,360.
3. SUBMERGED AQUATIC VEGETATION LOCATIONS WERE BASED ON DATA FROM THE VIRGINIA INSTITUTE OF MARINE SCIENCE, CURRENT TO 1994 AND AT A SCALE OF 1:24,000.
4. MAPPING ON PLATES 2 – 6 WAS BASED ON SURVEYS BY THE BALTIMORE DISTRICT IN JUNE 1996. SCALE OF MAPPING IS 1"=100', OR 1:1200.

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY

# SITE MAP & INDEX OF DRAWINGS

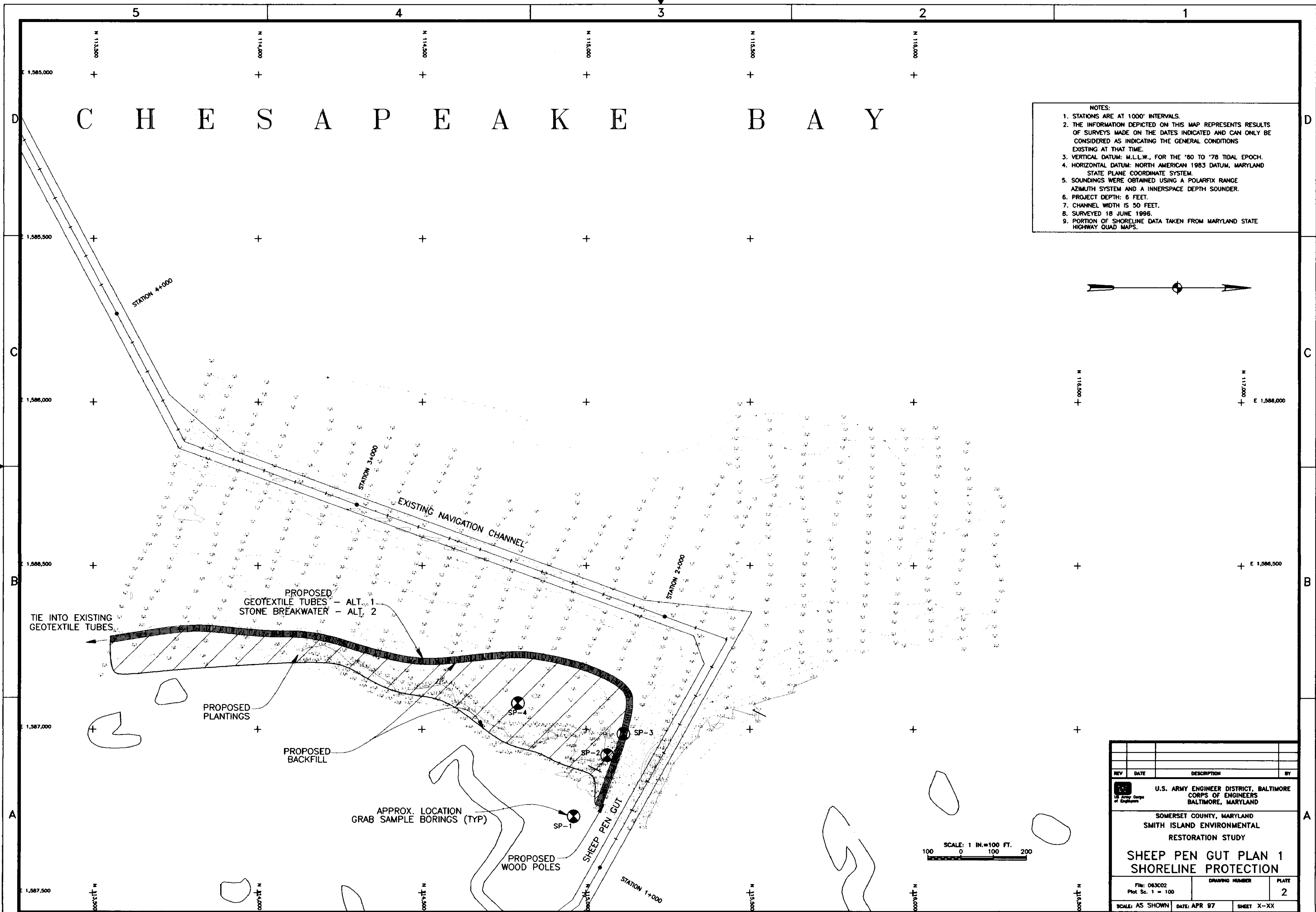
File: 063C01
Plot Sc. 1 = 1150

DRAWING NUMBER

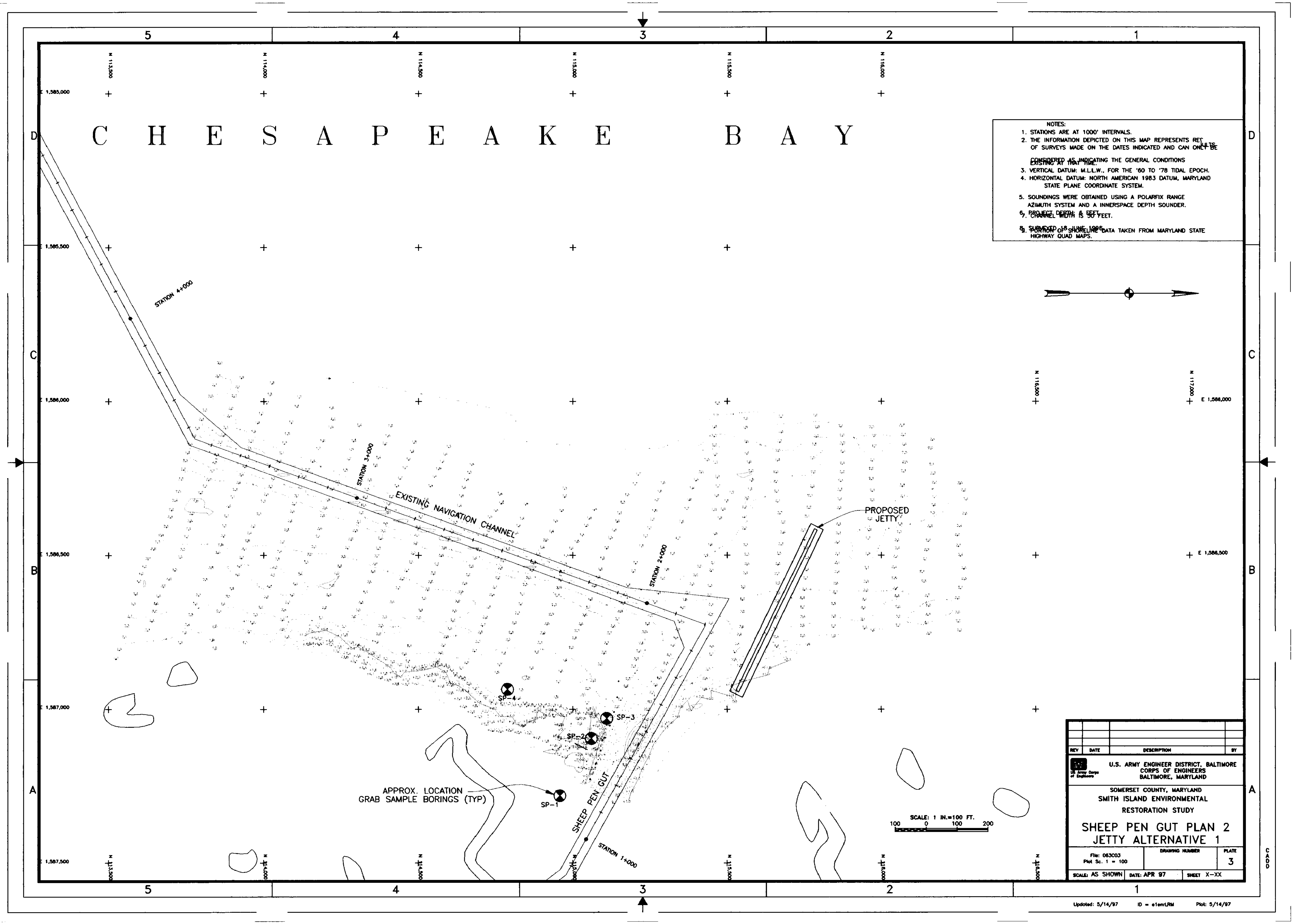
PLATE 1

SCALE: AS SHOWN | DATE: APR 97 | SHEET X-XX

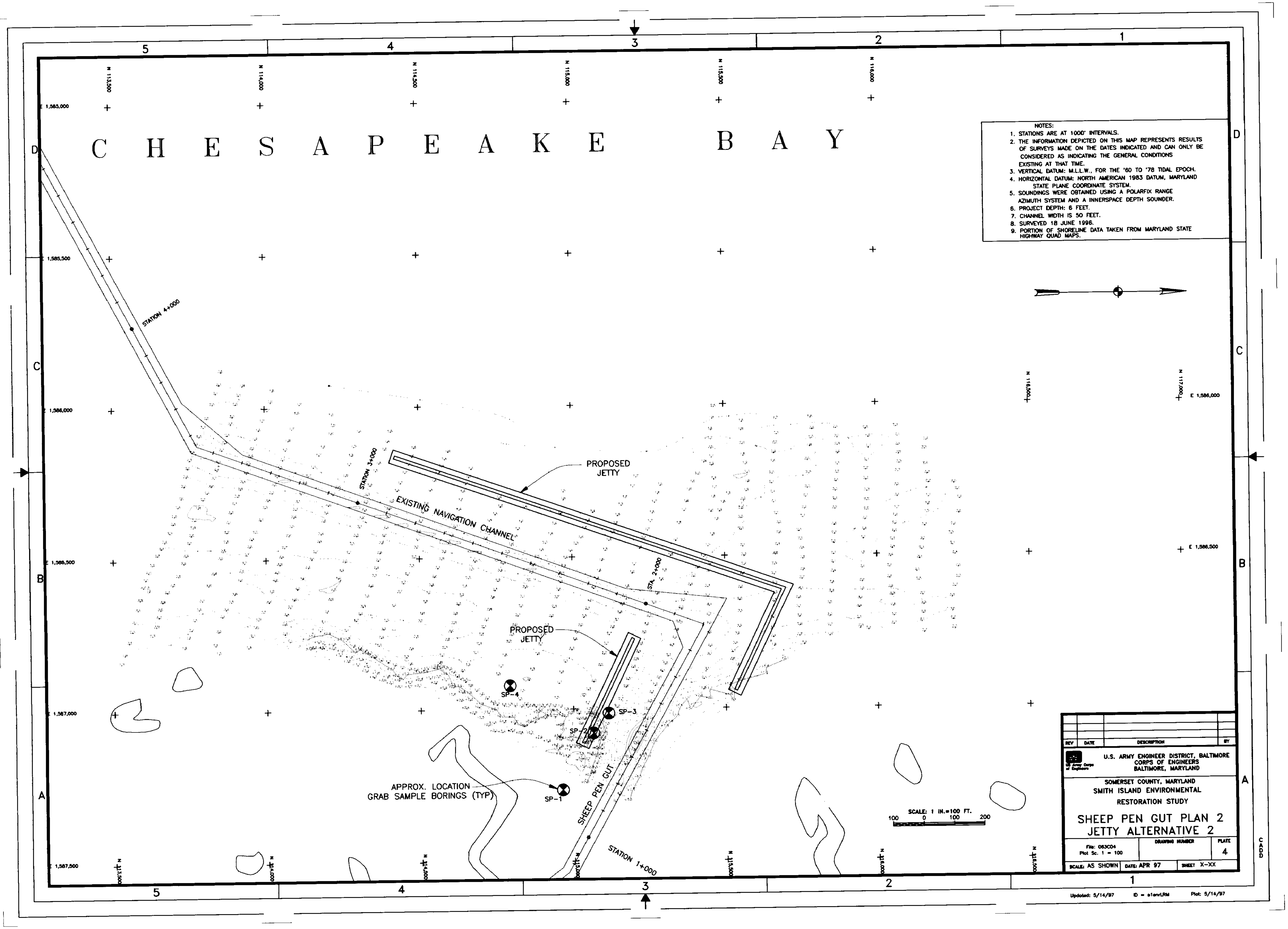
Updated: 5/14/97 ID = e1enrLRM Plot: 5/14/97



CHESAPEAKE BAY
NOTES:
1. STATIONS ARE AT 1000' INTERVALS.
2. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
3. VERTICAL DATUM: M.L.L.W., FOR THE '60 TO '78 TIDAL EPOCH.
4. HORIZONTAL DATUM: NORTH AMERICAN 1983 DATUM, MARYLAND STATE PLANE COORDINATE SYSTEM.
5. SOUNDINGS WERE OBTAINED USING A POLARFIX RANGE AZIMUTH SYSTEM AND A INNERSPACE DEPTH SOUNDER.
6. PROJECT DEPTH: 6 FEET.
7. CHANNEL WIDTH IS 50 FEET.
8. SURVEYED 18 JUNE 1996.
9. PORTION OF SHORELINE DATA TAKEN FROM MARYLAND STATE HIGHWAY QUAD MAPS.
STATION 4+000
STATION 3+000
EXISTING NAVIGATION CHANNEL
STATION 2+000
STATION 1+000
TIE INTO EXISTING GEOTEXTILE TUBES
PROPOSED GEOTEXTILE TUBES - ALT. 1 STONE BREAKWATER - ALT. 2
PROPOSED PLANTINGS
PROPOSED BACKFILL
APPROX. LOCATION GRAB SAMPLE BORINGS (TYP)
PROPOSED WOOD POLES
SHEEP PEN GUT
SP-1
SP-2
SP-3
SP-4
SCALE: 1 IN.=100 FT.
100 0 100 200
REV
DATE
DESCRIPTION
BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SHEEP PEN GUT PLAN 1
SHORELINE PROTECTION
File: 063C02
Plot Sc. 1 = 100
DRAWING NUMBER
PLATE
2
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX



CHESAPEAKE BAY
NOTES:
1. STATIONS ARE AT 1000' INTERVALS.
2. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
3. VERTICAL DATUM: M.L.L.W., FOR THE '60 TO '78 TIDAL EPOCH.
4. HORIZONTAL DATUM: NORTH AMERICAN 1983 DATUM, MARYLAND STATE PLANE COORDINATE SYSTEM.
5. SOUNDINGS WERE OBTAINED USING A POLARFIX RANGE AZIMUTH SYSTEM AND A INNERSPACE DEPTH SOUNDER.
6. PROJECT DEPTH: 6 FEET.
7. CHANNEL WIDTH IS 50 FEET.
8. SURVEYED 18 JUNE 1996.
9. PORTION OF SHORELINE DATA TAKEN FROM MARYLAND STATE HIGHWAY QUAD MAPS.
STATION 4+000
STATION 3+000
EXISTING NAVIGATION CHANNEL
STATION 2+000
PROPOSED JETTY
SP-4
SP-3
SP-2
SP-1
APPROX. LOCATION GRAB SAMPLE BORINGS (TYP)
SHEEP PEN GUT
STATION 1+000
SCALE: 1 IN.=100 FT.
100 0 100 200
REV | DATE | DESCRIPTION | BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL RESTORATION STUDY
SHEEP PEN GUT PLAN 2
JETTY ALTERNATIVE 1
File: 063C03
Plot Sc. 1 = 100
DRAWING NUMBER
PLATE 3
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
ID = e1enrLRM
Plot: 5/14/97



CHESAPEAKE BAY
NOTES:
1. STATIONS ARE AT 1000' INTERVALS.
2. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
3. VERTICAL DATUM: M.L.L.W., FOR THE '60 TO '78 TIDAL EPOCH.
4. HORIZONTAL DATUM: NORTH AMERICAN 1983 DATUM, MARYLAND STATE PLANE COORDINATE SYSTEM.
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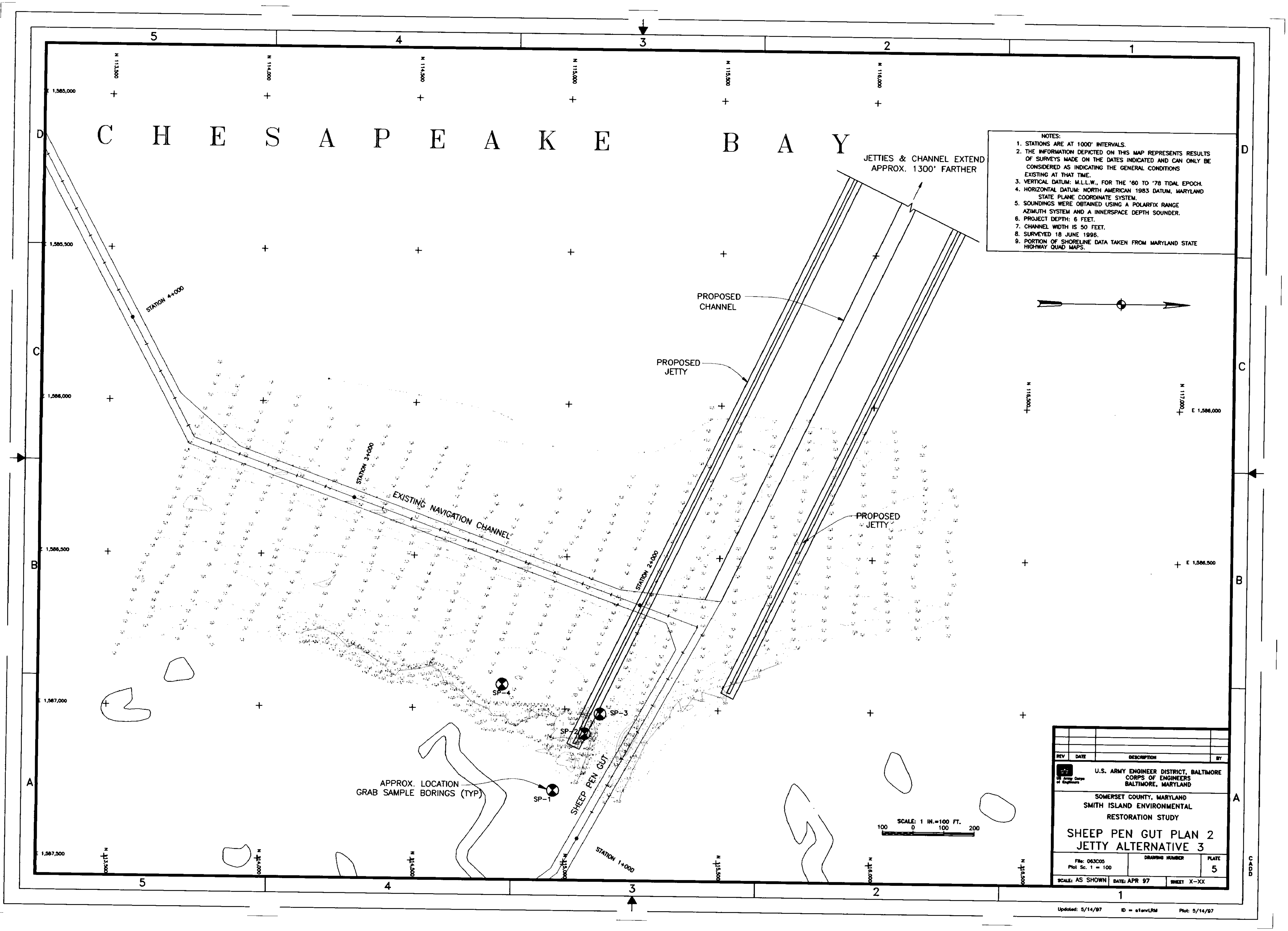
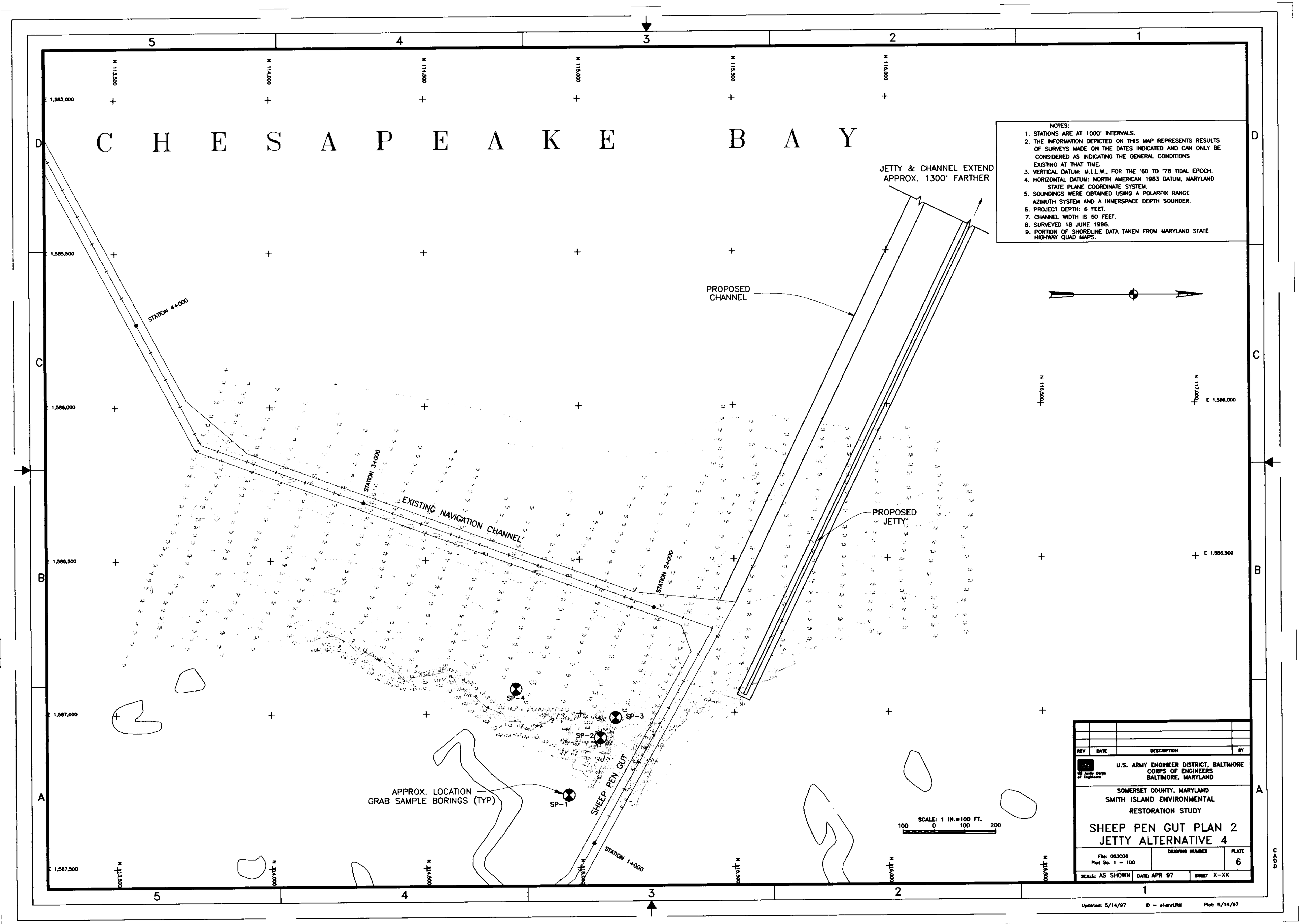
6. PROJECT DEPTH: 6 FEET.
7. CHANNEL WIDTH IS 50 FEET.
8. SURVEYED 18 JUNE 1996.
9. PORTION OF SHORELINE DATA TAKEN FROM MARYLAND STATE HIGHWAY QUAD MAPS.
STATION 4+000
STATION 3+000
STA. 2+000
STATION 1+000
EXISTING NAVIGATION CHANNEL
PROPOSED JETTY
PROPOSED JETTY
SP-1
SP-2
SP-3
SP-4
APPROX. LOCATION GRAB SAMPLE BORINGS (TYP)
SHEEP PEN GUT
SCALE: 1 IN.=100 FT.
100 0 100 200
REV | DATE | DESCRIPTION | BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SHEEP PEN GUT PLAN 2
JETTY ALTERNATIVE 2
File: 063C04
Plot Sc. 1 = 100
DRAWING NUMBER
PLATE 4
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
ID = e1enrLRM
Plot: 5/14/97


CHESAPEAKE BAY
JETTIES & CHANNEL EXTEND APPROX. 1300' FARTHER
NOTES:
1. STATIONS ARE AT 1000' INTERVALS.
2. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
3. VERTICAL DATUM: M.L.L.W., FOR THE '60 TO '78 TIDAL EPOCH.
4. HORIZONTAL DATUM: NORTH AMERICAN 1983 DATUM, MARYLAND STATE PLANE COORDINATE SYSTEM.
5. SOUNDINGS WERE OBTAINED USING A POLARFIX RANGE AZIMUTH SYSTEM AND A INNERSPACE DEPTH SOUNDER.
6. PROJECT DEPTH: 6 FEET.
7. CHANNEL WIDTH IS 50 FEET.
8. SURVEYED 18 JUNE 1996.
9. PORTION OF SHORELINE DATA TAKEN FROM MARYLAND STATE HIGHWAY QUAD MAPS.
PROPOSED CHANNEL
PROPOSED JETTY
PROPOSED JETTY
STATION 4+000
STATION 3+000
STATION 2+000
STATION 1+000
EXISTING NAVIGATION CHANNEL
SHEEP PEN GUT
SP-1
SP-2
SP-3
SP-4
APPROX. LOCATION GRAB SAMPLE BORINGS (TYP)
SCALE: 1 IN.=100 FT.
100 0 100 200
REV
DATE
DESCRIPTION
BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SHEEP PEN GUT PLAN 2
JETTY ALTERNATIVE 3
File: 063C05
Plot Sc. 1 = 100
DRAWING NUMBER
PLATE
5
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
Plot: 5/14/97


CHESAPEAKE BAY
JETTY & CHANNEL EXTEND APPROX. 1300' FARTHER
NOTES:
1. STATIONS ARE AT 1000' INTERVALS.
2. THE INFORMATION DEPICTED ON THIS MAP REPRESENTS RESULTS OF SURVEYS MADE ON THE DATES INDICATED AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS EXISTING AT THAT TIME.
3. VERTICAL DATUM: M.L.L.W., FOR THE '60 TO '78 TIDAL EPOCH.
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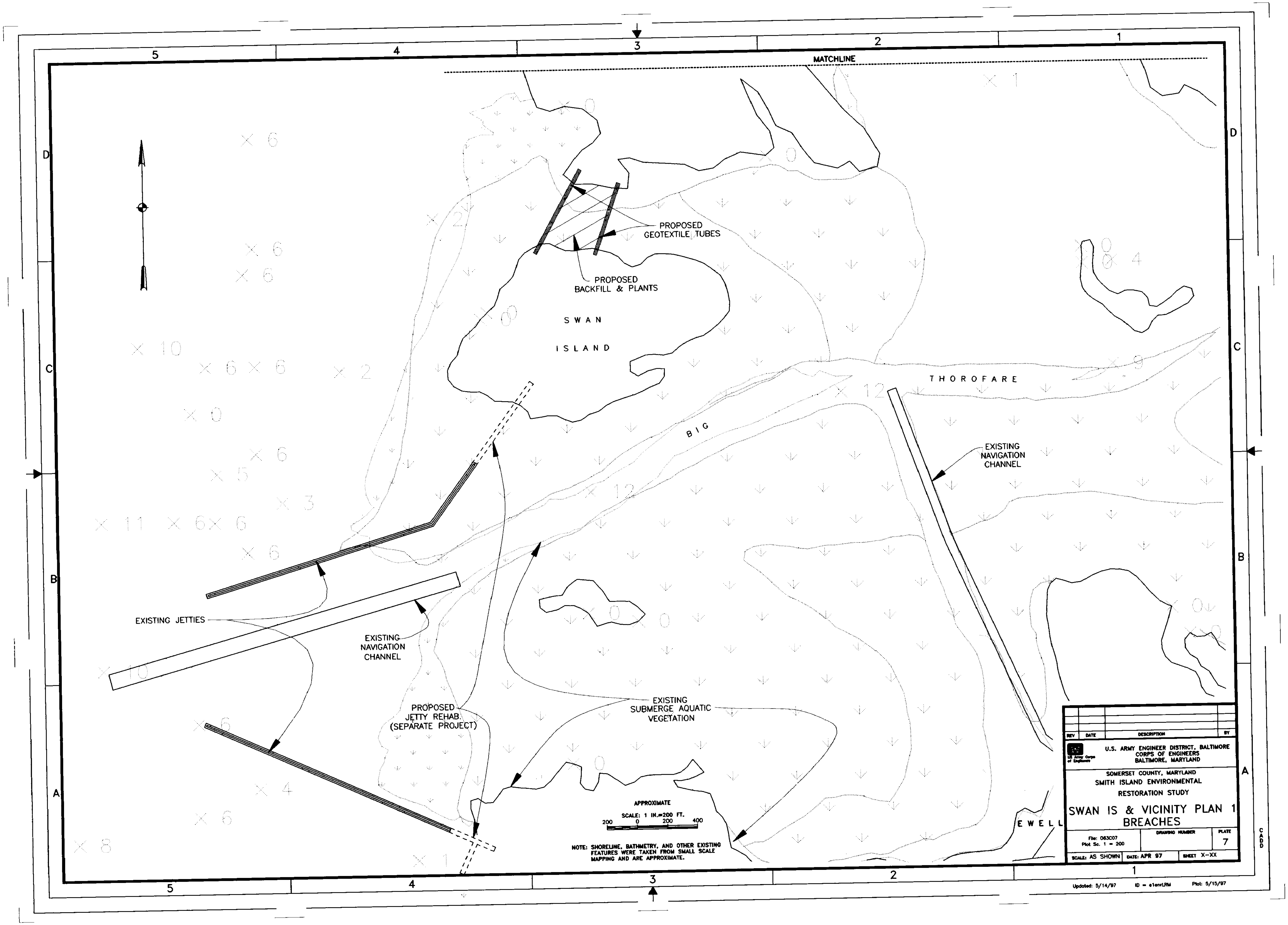
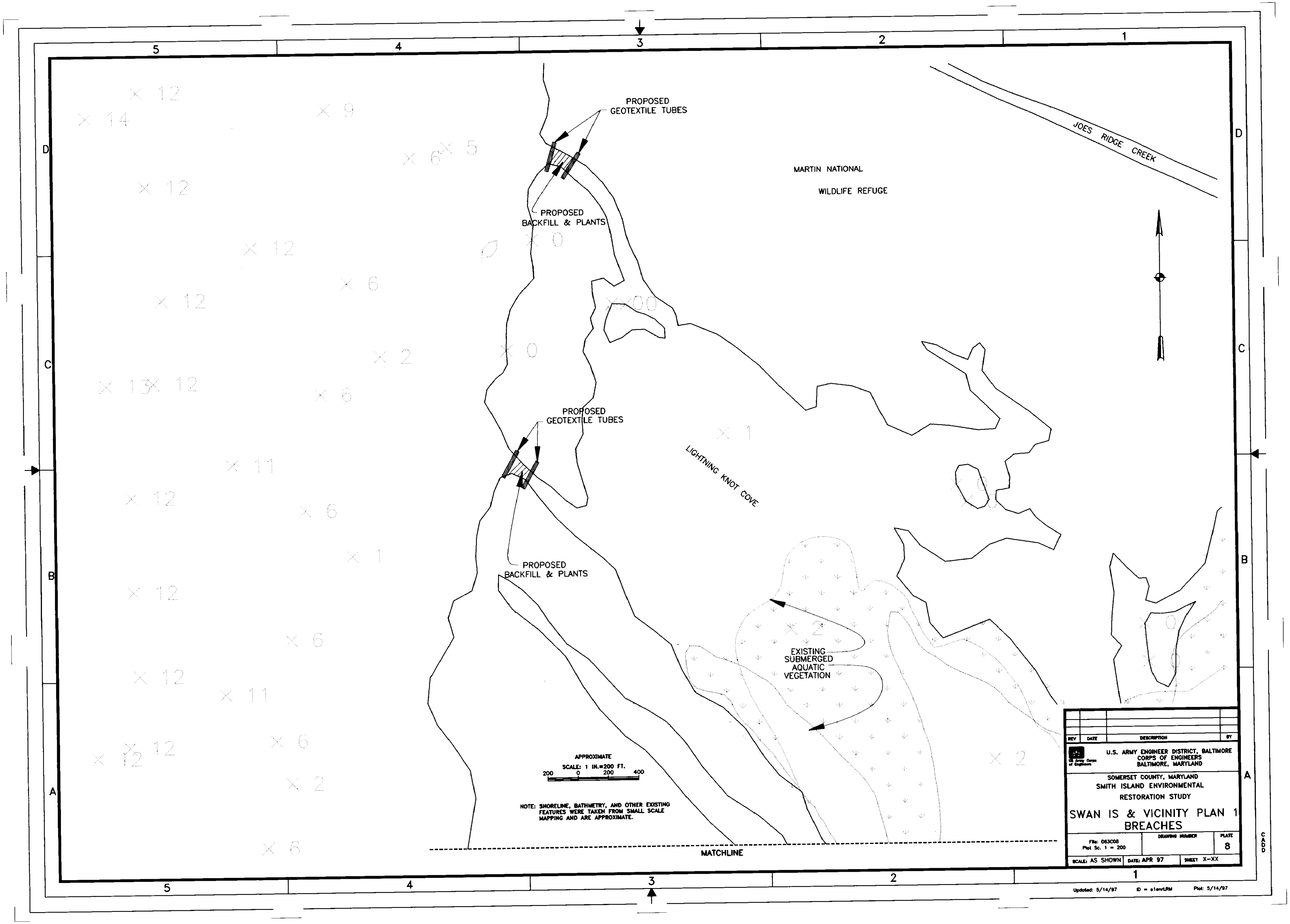
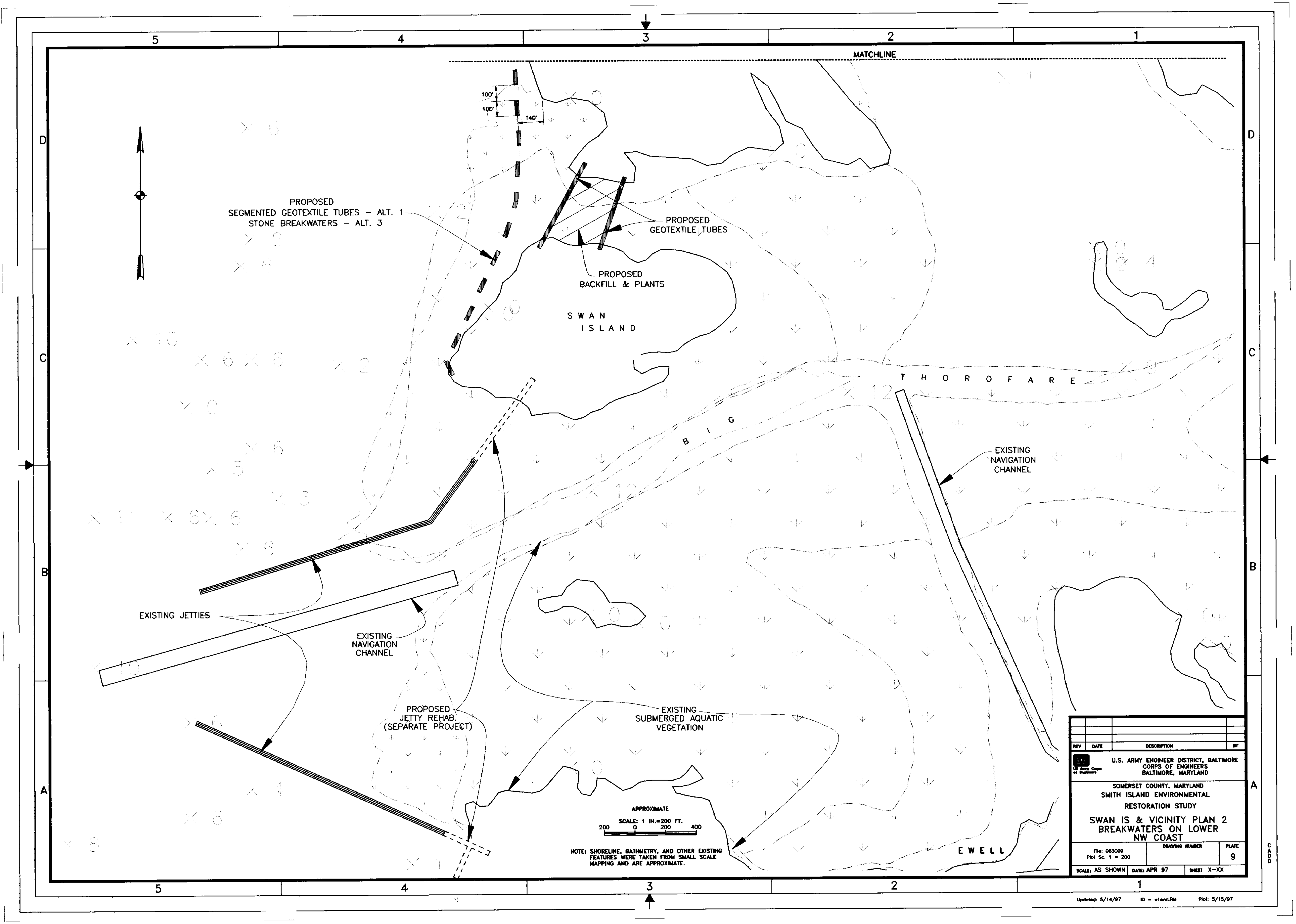
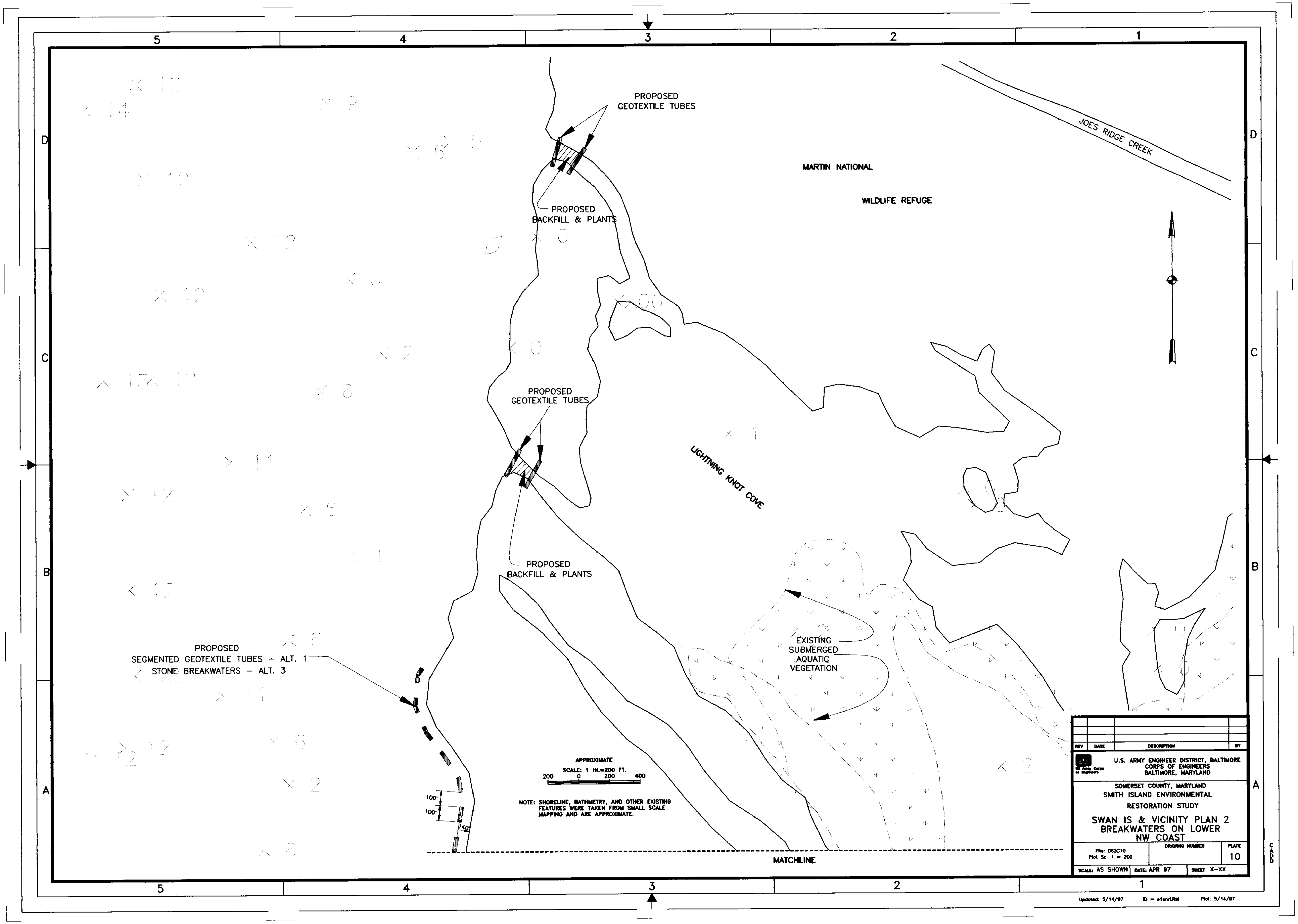
5. SOUNDINGS WERE OBTAINED USING A POLARFIX RANGE AZIMUTH SYSTEM AND A INNERSPACE DEPTH SOUNDER.
6. PROJECT DEPTH: 6 FEET.
7. CHANNEL WIDTH IS 50 FEET.
8. SURVEYED 18 JUNE 1996.
9. PORTION OF SHORELINE DATA TAKEN FROM MARYLAND STATE HIGHWAY QUAD MAPS.
PROPOSED CHANNEL
STATION 4+000
STATION 3+000
EXISTING NAVIGATION CHANNEL
STATION 2+000
PROPOSED JETTY
SP-4
SP-3
SP-2
SP-1
APPROX. LOCATION GRAB SAMPLE BORINGS (TYP)
SHEEP PEN GUT
STATION 1+000
SCALE: 1 IN.=100 FT.
100 0 100 200
REV | DATE | DESCRIPTION | BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SHEEP PEN GUT PLAN 2
JETTY ALTERNATIVE 4
File: 063C06
Plot Sc. 1 = 100
DRAWING NUMBER
PLATE 6
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
ID = elenrLRM
Plot: 5/14/97

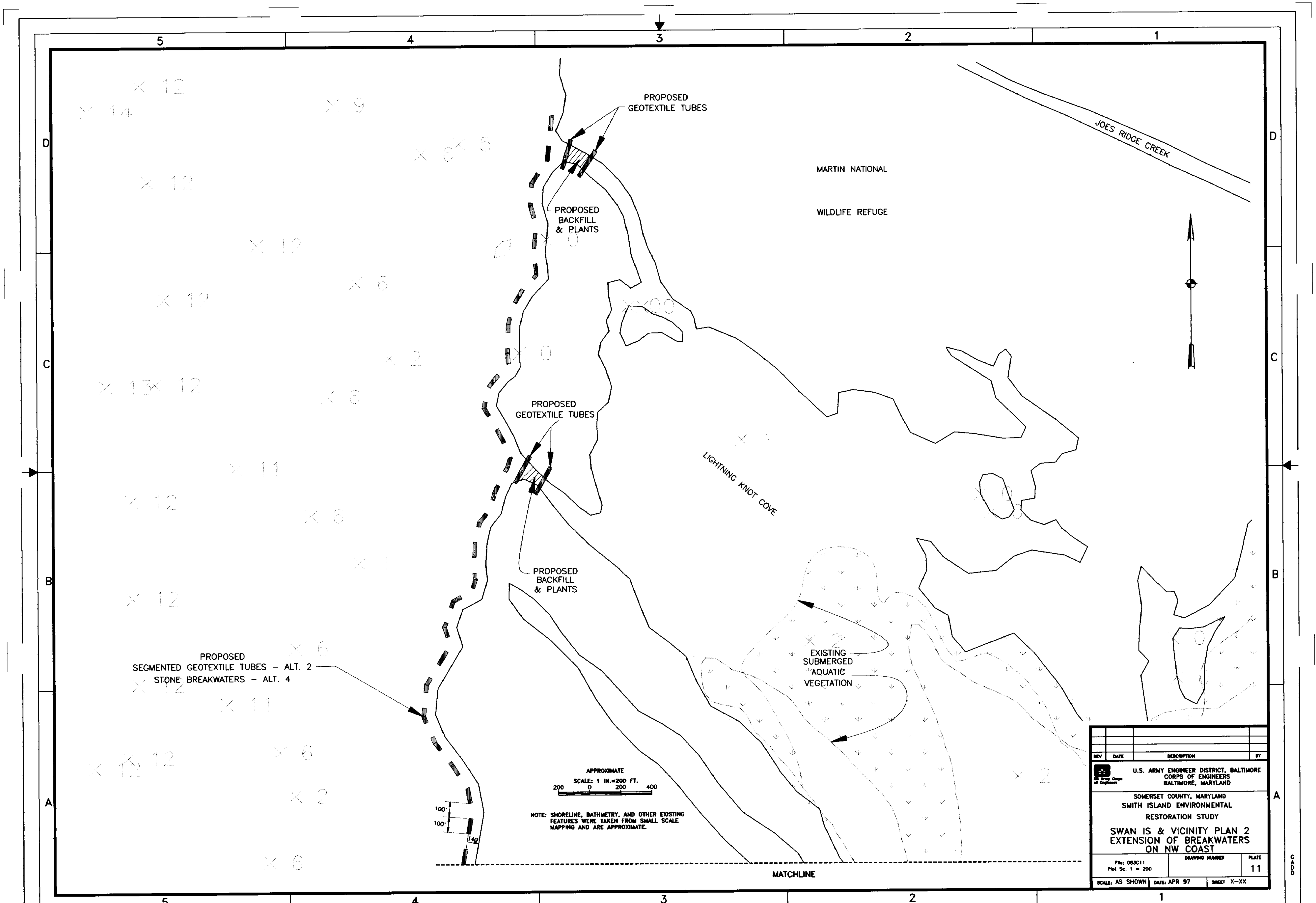

MATCHLINE
PROPOSED GEOTEXTILE TUBES
PROPOSED BACKFILL & PLANTS
S W A N
I S L A N D
T H O R O F A R E
B I G
EXISTING NAVIGATION CHANNEL
EXISTING JETTIES
EXISTING NAVIGATION CHANNEL
PROPOSED JETTY REHAB (SEPARATE PROJECT)
EXISTING SUBMERGE AQUATIC VEGETATION
E W E L L
APPROXIMATE
SCALE: 1 IN.=200 FT.
200 0 200 400
NOTE: SHORELINE, BATHMETRY, AND OTHER EXISTING FEATURES WERE TAKEN FROM SMALL SCALE MAPPING AND ARE APPROXIMATE.
REV
DATE
DESCRIPTION
BY
US Army Corps of Engineers
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SWAN IS & VICINITY PLAN 1
BREACHES
File: 063C07
Plot Sc. 1 = 200
DRAWING NUMBER
PLATE
7
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
ID = e1enrLRM
Plot: 5/15/97


PROPOSED GEOTEXTILE TUBES
PROPOSED BACKFILL & PLANTS
MARTIN NATIONAL WILDLIFE REFUGE
JOES RIDGE CREEK
PROPOSED GEOTEXTILE TUBES
LIGHTNING KNOT COVE
PROPOSED BACKFILL & PLANTS
EXISTING SUBMERGED AQUATIC VEGETATION
APPROXIMATE
SCALE: 1 IN.=200 FT.
200 0 200 400
NOTE: SHORELINE, BATHYMETRY, AND OTHER EXISTING FEATURES WERE TAKEN FROM SMALL SCALE MAPPING AND ARE APPROXIMATE.
MATCHLINE
REV DATE DESCRIPTION BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SWAN IS & VICINITY PLAN 1
BREACHES
File: 063C08
Plot Sc. 1 = 200
DRAWING NUMBER
PLATE
8
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
ID = e1enrLRM
Plot: 5/14/97


MATCHLINE
100'
100'
140'
PROPOSED
SEGMENTED GEOTEXTILE TUBES – ALT. 1
STONE BREAKWATERS – ALT. 3
PROPOSED
GEOTEXTILE TUBES
PROPOSED
BACKFILL & PLANTS
SWAN
ISLAND
THOROFARE
BIG
EXISTING
NAVIGATION
CHANNEL
EXISTING JETTIES
EXISTING
NAVIGATION
CHANNEL
PROPOSED
JETTY REHAB.
(SEPARATE PROJECT)
EXISTING
SUBMERGED AQUATIC
VEGETATION
EWELL
APPROXIMATE
SCALE: 1 IN.=200 FT.
200 0 200 400
NOTE: SHORELINE, BATHMETRY, AND OTHER EXISTING FEATURES WERE TAKEN FROM SMALL SCALE MAPPING AND ARE APPROXIMATE.
REV DATE DESCRIPTION BY
US Army Corps of Engineers
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SWAN IS & VICINITY PLAN 2
BREAKWATERS ON LOWER
NW COAST
File: 063C09
Plot Sc. 1 = 200
DRAWING NUMBER
PLATE
9
SCALE: AS SHOWN
DATE: APR 97
SHEET X–XX
CADD
Updated: 5/14/97
ID = e1enrLRM
Plot: 5/15/97



PROPOSED
GEOTEXTILE TUBES
PROPOSED
BACKFILL & PLANTS
JOES RIDGE CREEK
MARTIN NATIONAL
WILDLIFE REFUGE
PROPOSED
GEOTEXTILE TUBES
LIGHTNING KNOT COVE
PROPOSED
BACKFILL & PLANTS
PROPOSED
SEGMENTED GEOTEXTILE TUBES – ALT. 1
STONE BREAKWATERS – ALT. 3
EXISTING
SUBMERGED
AQUATIC
VEGETATION
100'
100'
140'
APPROXIMATE
SCALE: 1 IN.=200 FT.
200 0 200 400
NOTE: SHORELINE, BATHMETRY, AND OTHER EXISTING FEATURES WERE TAKEN FROM SMALL SCALE MAPPING AND ARE APPROXIMATE.
MATCHLINE
REV DATE DESCRIPTION BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
SWAN IS & VICINITY PLAN 2
BREAKWATERS ON LOWER
NW COAST
File: 063C10
Plot Sc. 1 = 200
DRAWING NUMBER
PLATE
10
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
ID = elenrLRM
Plot: 5/14/97

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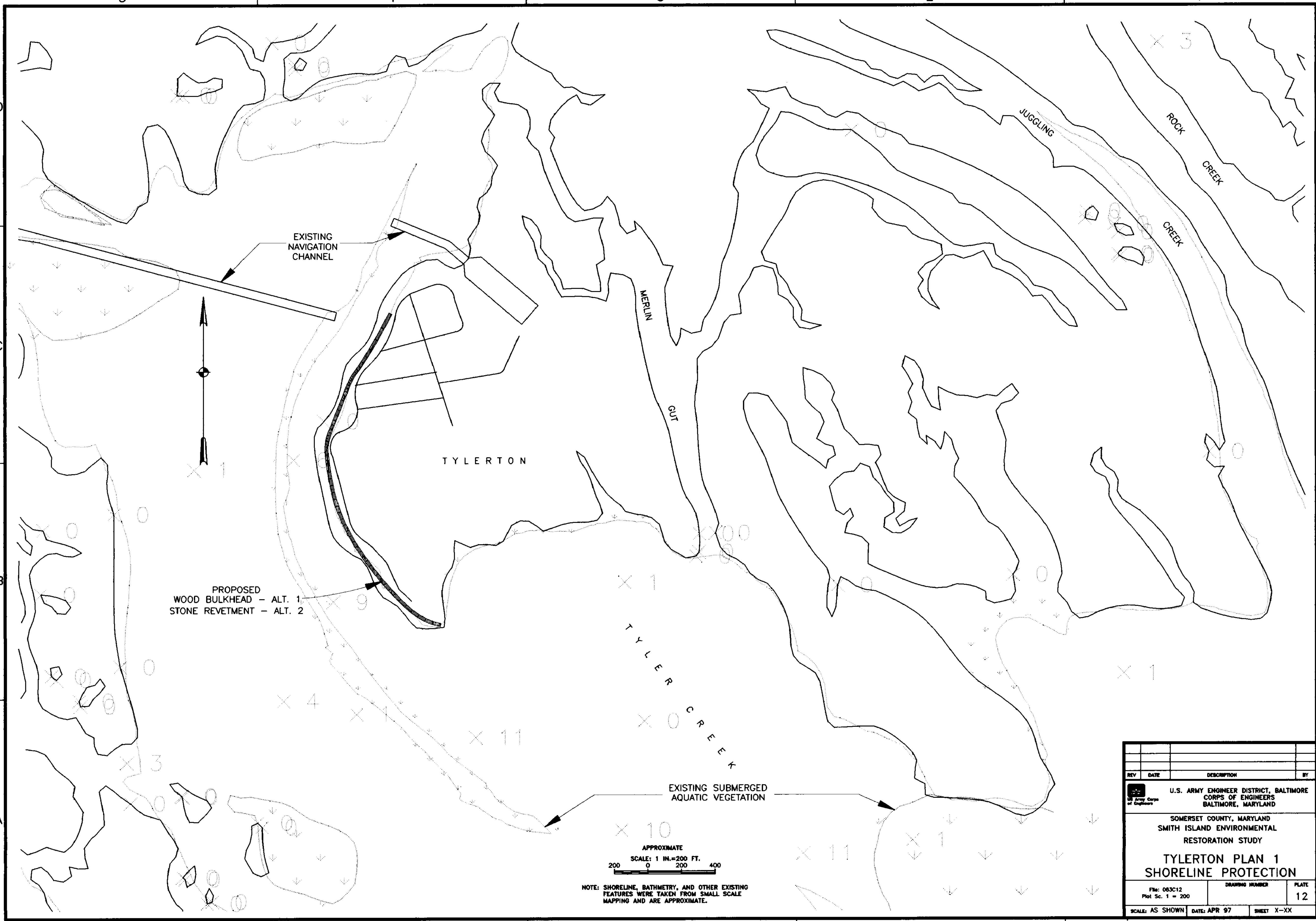


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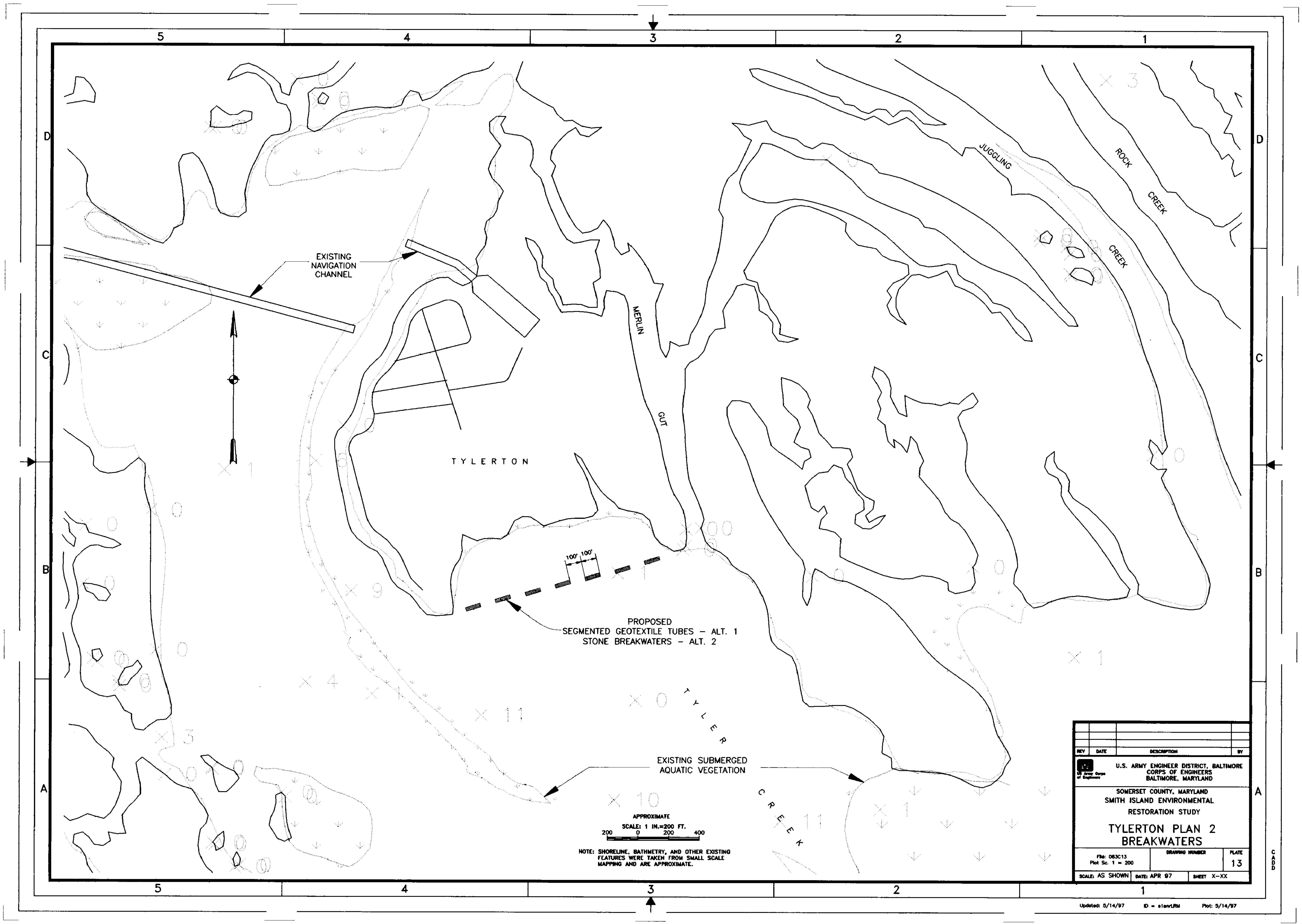
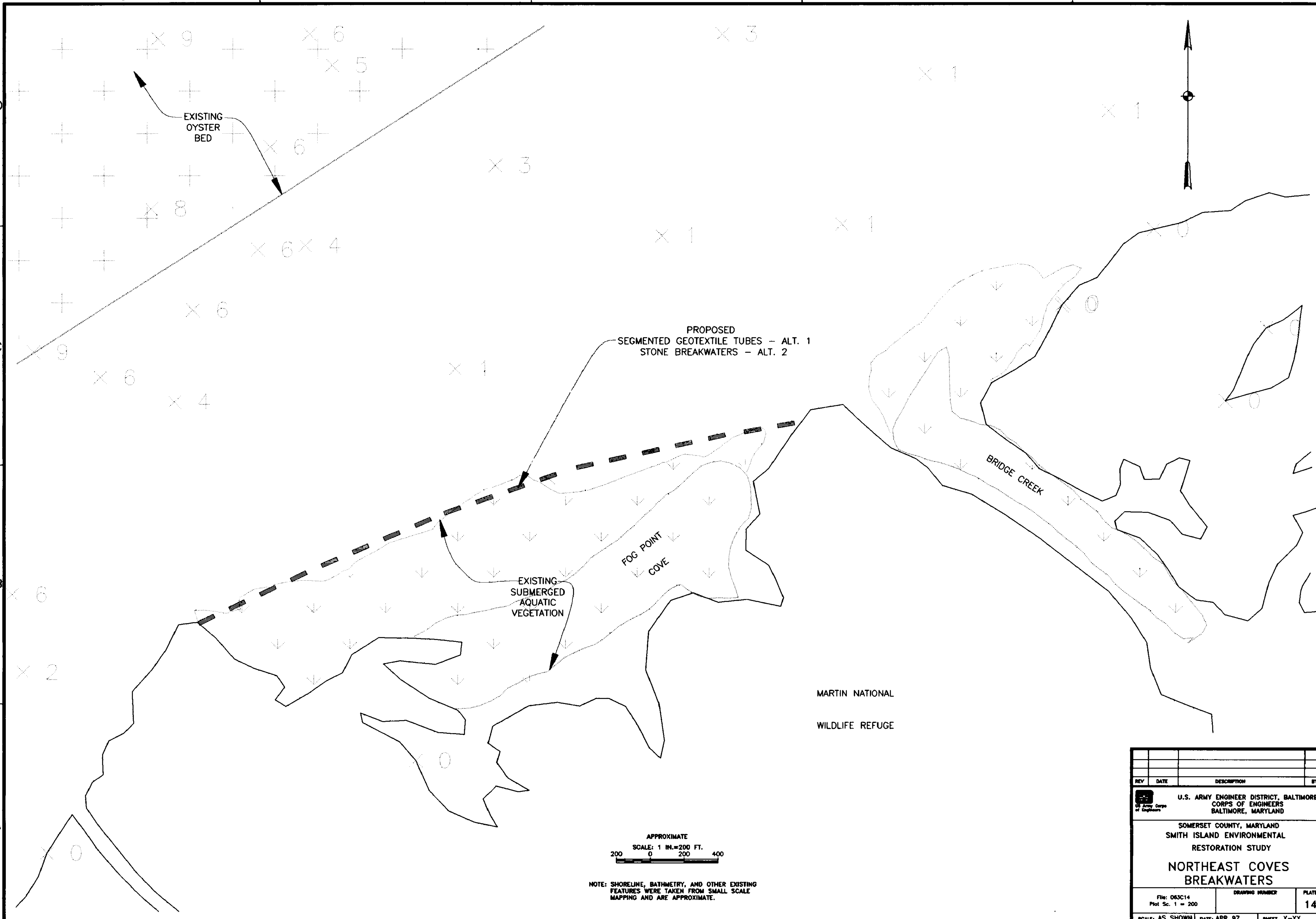
Updated: 5/14/97 ID = elenvLRM Plot: 5/14/97


EXISTING NAVIGATION CHANNEL
TYLERTON
MERLIN GUT
JUGGLING CREEK
ROCK CREEK
TYLER CREEK
100'
100'
PROPOSED
SEGMENTED GEOTEXTILE TUBES - ALT. 1
STONE BREAKWATERS - ALT. 2
EXISTING SUBMERGED AQUATIC VEGETATION
APPROXIMATE
SCALE: 1 IN.=200 FT.
200 0 200 400
NOTE: SHORELINE, BATHMETRY, AND OTHER EXISTING FEATURES WERE TAKEN FROM SMALL SCALE MAPPING AND ARE APPROXIMATE.
REV DATE DESCRIPTION BY
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
TYLERTON PLAN 2
BREAKWATERS
File: 063C13
Plot Sc. 1 = 200
DRAWING NUMBER
PLATE
13
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
Plot: 5/14/97




| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|

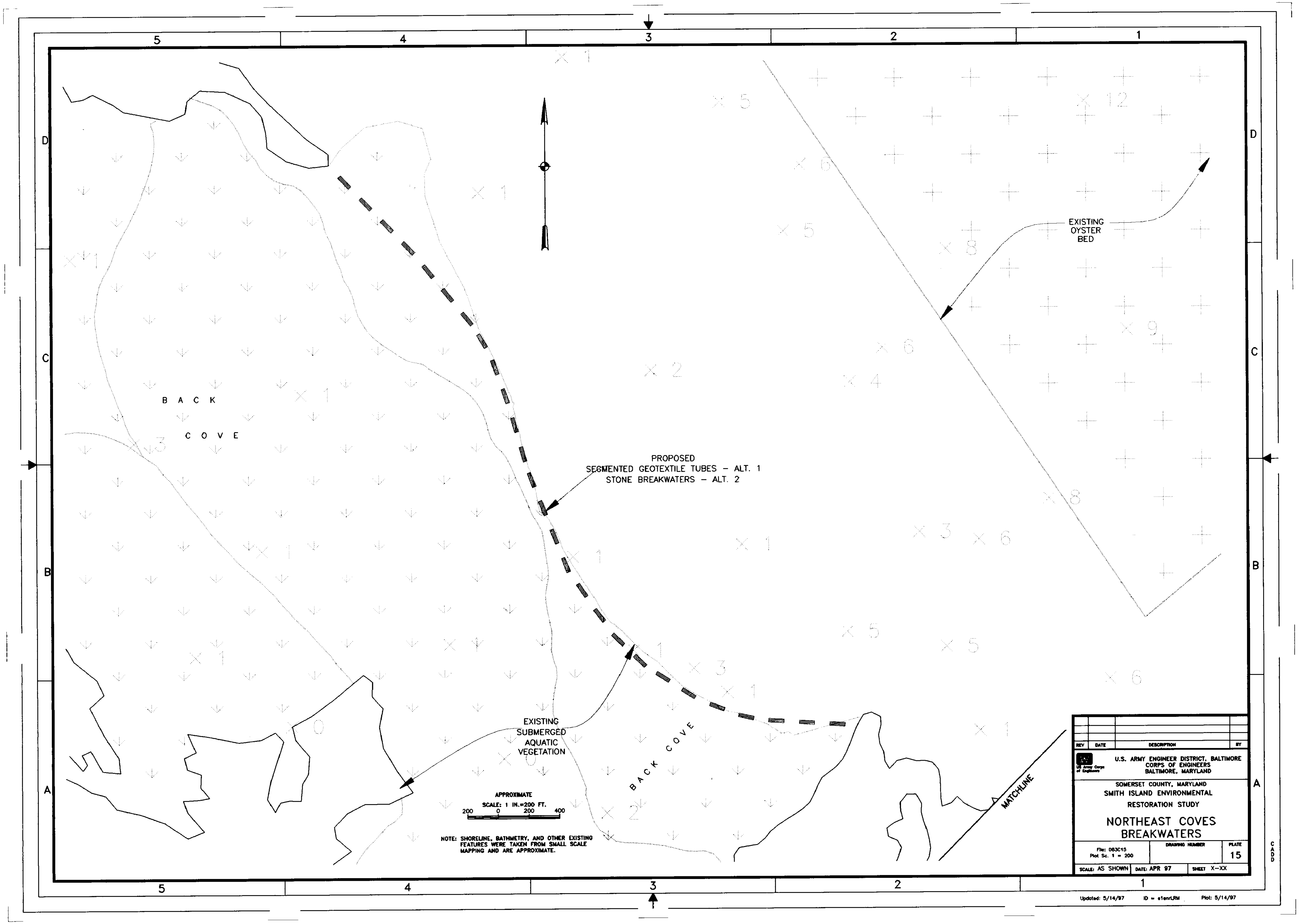
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

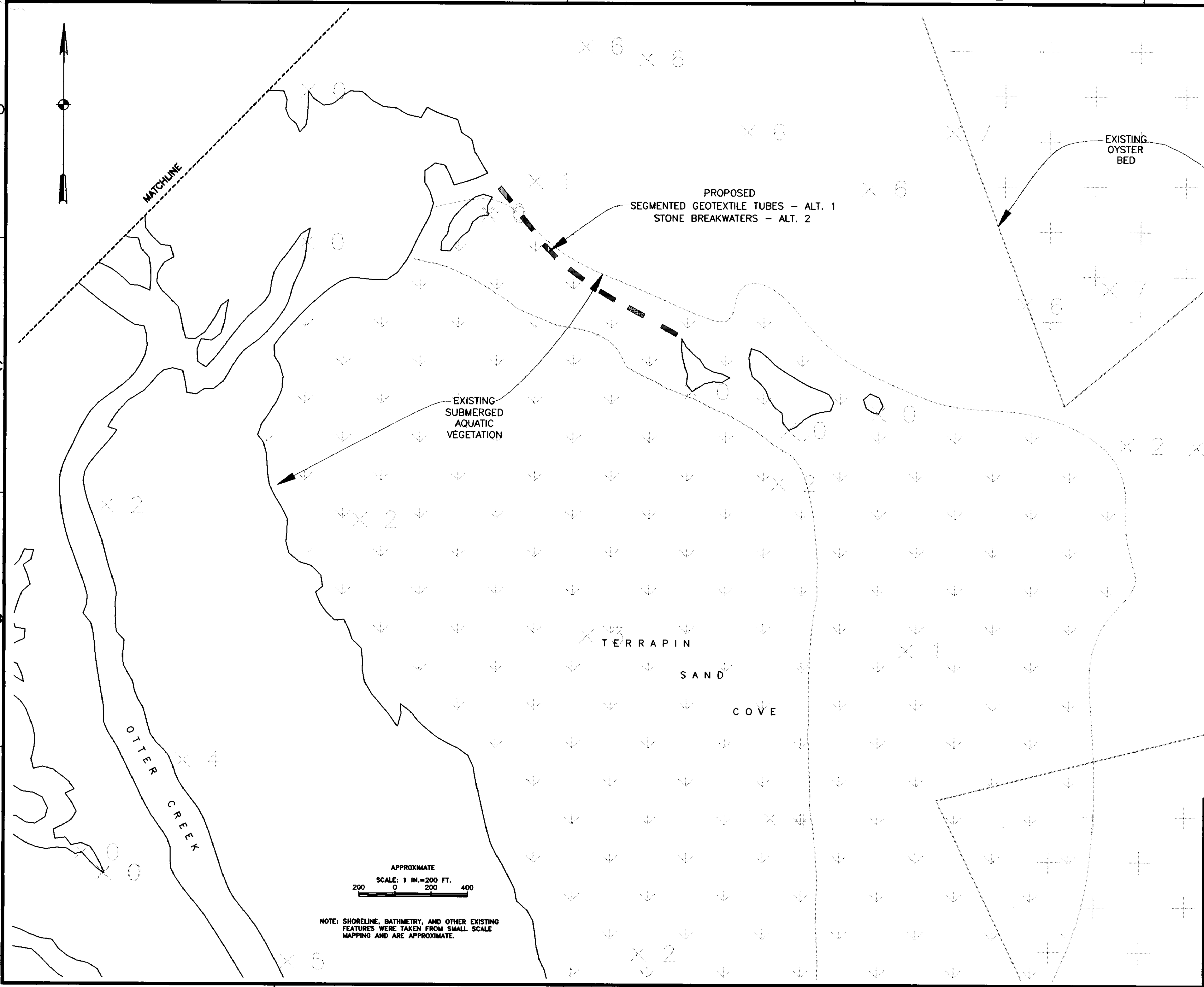
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY

NORTHEAST COVES
BREAKWATERS

| File: 063C14 Plot Sc. 1 = 200 | DRAWING NUMBER | PLATE 14 |
|---|---|---|
| SCALE: AS SHOWN | DATE: APR 97 | SHEET X–XX |

Updated: 5/14/97 ID = e1enrLRM Plot: 5/14/97


BACK COVE
PROPOSED
SEGMENTED GEOTEXTILE TUBES - ALT. 1
STONE BREAKWATERS - ALT. 2
EXISTING
OYSTER
BED
EXISTING
SUBMERGED
AQUATIC
VEGETATION
BACK COVE
MATCHLINE
APPROXIMATE
SCALE: 1 IN.=200 FT.
200 0 200 400
NOTE: SHORELINE, BATHMETRY, AND OTHER EXISTING FEATURES WERE TAKEN FROM SMALL SCALE MAPPING AND ARE APPROXIMATE.
REV DATE DESCRIPTION BY
US Army Corps of Engineers
U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND
SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY
NORTHEAST COVES
BREAKWATERS
File: 063C15
Plot Sc. 1 = 200
DRAWING NUMBER
PLATE
15
SCALE: AS SHOWN
DATE: APR 97
SHEET X-XX
CADD
Updated: 5/14/97
ID = e1enrLRM
Plot: 5/14/97




| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY

NORTHEAST COVES
BREAKWATERS

File: 063C16
Plot Sc. 1 = 200

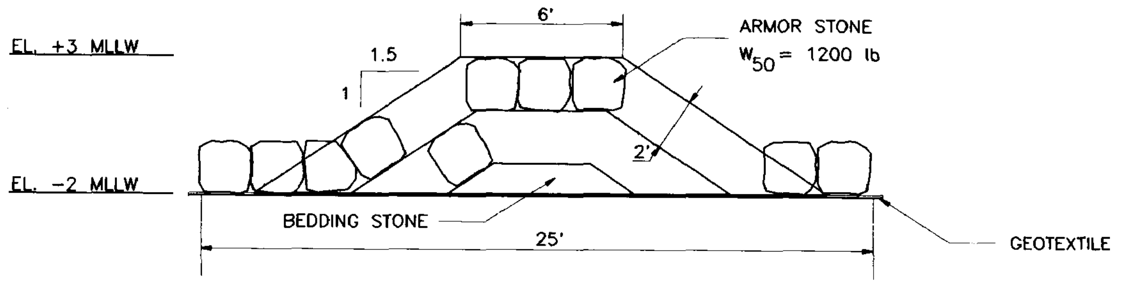
DRAWING NUMBER

PLATE 16

SCALE: AS SHOWN | DATE: APR 97 | SHEET X–XX

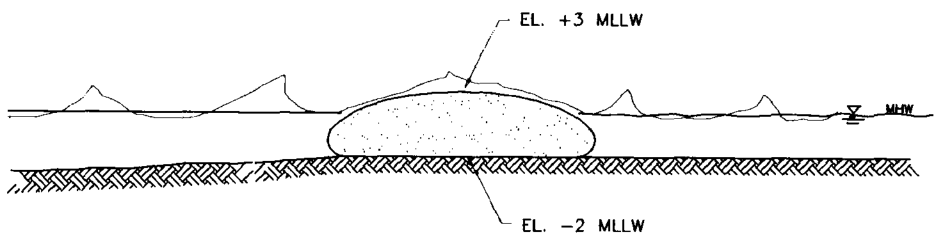
CADD

Updated: 5/14/97 ID = elenrLRM Plot: 5/14/97



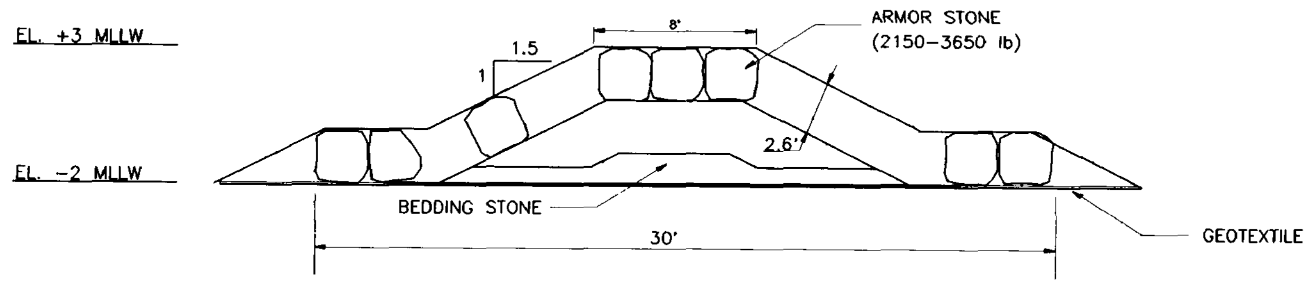

OFFSHORE STONE BREAKWATERS

**SHEEP PEN GUT, SWAN ISLAND & VICINITY**
**NORTHEAST COVES AND TYLERTON**



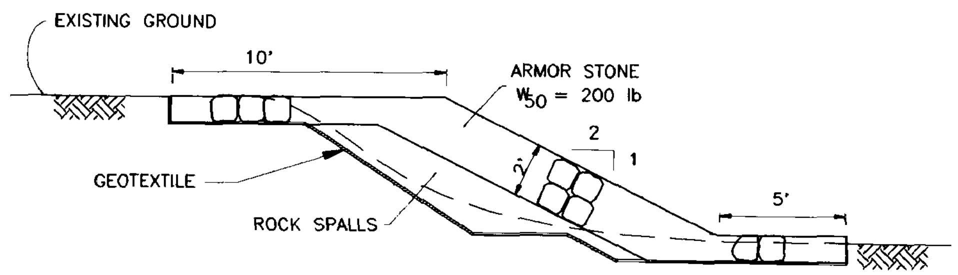

OFFSHORE SEGMENTED GEOTEXTILE TUBES (45' CIRUMFERENCE)

**SWAN ISLAND & VICINITY, NORTHEAST COVES AND TYLERTON**



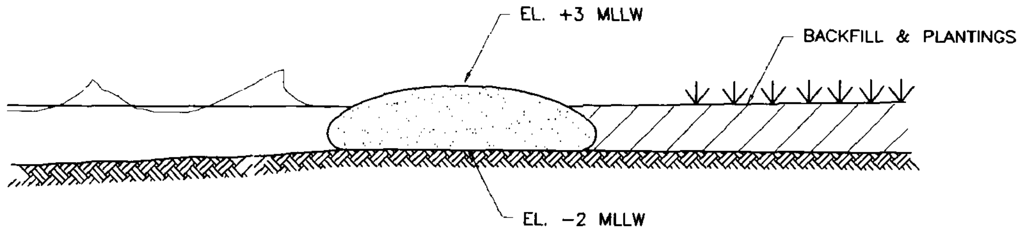

STONE JETTY

**SHEEP PEN GUT**




STONE REVETMENT

**TYLERTON**




GEOTEXTILE TUBE (45' CIRUMFERENCE) & BACKFILL

**SHEEP PEN GUT, SWAN ISLAND & VICINITY**

NOTE: ALL SECTIONS NOT TO SCALE
DIMENSIONS ARE APPROXIMATE

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

SOMERSET COUNTY, MARYLAND
SMITH ISLAND ENVIRONMENTAL
RESTORATION STUDY

## TYPICAL SECTIONS

File: 063C17
Plot Sc. 1 = 10
DRAWING NUMBER
PLATE 17

SCALE: AS SHOWN DATE: APR 97 SHEET X-XX

CADD