US Army Corps
of Engineers
Baltimore District

Rhodes Point, Smith Island, Maryland

Section 107 Feasibility Report
And Integrated Environmental Assessment

Final Report
January 2003

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P.O. Box 1715
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FINDING OF NO SIGNIFICANT IMPACT
CONSTRUCTION OF STONE JETTIES
RHODES POINT, SMITH ISLAND
SOMERSET COUNTY, MARYLAND

In compliance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers, Baltimore District has prepared an Environmental Assessment (EA) that evaluates and documents the potential environmental effects associated with the proposed navigation channel improvements at Rhodes Point on Smith Island, Maryland.

A broad range of alternative improvements to the current condition was investigated to identify if there is a Federal interest in a Section 107 navigation improvement project. Based on technical analyses and economic studies, it was determined that a twin jetty alternative in conjunction with a realignment of the existing Federal navigation channel will provide adequate protection from shoaling at an economically feasible cost. The jetty to the north of the navigation channel will be 1,300 feet long and the jetty south of the navigation channel will be 1,500 feet long. The jetties will be built to a crest height of +4.5 feet MLLW. The realigned channel will extend to the 6-foot contour in the Chesapeake Bay, approximately 1,500 feet from the mouth of Sheep Pen Gut. The recommended project includes construction of a series of breakwaters along the shoreline to contain the material dredged from the channel. In addition to providing a placement site for backfill of material, the breakwaters will provide stabilization for 1,500 feet of shoreline. The land created behind the breakwater will be planted with native wetland species creating 2 acres of marshland.

Potential impacts from the proposed action were assessed with regard to aesthetics; wetlands; fish and wildlife resources; cultural resources; land use; water and air quality; hazardous, toxic, and radioactive substances; threatened and endangered species; regional geology; environmental justice; and the general needs and welfare of the public. Although the jetty and breakwaters are permanent structures that will alter the face of the shoreline, the EA documents the overall effects of the project and finds that any adverse impacts will be minor and temporary in nature. These minor impacts are expected to be associated with the construction of the project and its future maintenance. The creation of 2 acres of marshland behind the breakwaters is a beneficial impact of the project.

Upon reviewing the EA, I find that there would be no significant impacts to the resources considered and that an Environmental Impact Statement is not required for the proposed actions. This statement has been prepared in accordance with the National Environmental Policy Act of 1969, as amended.

CHARLES J. FIALA, JR..
Colonel, Corps of Engineers
District Engineer

Date: 9 JAN 03

Rhodes Point, Somerset County, Maryland

Feasibility Report

EXECUTIVE SUMMARY

Rhodes Point is located along the southwestern shoreline of Smith Island in Somerset County, Maryland. Smith Island is located approximately 8 miles west of Crisfield, Maryland, and 95 miles south of Baltimore. Smith Island is bounded to the east by Tangier Sound, to the west by Chesapeake Bay, and straddles the Maryland/Virginia border. Smith Island is actually a series of small clusters of marsh areas, separated by shallow tidal guts (creeks or channels). The small pockets of upland are used as the residential portions of the island's three towns: Tylerton, Ewell, and Rhodes Point. The area of interest during this study was Sheep Pen Gut, which connects Rhodes Point to the Chesapeake Bay. The current Federal navigation channel that serves Rhodes Point goes through Sheep Pen Gut. The primary navigation problem being experienced by the watermen of Rhodes Point and the watermen of Tylerton, who also use the channel, is rapid shoaling of the existing Federal channel at Sheep Pen Gut, which provides access to the crabbing, oystering and fishing areas in Chesapeake Bay.

The existing Federal navigation project consists of a channel 6 feet deep and 50 feet wide from the northern limit of the Rhodes Point to Tylerton channel through Sheep Pen Gut channel to deep water in the Chesapeake Bay. The project was authorized in January 1982 under the Continuing Authority of Section 107 of the River and Harbor Act of 1960. The Sheep Pen Gut channel shoals much more quickly than the other channels in the area. Local users say that after dredging, the channel shoals within a few months. Once this happens, the 30 commercial watermen who use the channel 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 and an additional 10 miles roundtrip distance to the watermen's fishing trip.

A variety of structural and non-structural measures were considered during this feasibility study to address the navigation-related problems at Rhodes Point. Among the plans of improvement considered were relocation of the watermen, channel realignment or the construction of jetties, groins, breakwaters and/or a shoreline revetment. After applying technical criteria to screen the alternatives, three rubblemound jetty alternatives were selected for further evaluation. One jetty alternative included construction of a single jetty north of a realigned channel. A second jetty alternative featured twin jetties with continued use of the existing navigation channel. The third jetty alternative included twin jetties, one on either side of a realigned navigation channel.

The twin jetty alternative with a realigned channel is the recommended plan. This alternative features a jetty north of the navigation channel 1,300 feet long and a jetty south of the navigation channel 1,500 feet long. The realigned portion of the navigation channel will be approximately 1,500 feet in length. This alternative produced a benefit to cost ratio of 1.37

and net annual benefits of $42,000. This estimated total project cost is $3,163,000 (October 2001). This cost includes $665,000 to construct a breakwater and wetland plantings expected to produce about 2 acres of marshland using the material dredged from the navigation channel.

The cost share for this Section 107 project will be 90 percent Federal ($2,846,700) and 10 percent non-Federal ($316,300) with an additional 10 percent non-Federal payback ($316,300) after completion of project construction.

The overall environmental impacts associated with the construction and maintenance of the twin jetties and 4 offshore breakwaters at Rhodes Point have been evaluated and assessed by the U.S. Army Corps of Engineers. Based on this assessment, the Corps does not anticipate any significant adverse environmental impacts associated with the proposed action. Resource agency and public responses to this assessment will be coordinated and addressed during the public review period. Alternatives to the proposed action have been described and evaluated within. Therefore, it has been determined that the preparation of an environmental impact statement is not warranted. An Essential Fish Habitat (EFH) analysis was conducted in the study area for the December 2001 Twitch Cove, Big Thorofare River, and Rhodes Point to Tylerton Federal Navigation Channel Maintenance Dredging EA. The EFH analysis determined that the only potentially affected species in the Smith Island EFH area are the bluefish and the summer flounder. Since both species can relocate during construction, any impacts to their habitats will be minor, and for the most part, temporary. The District has concluded that this action will not affect any species covered under the Magnuson-Stevenson Fishery Conservation and Management Act. The District has prepared a finding of no significant impact (FONSI), which is provided in this integrated EA.

The results of the feasibility phase support Federal involvement in constructing the twin jetty project with a realigned channel and offshore breakwaters for placement of dredged material to improve commercial navigation at Rhodes Point on Smith Island, Maryland. The non-Federal sponsor, the State of Maryland Department of Natural Resources (DNR) agrees with the findings in this report and has provided a letter of intent to cost share the project. The letter of intent is included in Annex D of this report. In view of this expression of non-Federal support and the favorable results of the technical analyses, the District Engineer recommends the selected plan for implementation under the Section 107 authority.

Rhodes Point, Smith Island,
Section 107 Small Navigation Project
Somerset County, Maryland

Feasibility Report

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Section 1

INTRODUCTION

Rhodes Point is located along the southwestern shoreline of Smith Island in Somerset County, Maryland. Smith Island is located approximately 8 miles west of Crisfield, Maryland, and 95 miles south of Baltimore (Figure 1.1). Smith Island is bounded to the east by Tangier Sound, to the west by Chesapeake Bay, and straddles the Maryland/Virginia border. Smith Island is actually a series of small clusters of upland and marsh areas, separated by shallow tidal guts (creeks or channels). The small pockets of upland are used as the residential portions of the three towns: Tylerton, Ewell, and Rhodes Point. The area of interest during this study was Sheep Pen Gut, which connects Rhodes Point to the Chesapeake Bay through Hog Neck (Figure 1.2). The current Federal navigation channel that serves Rhodes Point goes through Sheep Pen Gut.

Rhodes Point, which is the second most populated town on Smith Island with approximately 100 year-round residents, is built along a single road. This road connects Rhodes Point to Ewell, the largest town on the Island, where the residents get most of their services. The town itself is almost entirely dependent upon the crabbing industry and is one of the few remaining communities of watermen on the Chesapeake. Almost all of the economic activity stems directly from the resources of the Chesapeake Bay and boats are more common and more important than cars. 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. Rhodes Point is the most vulnerable of the Island's towns to impending damage from wave energy and erosion.

1.1 PURPOSE OF STUDY

The purposes of this feasibility study are to examine the navigation-related problems affecting the local users of Sheep Pen Gut, identify a solution which is economically feasible and minimizes potential impacts to the environment, and identify a local sponsor to share the costs of implementing a project.

1.2 STUDY AUTHORITY

This study effort commenced as part of the Smith Island Environmental Restoration and Protection Feasibility Study. The Smith Island study was conducted under a resolution of the House of Representatives sponsored by Representative Wayne T. Gilchrest, MD-1, on September 28, 1994. This authority allowed for the U.S. Army Corps of Engineers (USACE) to conduct a study and recommend improvements in the interest of navigation, flood control,

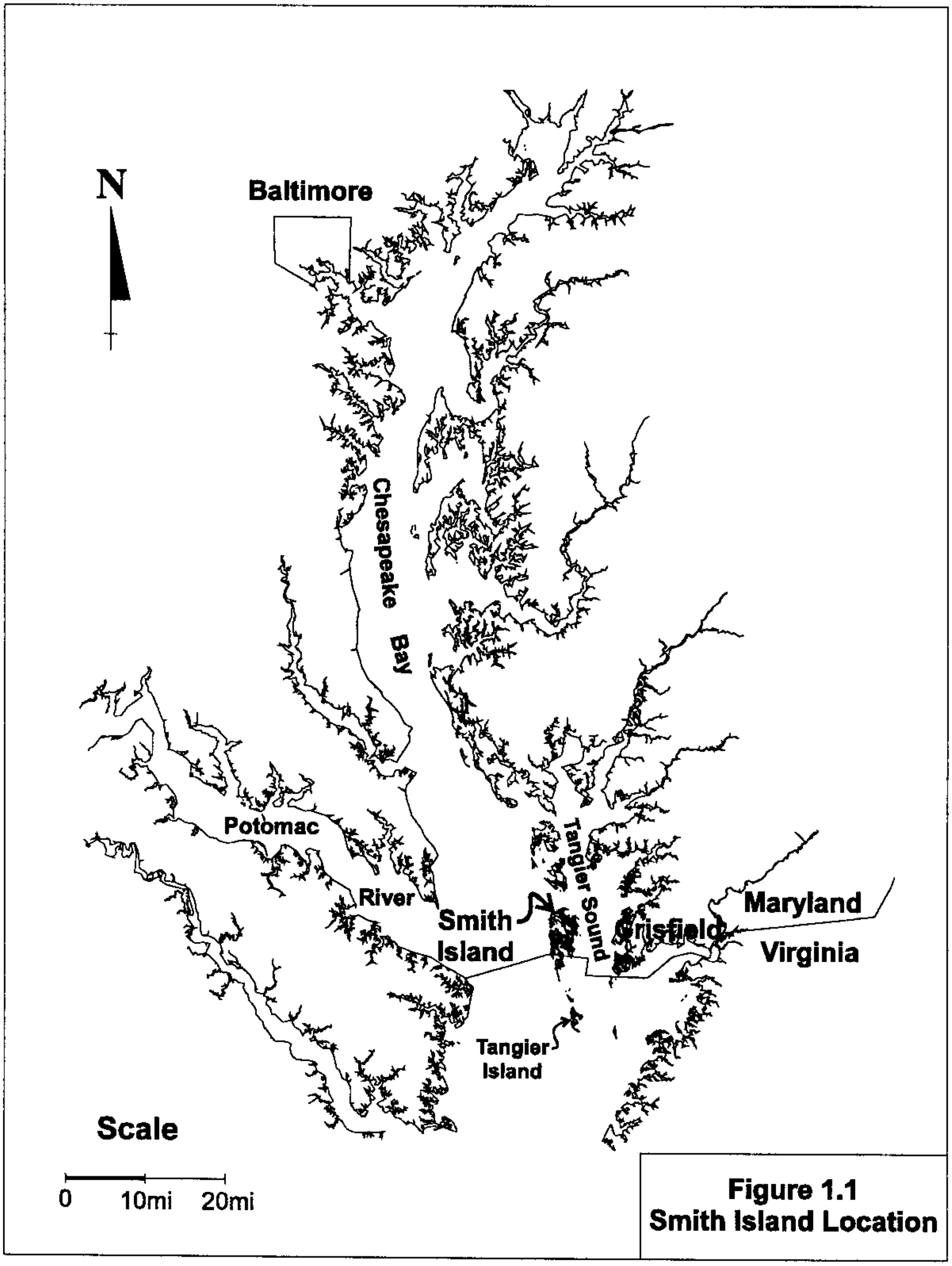

Figure 1.1
Smith Island Location

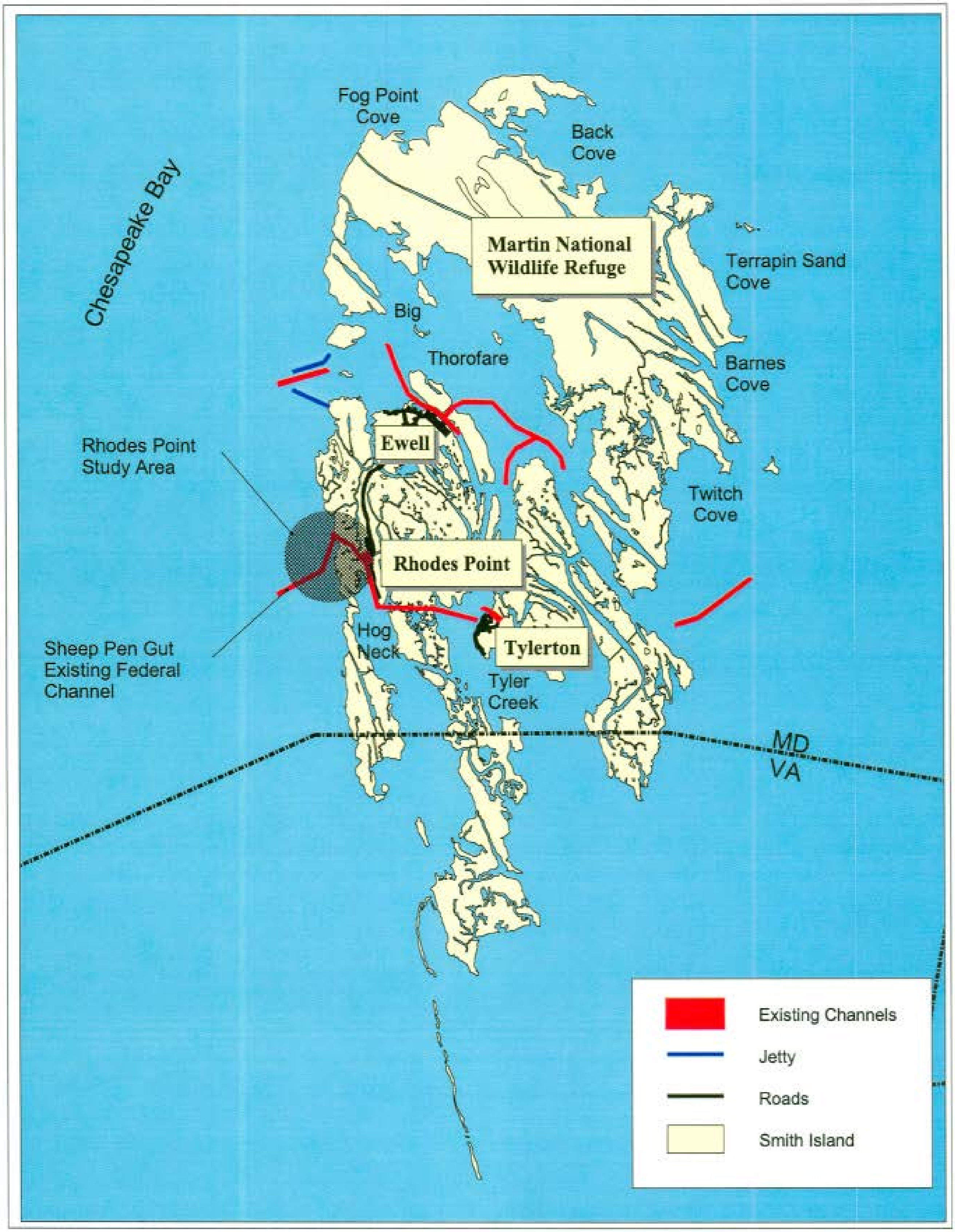

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Figure 1.2: Location Map - Smith Island and Rhodes Point Study Area

shoreline erosion, environmental protection, wetlands protection and other purposes. During the course of the study effort, the Tylerton Shoreline Protection project was removed from the study to be implemented under Section 510 of the Water Resources Development Act of 1996. Similarly, the USACE and local sponsors agreed that the Rhodes Point navigation project should be considered under the Continuing Authority of Section 107 of the River and Harbor Act of 1960, as amended. At a management-level study meeting, held on April 26, 2000, among the Smith Island project team and the North Atlantic Division USACE (the "P-7" meeting), it was agreed that the Rhodes Point project would be "spun off" as a Section 107 Small Navigation project. The decision allowed the Rhodes Point portion of the Smith Island project to be conducted as a separate feasibility study for improving the navigation and/or protecting the harbor at Rhodes Point.

This study was conducted under the general Continuing Authority of Section 107 of the River and Harbor Act of 1960, as amended, which states in part

> a. "The Secretary of the Army is authorized to allot from any appropriations hereafter made for rivers and harbors not to exceed $35,000,000 for any fiscal year for construction of small river and harbor improvement projects not specifically authorized by Congress which will result in substantial benefits to navigation and which can be operated consistently with other purposes, when in the opinion of the Chief of Engineers such work is advisable, if benefits are in the excess of costs."
>
> b. "Not more than $4,000,000 shall be allocated for the construction of a project under this section at any single locality and the amount allocated shall be sufficient to complete the Federal participation in the project under this section...subject to certain conditions of local cooperation."

1.3 STUDY AREA

Smith Island is approximately 8,000 acres in area and is 8 miles long and 4 miles wide. The island is actually many smaller 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. The primary navigation problems being experienced by the watermen of Rhodes Point and Tylerton is shoaling in Sheep Pen Gut, which connects the watermen from these towns to the crabbing and fishing areas in Chesapeake Bay. The study area is shown on the United States Department of the Interior Geological Survey, Ewell, Maryland/Virginia quadrangle map.

1.4 SCOPE OF STUDY

The feasibility study involved a detailed investigation that was based primarily on the findings and recommendations of the Smith Island Environmental Restoration and Protection reconnaissance report, dated May 1997. Meetings and interviews with residents and local officials helped to identify the existing problems. Data was collected through methods such as interviews, hydrographic surveys, soil borings, and hydraulic calculations including computer modeling.

The recommended plan identified in this report to address the navigation problems in Sheep Pen Gut was selected through detailed comparison of plans, environmental impacts, and economic benefits. An environmental assessment is integrated within this report, and includes an existing conditions assessment and an assessment of the impacts of the recommended project on water quality; threatened and endangered species; cultural resources; hazardous, toxic, and radioactive substances (HTRS); and other environmental resources. Pending approval of this report, construction plans and specifications including final drawings, construction schedule, and construction cost estimate will be prepared. The project will be recommended for construction if approved by North Atlantic Division, USACE.

The planning for this Federal navigation project was accomplished in two phases; a reconnaissance phase and a feasibility phase. The reconnaissance phase was conducted at full Federal expense as part of the Smith Island Environmental Restoration and Protection Study, while the cost of the feasibility phase was shared between the Federal government and a non-Federal sponsor(s). The majority of the Section 107 studies required to assess the feasibility of improvements were conducted as part of the Smith Island Feasibility Study, which was a cost-shared effort between the Baltimore District USACE, the State of Maryland Department of the Environment and Natural Resources and Somerset County. The Feasibility Cost Sharing Agreement (FCSA) was executed in May 1998.

The objectives of the reconnaissance phase were to study Smith Island "in the interest of navigation, flood control, erosion control, environmental restoration, wetlands protection, and other purposes." The Smith Island reconnaissance report contains a summary of investigations, results, conclusions, and recommendations of the reconnaissance phase, and was completed in May 1997. The recommended projects in the reconnaissance study included a project to provide erosion protection at the mouth of Sheep Pen Gut and a project to construct twin jetties along the current alignment of the navigation channel.

The purpose of this feasibility study is to undertake a more detailed examination of the recommended improvements in the Rhodes Point study area from the reconnaissance phase. The objectives of the feasibility phase are 1) to evaluate the specific engineering, environmental, and economic effects of proposed improvements, including a without-project alternative; 2) to identify the optimum project for the Sheep Pen Gut users from both a Federal and non-Federal perspective; and 3) to recommend a project for construction, if justified and supported by the non-Federal sponsor(s). The product of the feasibility phase is a feasibility report, including the appropriate environmental documentation, for submission to Corps of Engineers higher authority for project authorization. The Smith Island Environmental Restoration and Protection draft feasibility report was released for public review in spring 2001. The final report is dated May 2001. This Rhodes Point Section 107 report documents the studies related to navigation improvements at Sheep Pen Gut after the project was removed from the larger Smith Island study for consideration under Section 107.

The integrated environmental assessment (EA) presents environmental data to determine if any impacts associated with proposed improvements are of a significant nature and warrant the preparation of an environmental impact statement (EIS). Since the impacts were not determined to be significant, a finding of no significant impact (FONSI) was prepared. If the potential impacts had been determined to be significant, a notice of intent would have been published, leading to the preparation of an EIS. This document was prepared in accordance with provisions of the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations CFR 1500-1508, the U.S. Army Regulation 200-2-2 "Procedures for Implementing NEPA", and 33 CFR 230.

1.5 PRIOR STUDIES, REPORTS, AND EXISTING PROJECTS

The Corps has constructed and maintained navigation projects in Smith Island waterways since Big Thorofare Channel was constructed in 1912. Several additional channels were added to Smith Island between 1930 and 1985 (Ewell Canal, Tyler Creek Channel, Rhodes Point Channel, Twitch Cove Channel, Levering Creek and Swan Island). Included among these improvements was the existing Federal channel at Sheep Pen Gut. This project consists of a channel 6 feet deep and 50 feet wide from the northern limit of the Rhodes Point to Tylerton channel through Sheep Pen Gut channel to deep water in the Chesapeake Bay. The project was authorized in January 1982 under the Continuing Authority of Section 107 of the River and Harbor Act of 1960. In addition, the Corps provided the towns of Ewell, Rhodes Point, and Tylerton with workboat basins, and jetties were constructed at the western entrance to Big Thorofare in 1939.

Construction and maintenance of these navigation projects over the years has utilized upland placement of dredged material. Collectively, this upland placement has converted 51 acres of wetland habitat to uplands. The construction of the workboat basins included the dredging of approximately 3.5 more acres of wetlands. Recent maintenance dredging activities in 1995 and 1998 have included placement of dredged material behind geotextile tubes to create wetland habitat and to protect Submerged Aquatic Vegetation (SAV) at Hog Neck, west of Rhodes Point.

The 1980 Smith Island feasibility study recommended construction of a jetty along with the Sheep Pen Gut channel and offshore 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.

The May 1997 Smith Island reconnaissance report concluded that there was a Federal interest to further investigate the feasibility of constructing a project to improve navigation in Sheep Pen Gut channel. During the reconnaissance phase, a number of alternatives to address both navigation and shoreline stabilization at Rhodes Point were identified. There were 4 jetty alternatives identified to address the shoal-induced navigation problems in Sheep Pen Gut. Two single-jetty alternatives were formulated and two twin jetty alternatives were formulated.

The May 2001 Smith Island Environmental Restoration and Protection Feasibility Report recommended improvements to the western shoreline of Martin National Wildlife Refuge, Fog Point and Back Cove to protect and restore submerged aquatic vegetation and emergent wetlands at Smith Island. Design of these improvements is underway. Construction is expected to begin in 2004.

Concurrent maintenance dredging of Twitch Cove, Big Thorofare River, and the Rhodes Point to Tylerton Federal navigation channels is scheduled for 2002. Figure 1.3 is a map identifying the locations of key Federal projects at Smith Island.

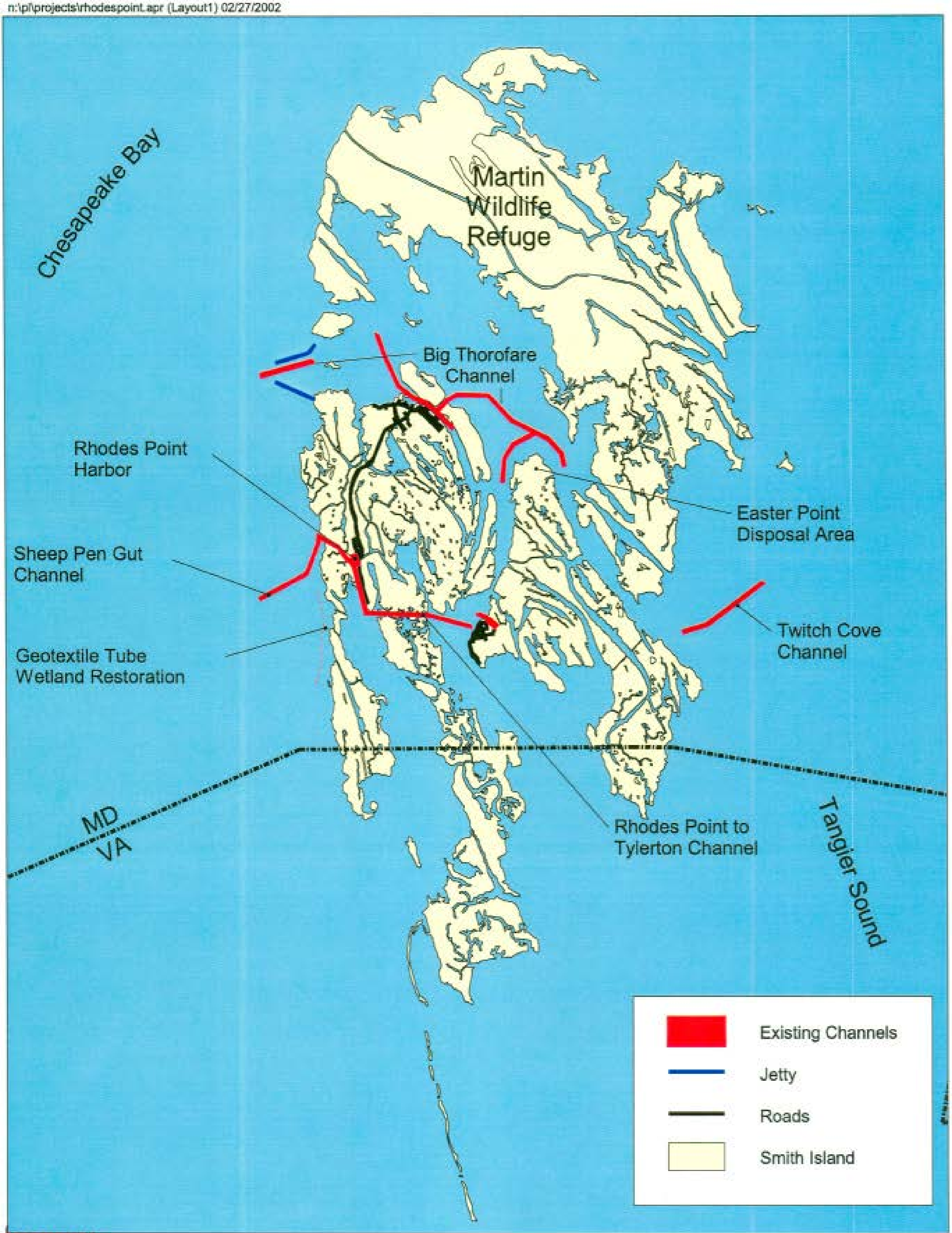

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Figure 1.3: Existing Federal Projects at Smith Island

Section 2

EXISTING CONDITIONS

The following section contains a description of the existing conditions at Rhodes Point, Maryland. The description provides a basis for measuring impacts associated with the construction and operation of a potential Federal navigation project.

2.1 PHYSICAL SETTING

2.1.1 Location

Smith Island is located 8 miles west of Crisfield, Maryland, and 95 miles south of Baltimore. Smith Island is actually a low-lying complex of islands with an area of almost 8,000 acres. The western shore of the island is exposed to a long open-water fetch from the west, southwest, and northwest. Because of its exposed position, the entire island is subject to shoreline erosion. Although it once supported 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 placement areas, and approximately a dozen isolated hammocks, dunes, and ridges. Because of its low elevation and exposed location, the Island is vulnerable to flooding. Vulnerability to the effects of erosion, flooding, and subsidence 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 soft-shell crab fishery.

Smith Island is part of a string of marshy islands that separate Tangier Sound from the Chesapeake Bay. The northern half of the Island is owned by the U.S. Fish and Wildlife Service (USFWS) and managed as the Martin National Wildlife Refuge. Big Thorofare Channel separates the refuge from the settled areas of Smith Island and is the most important water access to the "capital" city of Ewell (Figure 1.2). In addition to Ewell, the communities of Rhodes Point and Tylerton are residential centers on the island. 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 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."

2.1.2 Physiography

The Island is currently a complex of salt marsh islands separated primarily by narrow tidal creeks and shallow water areas. The majority of the Rhodes Point area is salt marsh, with the town located on the upland area. The few upland areas in the vicinity of Rhodes Point are limited to several former dredged material placement areas and to two isolated and formerly inhabited hummocks. The adjacent high ground is utilized by colonial nesting waterbirds and other wildlife. The town itself is located on the remaining high ground near the project area. The upland area is slowly converting into wetlands, resulting in a loss of developable area. Thus, the local residents place considerable emphasis on protecting the remaining upland and their town. The proposed project is designed to help accomplish this.

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. The mean range of tide is about 1.6 feet. Rhodes Point is exposed to a long (57 miles) open-water fetch (distance over water that the wind blows for a given direction). The average depth of the fetch is 31.5 feet with a 25-year wave height of 5.3 feet. In the Sheep Pen Gut project area erosion rates of 7 to 8 feet per year are typical. Sea level is rising at a rate of 3.5mm per year in the Chesapeake Bay region. Even without the occurrence of erosion, it is predicted that Rhodes Point will be underwater in approximately 400 years.

2.1.3 Sediments and Soils

The erosion at Smith Island is affected by waves and winds eroding the exposed shorelines and tidal currents that affect the guts in the interior portions of the islands. The bottom sediment character in the navigation channel, as revealed by test borings, is alternating layers of clay and sandy silts to a depth of 16 feet. Analysis of the wind records indicates that the wave driven sediment transport is fairly evenly split between transport to the south and transport to the north, along the western shoreline of Smith Island, with transport to the south exceeding transport to the north by about 12 percent. This is based on an analysis of winds in the northwest and southwest quadrants that contribute to wave generation and wave driven transport. Actual wave driven transport quantities will depend on the availability of sediment in the nearshore area, orientation of the local shoreline, and local wave refraction effects.

Analysis of surveys of the offshore navigation channel at Sheep Pen Gut indicates that about 6 cubic yards/year/foot of material is trapped by the channel, leading to infilling rates of 2 to 3 feet per year for the years immediately following dredging. Over the entire length of the channel this is equal to 9,000 cubic yards per year being deposited into the navigation channel.

2.1.4 Tidal Data, Currents and Wave Action

During storm conditions, water levels are dominated by storm surge and wave setup in combination with the astronomical tide. Storm surge is a temporary rise in water level generated either by large-scale extratropical storms known as northeasters or by hurricanes. The rise in water level results from wind stresses, the low pressure of the storm disturbance and the Coriolis force. Wave setup is a term used to describe the rise in water level due to wave breaking. A comprehensive evaluation of storm-induced water levels for several Chesapeake Bay locations has been conducted by the Virginia Institute of Marine Science (1978) as part of the Federal Flood Insurance Program. Storm surges result in more extreme water levels, which affect flooding, overtopping of structures and maximum expected depth limited wave heights in shallow areas.

The magnitude of the tide heavily influences Smith Island. The strongest tidal currents occur in the guts. Tidal currents are otherwise weak and variable in the area. Nearly the entire island is tidal marsh, regularly inundated by high tides. Higher tides, such as occur during spring tides and storms, 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 2.1 provides measured and modeled tidal elevations in the study area for the various return periods.

Table 2.1: Return Intervals and Tidal Elevations

RETURN INTERVAL	ELEVATION (ft MLLW)
Mean Tide[1]	.9
5 year[2]	4.2
10 year[2]	4.6
25 year[2]	5.3
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 the Chesapeake Bay, 1978.

All of Smith Island is exposed to significant wind conditions. The prevailing winds are from a northwesterly direction, which can intensify over the Chesapeake Bay because of the wide fetch. Winds speeds and return intervals were calculated for Smith Island. The strongest winds are, as expected, from the northwest.

For most of the areas under consideration, northerly winds will create the most severe wave condition at the shoreline. Therefore the offshore waves due to northerly winds are used as input into the nearshore wave transformation.

Winter storms, generally known as "northeasters" dominate storm generated coastal processes in the Chesapeake Bay region. Hurricane season typically extends from June through November, but in the local region, the more frequent "northeasters" have a more devastating impact to the region. They typically occur from December until April, and although they generate less windspeed, their frequency of occurrence results in periodic inundation of the area.

Available data shows the fact that historically the Chesapeake Bay region is generally subjected to maximum winds between gale and hurricane force. The wind speed frequency distributions derived from data indicate wind speed ranges are between 35 and 50 miles per hour for the 25 to 50 year return intervals.

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, 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 of strong winds result in greater wave heights propagating into an area.

Smith Island is located in an area with a large fetch (greater than 5 miles) in almost every direction. The highest waves occur along the western shoreline, an area exposed to the currents and winds coming across the Chesapeake Bay. The most significant waves occur from the northwest, where the winds blow across the bay and the fetch is greater than twenty miles.

2.1.5 Prime Farmland

There is no farming on Smith Island and therefore, no designated Prime and Unique Farmlands exist on the island. The existing upland is used for the towns, and is surrounded by unbroken expanses of tidal marsh. Farming has not occurred for decades, as a result of erosion and saltwater intrusion.

2.1.6 Climate

Somerset County has an average annual temperature of 56°F. Temperatures average 77°F in July, the warmest month, and 37°F in February, the coldest month. Precipitation averages 42 inches per year. Rainfall is distributed throughout the year, although August tends to be the wettest month due to thunderstorm activity. The normal snowfall is approximately 14 inches. Prevailing winds blow from the west and southwest.

2.1.7 Air Quality

Ambient air quality is determined by measuring the ambient pollutant concentrations of particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and ozone, and comparing the concentration to the corresponding standards as determined by the U.S. Environmental Protection Agency. Maryland is divided into six air quality control areas. Smith Island lies within the Eastern Shore control area. The Eastern Shore of Maryland is an attainment area for all identified pollutants. Smith Island, as part of the Eastern Shore control area, has achieved all of its air quality goals.

2.1.8 Hydrology and Water Quality

Smith Island is surrounded by saline water (mesohaline) typical of the middle Bay ranging from 11 to 19 parts per thousand, about half the salinity of ocean water. The average water temperature in the area ranges from 82 degrees F (28 degrees C) in July to 39 degrees F (4 degrees C) in February. The Smith Island area of the Chesapeake Bay experiences relatively little stratification and has good water clarity. Water clarity is required for sustained SAV growth. Water clarity conditions determine the depth to which SAV will grow. However, the extensive marsh erosion on the island has added considerable amounts of solids to the local area.

While much of the eroded sediment may settle to the bottom or flow south, it may still affect the local water clarity. The silty marsh soils, composed of fine particles, add suspended solids to the water when eroded, decreasing light availability, and contributing to declining SAV beds in the area. Dissolved oxygen ranged from 5.6 mg/L in July to 11 mg/L in December. Several areas around Smith Island have been temporarily closed to shellfish harvesting due to high fecal coliform levels as a result of inadequate wastewater treatment. Shellfish closure standards are of significance because bivalves concentrate bacteria and toxins in their tissue that can subsequently be consumed by people. Improvements to the wastewater treatment facilities on Smith Island are planned in the near future.

2.2 SOCIAL AND ECONOMIC SETTING

This discussion focuses on the communities on Smith Island.

2.2.1 Social and Cultural

The culture and society of Smith Island is deeply rooted in its ancestry. 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. Much of the social life on the island is organized around the church. The church, through annual tithings 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 is distinctly unique. There is pride within and rivalry among the three towns. Ewell is the most populated with over 200 residents and is considered the most metropolitan. Ewell is home to the visitor's center, restaurants, a gift shop, and a motel. Ewell is connected to Rhodes Point by one road. Along the road between the two towns, there is an incinerator and a waste water 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.

Each of the towns is indeed unique unto each other (although the casual visitor would likely not notice), 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 crabmeat, 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 last 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. The younger residents are moving away and the population is declining through the attrition of its elders. This incredible culture is threatened. 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

Nearly all of the permanent residents at Rhodes Point 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 30 commercially used boats at Rhodes Point. 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. The primary industry is the crab picking co-operative venture, run by the wives of many watermen.

The rapid formation of shoals in the navigation channel at Sheep Pen Gut 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 beds is reducing the availability of soft-shell crabs and other species in the waters around Smith Island. The islanders have traditionally depended on soft-shell crab harvests for income and crabs represent the main source of income.

Demographics. The town of Rhodes Point contains 100 residents, many living on low or fixed incomes. The population is generally elderly and most are directly descended from the original English settlers. The permanent population is comprised entirely of Caucasians.

Aesthetics and Recreation. The charm and beauty of Smith Island are magnets for both natives and outsiders. There are 2 bed and breakfasts and a restaurant on the island, catering to the seasonal tourists disembarking from the tour boats from May to October. Tourism is becoming a thriving industry on the island.

2.2.3 Navigation Infrastructure

The Corps of Engineers constructed and maintains the existing navigation channel at Sheep Pen Gut on the western shore of Smith Island near the town of Rhodes Point. The channel was constructed in 1982 to provide access through a 6-foot deep channel to Chesapeake Bay fishing waters for commercial watermen in Rhodes Point and Tylerton. Commercial vessels used to harvest fish, crabs, and oysters are having problems related to shoaling of the Sheep Pen Gut navigation channel. According to the results of commercial watermen surveys, commercial vessels range from 34 to 60 feet in length, draft from 3.5 to 6 feet, and have a beam of 10 to 15 feet.

There are a number of facilities designed to support the activities of the commercial watermen of Rhodes Point and Tylerton. Numbered among these facilities is the Somerset County dock, a work basin, a boat launch, a vessel repair facility and several private docking structures.

The Sheep Pen Gut channel is a key artery in the network of federally maintained channels that comprise the basic waterway transportation system for Smith Island watermen. The existing Rhodes Point to Tylerton, which is 6 feet deep and 50 feet wide, provides navigation access between Tylerton and Sheep Pen Gut channel.

2.2.4 Existing Condition Vessel Damages and Operating Costs

Rhodes Point and Tylerton commercial watermen using the Smith Island navigation system operate their businesses in the face of economic inefficiencies and increased operating costs that are a direct result of rapid deposition of shoal material in the existing Federal navigation channel. The channel has an authorized depth of 6 feet, which is the controlling depth at the outset of the dredging cycle. The existing channel is dredged to the authorized depth on a 4-year cycle, but navigation-impeding shoals form within 3-6 months following maintenance dredging. The challenge for the commercial watermen who use Sheep Pen Gut channel is to avoid damage to the fishing vessel, which is essential to their livelihood. The local watermen have adapted their operations to the conditions they encounter in order to avoid, to the extent possible, damage to their fishing vessels.

The most common adaptation strategies utilized by the commerical watermen consist of waiting for tides to shift to allow them to traverse shoals in the channel and avoiding use of Sheep Pen Gut entirely by using an indirect navigation route through Big Thorofare to fishing waters. Each of these strategies minimize the frequency and severity of vessel damage, but result in significant increases in operating costs for commercial watermen.

The existing condition damages and costs experienced by the commercial users of the Sheep Pen Gut channel due to insufficient channel depths were analyzed by category, and they provide the basis for the benefit evaluation in Section 5. The nature and extent of these costs are summarized in this section. More detailed analysis of existing condition damages is presented in Annex A.

<u>Commercial Vessel Damages</u>. The most common type of shoal-induced damage incurred by commercial vessels, according to watermen and marina repairmen, is wheel and rudder damage from striking a shoal at a relatively high speed. The average repair cost for such an event is $1,500. According to data collected from watermen, the frequency of vessel damages is greater during the first year following maintenance dredging of the channel because the usage of the channel is greater in that year. After navigation-impeding shoals develop in the channel, watermen use the channel much less frequently and vessel damages are minimized. The economic model for vessel damages reflects this condition. In year 1 of the dredging cycle, vessel damages are $4,500. In years 2-4 of the dredging cycle, vessel damages amount to $1,500.

<u>The Cost of Labor Lost Due to Delays.</u> Avoiding use of Sheep Pen Gut channel by accessing fishing waters through Big Thorofare Channel is the primary tactic used by watermen to avoid

vessel damage in the years following maintenance dredging. Although this tactic is successful in avoiding vessel damages, it results in economic operating cost inefficiencies resulting from fishing time lost awaiting favorable tides and fishing time lost avoiding channel usage.

The operating cost involved in implementation of the shoal-avoidance strategy is that watermen lose valuable fishing time. This loss is a direct by-product of navigating through Big Thorofare as an alternate route, and to a lesser degree, waiting for the tides to shift in the channel. The watermen interviewed for this study indicated that they prefer to navigate the additional distance to Chesapeake Bay through Big Thorofare to avoid vessel damages after the shoals form in Sheep Pen Gut channel. On many fishing days, the watermen are unable to return to the fishing waters for a second harvest because of time lost awaiting the tide change during their return from their first fishing trip of the day or because of time lost due to the increased navigating distance associated with use of Big Thorofare as an alternate navigation route. An even more insidious cost, because it seems relatively insignificant, is the day-by-day cumulative costs of hours and fractions of hours of labor time lost due to increased travel time. The watermen are aware of the fact that they lose time, but it has become a conditioned aspect of their operational routine and they hardly notice that there is a real economic cost associated with the shoal avoidance strategy.

As channel shoaling worsens and the risk of damages becomes greater over the 4-year dredging cycle, the avoidance of use of the navigation channel becomes greater. The watermen estimate an average round-trip loss time of 1 hour for the approximately 10-mile trip to avoid using Sheep Pen Gut. The economic computation of the cost of lost labor reflects the decreased use of Sheep Pen Gut as shoaling worsens during the dredging cycle. In the first year of the dredging cycle, the lost labor cost is $24,000. In the second through the fourth year of the maintenance dredging cycle, as the number of damage avoidance trips increases, the lost labor cost amounts to $78,000.

<u>Additional Fuel Operating Cost</u>. Another cost incurred when the Sheep Pen Gut channel shoals is an increase in fuel cost. This increase results from additional fuel consumption related to avoiding the shoals in the Sheep Pen Gut channel. Avoidance of Sheep Pen Gut adds about a 10-mile roundtrip to the distance watermen would navigate if the channel were shoal free, and an average increase in fuel consumption of 10 gallons per trip. Fuel costs increase over the dredging cycle as use of the Sheep Pen Gut channel decreases. In the first year of the dredging cycle, additional fuel cost amounts to $32,000 for the 30 boats in the base commercial fleet. For years 2-4 of the dredging cycle, the cumulative added fuel cost for the commercial fleet amounts to $97,000, a cost of $3,200 per boat annually.

<u>Increased Ordinary Maintenance Cost</u>. Watermen report that under existing conditions, the frequency of vessel maintenance required is 3 times per year. This frequency is an increase in comparison to the semi-annual ordinary maintenance required when Sheep Pen Gut channel is shoal-free. This increase in maintenance frequency is directly attributable to the increased travel distance vessels travel to avoid using Sheep Pen Gut channel. The expected cost for increased maintenance increases as usage of Sheep Pen Gut channel decreases due to shoaling. In year 1 of the dredging cycle, the increase in ordinary maintenance cost for the commercial fleet is $6,000. In years 2-4 of the dredging cycle the cumulative increase in ordinary maintenance cost for the 30 vessel commercial fleet amounts to $18,000.

The total national economic development (NED) damages and costs associated with the existing condition range from $67,000 in year 1 of the dredging cycle to $195,000 in years 2-4 of the dredging cycle. Table 2.1 presents the existing condition damages and costs incurred by commercial watermen who use Sheep Pen Gut channel.

Table 2.1
Existing Condition Damages and Costs
During 4-year Dredging Cycle (2001 P.L.)

Category	Year 1	Year 2	Year 3	Year 4
Vessel Damages	$4,500	$1,500	$1,500	$1,500
Lost Labor Cost	$24,000	$78,000	$78,000	$78,000
Increased Fuel Cost	$32,000	$97,200	$97,200	$97,200
Incr. Maintenance Cost	$6,000	$18,000	$18,000	$18,000
Total	$66,500	$194,700	$194,700	$194,700

2.2.5 Cultural Resources

No comprehensive archeological survey of Smith Island has been conducted. However, meetings with the staff of the Maryland Historic Trust (MHT) during the Smith Island environmental restoration study and limited documentary research and field investigations, indicate the potential for historic and prehistoric archeological resources to exist within the upland areas of the project area. There are probably a number of properties associated with former settlements which the State Historic Preservation Officer (SHPO) may deem important. However, there are no sites eligible for or listed on the National Register of Historic Places (NRHP).

There are no known submerged archeological resources in the project area. Along the western shoreline, there are no historic structures. The upland areas away from the project area may contain traces of old island settlements.

2.2.6 Hazardous, Toxic, and Radioactive Waste

The Smith Island area of the Chesapeake Bay was evaluated for hazardous, toxic and radioactive wastes (HTRW) using the Environmental Protection Agencies Toxic Release Information System (TRI) and Resource Conservation Recovery Information (RCRIS) databases, as well as the Comprehensive Environmental Response, Compensations, and Liability Information System (CERCLIS) and National Priority List (NPL). No HTRW sites were found on Smith Island. Because of a lack of industry on the island, none had been expected.

2.3 BIOLOGICAL RESOURCES

2.3.1 Plankton

Phytoplankton and zooplankton form the base of the aquatic food web and support a variety of fish species, which help support larger species. Numerous species of phytoplankton and zooplankton inhabit the waters near and within Smith Island. As in other areas of the Bay, Smith Island is sensitive to excess levels of nutrients (typically nitrogen and phosphorous) and summer algae blooms may damage the aquatic habitat and adversely impact submerged aquatic vegetation by reducing water clarity.

2.3.2 Benthos

Benthos are bottom dwelling organisms of aquatic ecosystems, such as snails, worms, clams, shrimp, whelks, oysters and crabs. While benthic populations have a high degree of natural population variability from year to year, many of these organisms are found in dense concentrations within the SAV beds surrounding Smith Island. Benthic organisms support the food web, and make up the staple diet for larger organisms.

Some benthic organisms are commercially valuable, the most important of which within the Smith Island area is the blue crab (*Callinectes sapidus*), which seeks the protection of SAV during the molting season. The Smith Island area is centrally located for the blue crabs annual migrations between the headwaters of the bay and the Atlantic Ocean, making the SAV beds one of the most productive blue crab areas in the US. The commercial harvest of blue crabs is a major source of income for island residents. The Smith and Tangier Islands area is the most important soft-crab and peeler-crab producing areas in the Chesapeake Bay. Scientific studies have determined that each acre of SAV produces an estimated 43,000 individual crabs, which is approximately 1 crab per square foot. For watermen using the Sheep Pen Gut channel the main cash species is the blue crab. For the 5-year period from 1994-1998, there was an average of 297,000 pounds of reported blue crabs landed by Smith Island commercial watermen. Over the same time period, the average annual harvest of oysters was about 16,000 pounds.

The general Smith Island/Tangier Sound area also supports other commercial shellfish operations including the harvest of oysters and clams. As with the rest of the Chesapeake Bay, the oyster diseases MSX and Dermo have decimated populations in the vicinity of Smith Island. There are nine charted oyster bars located north, west, and east of Smith Island. None are located in the vicinity of the study area.

2.3.3 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. Shallow waters near Smith Island are likely to support minnows, killifish, silversides, and striped bass (*Morone saxatilis*). Species that inhabit deeper water include: menhaden (*Brevoortia tyrannus*), rays, bluefish (*Pomatomus saltatrix*), sea trout (*Cynoscion nebulosus*), spot (*Leiostomus xanthurus*), summer flounder (*Paralichthys dentatus*), and drum (Lippson & Lippson, 1997). Important commercial finfish species include striped bass, herring (*Clupea harengus harengus*), and menhaden.

Many of these species find extensive food source and protection in the SAV and tidal creeks that channel through the marsh. Some of these species that require wetlands and SAV include: pipefish, seahorses, sticklebacks, anchovies, silversides, shrimp, blue crabs, clams, menhaden, shad, spot, croaker, and red drum (*Sciaenops ocellatus*). The wetlands are especially important during juvenile lifestages, when the fish are most vulnerable to predation from larger organisms. In addition, the protection provided by the grasses makes SAV and wetlands an important spawning area. The larvae make an attractive food source for larger fish. The result is an environment that supports large fish populations.

The area of the Chesapeake near Smith Island is designated by the National Marine Fisheries Service (NMFS) as an Essential Fish Habitat (EFH) for a number of species. The Rhodes Point study area lies within the general area that may provide EFH for some of the species managed by NMFS. Study area species of concern identified on the NMFS EFH website were: Summer Flounder *(Paralicthys dentatus),* Windowpane Flounder *(Scopthalmus aquosus*), Bluefish *(Pomatomus saltatrix*)**,** Cobia *(Rachycentron Canadum),* Red Drum *(Sciaenops ocellatus),* King Mackerel *(Scomberomorus cavalla),* and Spanish Mackerel *(Scomberomorus maculatus).*

Direct coordination with the NMFS office in Oxford, Maryland narrowed the initial list of 7 species to two of primary concern, the summer flounder (juveniles and adults) and the bluefish (particularly the juvenile life stage). Summarized existing conditions information on these species of primary concern is presented in the following paragraphs. A stage by stage life history analysis of all 7 Smith Island species of concern, with greater emphasis on the summer flounder and the bluefish, is included in Annex G, the EFH assessment.

The summer flounder is a large flatfish common to Maryland waters. Its migration pattern is similar to many other migrating fish species, which enter the Bay in the spring and summer and leave with the onset of winter. It is believed that the summer flounder is a winter spawner and probably seeks deep water. Since the summer flounder is not usually found in the Smith Island area during winter, there is no reason to believe that this area is used for spawning. The summer flounder is a valuable food fish in the Bay and is caught from March until November. Summer flounder feed mainly on fish, squids, shrimp, crabs and mysids. The summer flounder prefers sandy substrate and is frequently seen near the shore, partly buried in the sand. Color adaptation is developed to a very high degree.

The bluefish travels in schools, especially in deeper water, feeding predominantly on menhaden, herring, and mackerel. The fish has a voracious appetite and often pursues schools of small fish onto the beach. The bluefish is most prevalent just off the shores of the Chesapeake Bay during the summer. Bluefish, especially juveniles, follow herring, menhaden, and other small fish into the middle and upper Chesapeake Bay. The waters of the Eastern Shore of Maryland are especially important to the juveniles. There may be late summer populations of adult bluefish near Smith Island, although they are unlikely to be nearshore.

<u>Commercial and Recreational Fishery</u>. Commercial fisheries for finfish such as striped bass (*Morone* saxatilis), sea trout, herring, croaker, Spanish mackerel (*Scomberomorus maculatus*), and summer flounder exist near Smith Island. The populations of shad, black sea bass, and bluefish have all fallen below commercially viable levels.

The Smith Island/Tangier Sound area has a significant recreational fishery. The most common sport species include sea trout, croaker, spot, bluefish, striped bass, and summer flounder.

2.3.4 Birds

The salt marshes of nearby Janes Island State Park have many creeks and ponds that attract waterfowl. American Black Duck, Canvasback, and Redhead winter in the study area. Marsh birds and Osprey nest in the area. Many waterbird species, including herons and egrets, utilize the waters and marshes of the area as foraging grounds. Colonial waterbird colony sites occur on Smith Island and in Deal Island W.M.A. to the north.

Smith Island's combination of expansive wetlands and scattered upland hammocks provide premier habitat for an incredible variety of bird species. The mix of undisturbed wetlands and scattered uplands provides an ample food supply that makes Smith Island an attractive habitat for colonial waterbirds, shorebirds, and waterfowl including dozens of migratory bird species. Smith Island may also provide a suitable winter staging area for waterfowl. This will be verified in coordination with resource agencies during the public review period.

2.3.5 Reptiles

The diamondback terrapin (*Malaclemys terrapin*), snapping turtle (*Chelydra serpentina*), northern water snake (*Natrix sipedon*), and rough green snake (*Opheodrys aestivus*) are known to occur in the Smith Island area. Terrapin are an important resource to the watermen of Smith Island as well as an integral part of the food web on the island.

2.3.6 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 (*Canis vulpesalso*) occur. Each of these species is native to the expansive tidal marshes, typically feed on the marsh vegetation, and is an important part of the marsh ecosystem.

Smith Island is notably free of nutria (*Myocastor coypus*), an invasive species that has caused extensive damage to other marshes on the Eastern Shore of Maryland. As a result, the marsh on Smith Island is in better health than many comparable marshes on the mainland.

2.3.7 Floral Resources

Emergent Wetlands

The emergent wetland vegetation on Smith Island is expansive and extremely valuable. The majority of the emergent vegetation is black needlerush (*Juncus roemerianus)*, which is rarely found in such pristine expanses. Other Species located with the Smith Island area are smooth cordgrass (*Spartina alterniflora*), saltmeadow hay (*Spartina patens*), salt grass (*Distichlis spicata*), marsh elder (*Iva frutesccens*), groundsel bush (*Baccharis halimfoilia*), saltmarsh bulrush (*Scirpus robustus*), waterhemp (*Amaranthus cannabinus*), and common reed (*Phragmites australis*). Older dredged material disposal sites scattered throughout the island are primarily vegetated by beneficial wetland species, while more recent placement sites are dominated by common reed, an invasive plant of relatively low wildlife value.

The Rhodes Point study area has an abundance of salt marsh lining the shoreline and channel. Dominant salt marsh plants in the area include typical species such as smooth cordgrass (*Spartina alterniflora*), needlerush (*Juncus roemerianus*), spike grass (*Distichlis spicata*), salt hay (*Spartina patens*), marsh eldar (*Iva frutescens*), and high tide bush (*Baccharis halimifolia*). Minor areas of palustrine scrub and forested wetlands also occur.

Submerged Aquatic Vegetation (SAV) Beds

Submerged Aquatic Vegetation (SAV) is among the most valuable aquatic resource within the Chesapeake Bay. SAV species are also termed 'bay grasses' or 'seagrasses,' and refer to the rooted vascular plants that inhabit shallow coastal water. In recent years, there has been a significant overall loss in the acreage of SAV at Smith Island. Figure 2.1 shows the change in SAV from 1992-1998 from 2,963 acres in 1992 to 453 acres in 1998 in selected sites around the island.

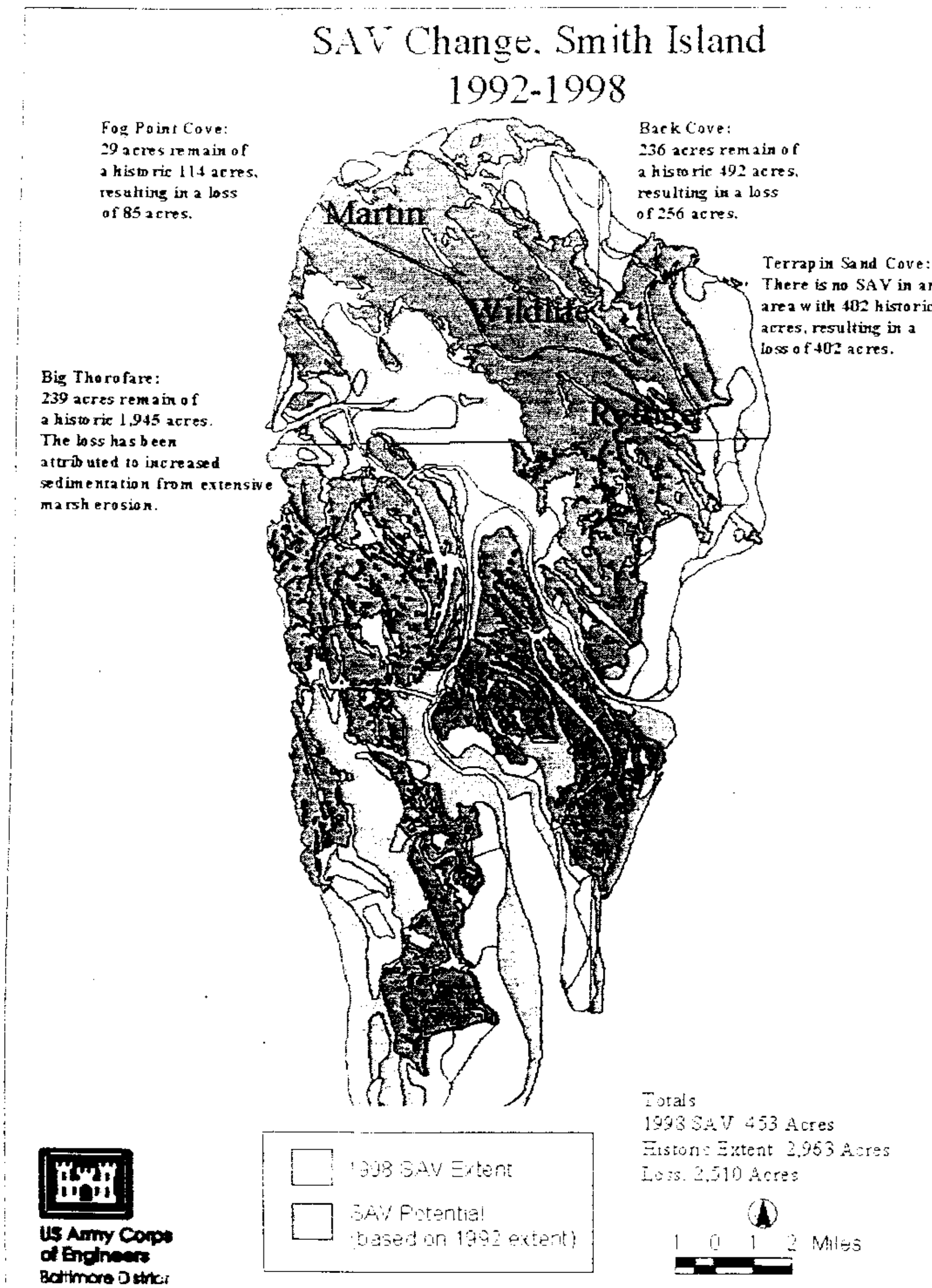
Historically, there have been substantial SAV beds located off the coast of the western shoreline of Smith Island. In fact, the need to avoid disturbing these beds influenced the alignment of the existing navigation channel in 1982. Since 1994, however, SAV beds have not been consistently present off the western shore, and there has been a significant reduction in SAV near the channel. Since 1994, the only SAV indicated on the Virginia Institute of Marine Science (VIMS) SAV maps is a one-acre area, identified south of the channel in 1999. The bed did not return in 2000, the most recent year where data is available.

The loss of SAV in the study area has been linked to the fine sediments eroded from the marsh. In addition, recent research has indicated that eroded shoreline does not provide quality SAV habitat, and shoreline erosion rate along the western shoreline is substantial. Estimates of shoreline erosion are approximately 6 to 9 feet per year, dramatically altering the shoreline conditions and substrate. Although it is difficult to predict future SAV growth, evidence suggests a trend toward degraded SAV habitat along the western shoreline, especially in the recently eroded areas.

Upland Vegetation

Upland habitat is a rare and valuable resource on Smith Island. Smith Island is a low-lying series of islands, with occasional drier hummocks. The largest of these hummocks provides the land upon which Rhodes Point, Tylerton and Ewell are built. There are no uplands in the vicinity of the Rhodes Point study area.

Figure 2.1: SAV Change on Smith Island from 1992-1998



2.3.8 Threatened or Endangered Species.

The USFWS and MD DNR acknowledge Smith Island as potential habitat for several threatened and endangered species. The federally threatened and endangered species known to visit Smith Island are listed in Table 2.3. In addition, the Northern Harrier (*Circus cyaneus*), a state rare species, and the Black Skimmer (*Rynchops niger*), a state threatened species, occur on the island. These species predominately use Martin National Wildlife Refuge, located on the northern section of the island, over two miles away from the project site. There are no permanent populations of any of the state or federally listed species within the project area. The project area lies outside of the disturbance area of the nesting Northern Harrier.

Three federally listed endangered turtles have been documented to visit Smith Island over the past thirty years. These include the leatherback turtle *(Dermochelys coriacea coriacea*), hawksbill turtle *(Eretomochelys imbricata imbricata*), and Atlantic ridley turtle *(Lepidochelys kempi*). The loggerhead turtle *(Caretta caretta caretta*) and the Atlantic green turtle *(Chelonia mydas mydas)* are considered threatened species by the federal government.

Table 2.3: Threatened and Endangered Species known to visit Smith Island.

Species	Status
Bald eagle *(Haliaeetus leucocephalus leucocephalus*)	Threatened
Red-cockaded woodpecker *(Picoides borealis*)	Endangered
Shortnose sturgeon *(Acipenser brevirostrum)*	Endangered
Leatherback turtle *(Dermochelys coriacea coriacea*)	Endangered
Hawksbill turtle *(Eretomochelys imbricata imbricata*)	Endangered
Atlantic Ridley turtle *(Lepidochelys kempi*)	Endangered
Loggerhead turtle *(Caretta caretta caretta*)	Threatened
Atlantic green turtle *(Chelonia mydas mydas)*	Threatened

Section 3

PROBLEM IDENTIFICATION

The problem identification process for the Rhodes Point study was designed to be sensitive to the needs and desires of community and island residents as well as to include the input of interested agencies and government officials. Early problem identification efforts were conducted during the reconnaissance study and involved identifying the values, concerns, ideas, and issues of island residents. During the reconnaissance phase of the study the team made a number of visits to the island and also used phone conversations and other communication techniques to determine the issues that island residents considered most critical. Similar public involvement activities continued after the reconnaissance study was completed and the feasibility phase was initiated. The feasibility phase public involvement, along with agency and local government coordination, is summarized in this section.

3.1 MEANS BY WHICH PROBLEMS WERE IDENTIFIED

The Baltimore District has developed an active involvement with the Smith Island public during the past several years. The identification of problems on the island has been a combination of both public coordination efforts and consultation with other Federal, State and county agencies.

3.1.1 Public Involvement

In a June 1999 newsletter (see Annex E) and at a public meeting held in Rhodes Point on July 14, 1999, the study team provided a status report for island residents. The team presented information on technical investigations for the overall study, reported on the separate funding received and accelerated schedule for the Tylerton project, and the continuing efforts to identify separate funding sources for the Rhodes Point project. Meeting attendees expressed strong support for pulling the Rhodes Point project out of the larger Smith Island feasibility study and finding separate funding so the project could be accomplished on an accelerated schedule, similar to the Tylerton project.

Issue #4 of the newsletter (see Annex E) was mailed in July 2000. The newsletter reported on the status of the Smith Island Feasibility Study, which deals with projects on the entire island, and on the Tylerton project. The newsletter also announced a community meeting to be held on August 15, 2000, at Rhodes Point, and discussed efforts being coordinated by the Corps to develop improvements to wastewater treatment and an effort by the Maryland Rural Community Assistance Project to improve solid waste management on the island.

The August 15 community meeting at the Rhodes Point Community Center provided an opportunity for additional discussion of the Rhodes Point project alternatives. Comments received resulted in ideas for modifying the project design in a way that provides improved shoreline erosion protection and boat access through Sheep Pen Gut

According to commercial watermen who use the channel to reach Chesapeake Bay fishing waters, navigation-impeding shoals develop in the channel within 3-6 months after a maintenance-dredging event. The existing Federal channel at Sheep Pen Gut is currently dredged every 3-4 years. There are 30 commercial fishermen who depend on the channel to access Chesapeake Bay fishing waters to the west of Smith Island. When the Sheep Pen Gut channel shoals in, these watermen use an alternate, indirect access route through Big Thorofare in order to avoid the shoal and the potential for vessel damages.

The Sheep Pen Gut navigation channel is dredged to an authorized depth of 6 feet and a width of 50 feet. The channel was most recently dredged in 1998 when 9,000 cubic yards of material was removed at a cost of $325,000. The material dredged from the channel was used to fill geotextile tubes along the Hog Neck Peninsula south of the channel. At the time of this dredging event, shoaling was evident in several sections of the channel. Previous to the 1998 maintenance dredging, the channel was dredged in 1995 and a total of 54,000 cubic yards of material was removed at a total cost of $515,000.

3.1.2 Agency Coordination

A study initiation letter and Public Notice announcing the beginning of the Smith Island Environmental Restoration Feasibility Study was mailed in October 1998. Following the Public Notice, a series of agency coordination tasks were completed, including meetings and discussions with, and presentations to USFWS, the Maryland Historical Trust, DNR, the CBF, Somerset County government, MDE, and others.

Many meetings among project team members and representatives of other agencies and offices have been held in the years following the reconnaissance study initiation in 1996. In March 1999 a meeting was held on the island to determine agency support for the projects. Participants agreed on the construction of a bulkhead at Tylerton, rather than stone, and the issue of using offshore material for "borrow" or fill material was discussed. The participating agencies did not express objections to the Rhodes Point project. An Executive Committee meeting, including the Secretaries of the DNR, MDE, USFWS, and the Somerset County commissioners, was held in March 1999. At this meeting the Tylerton project was "spun-off," study funding was defined, and a decision was made to pursue the Rhodes Point project under the Section 107 program. A subsequent agency coordination meeting was held at the Corps District Offices on October 7, 1999.

3.1.3 Other Public Involvement Activities

During the reconnaissance study, public involvement and agency coordination 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. Several team members participated in meetings with residents of Tangier Island, located 10 miles south of Smith Island. Conditions on both Smith and Tangier Islands are similar and local residents are dealing with many similar issues, such as erosion, loss of population, and declining fisheries.

During the feasibility study, study team members responded to a number of inquiries from the news media, governmental offices, and the public.

3.2 PROBLEMS, NEEDS, AND OPPORTUNITIES

The 1980 Smith Island Feasibility Report recommended construction of a jetty along with the Sheep Pen Gut channel and offshore breakwaters to protect Hog Neck, to the west of Rhodes Point, from shoreline erosion. This project would also have provided storm damage protection to the town of Rhodes Point and shoaling protection to the Sheep Pen Gut Channel. Due to a lack of non-Federal funding, the project was not implemented. During maintenance dredging in 1995 and 1998, however, material removed from the entrance to the Sheep Pen Gut channel was used to fill geotextile tubes placed to provide protection for Hog Neck and to create wetlands behind the tubes. Though many of the geotextile tubes have failed, the marshland created behind the tubes has been stable.

Overall, 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 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 they were able to prior to sedimentation of the docking area. Also, the sediment has a detrimental effect on SAV in 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.

The Sheep Pen Gut Federal navigation channel that runs from Rhodes Point to deep water in the Chesapeake Bay shoals much more quickly than the other navigation channels in the area. Commercial watermen find it necessary to wait for high tide conditions for safe navigation through the channel within 3 to 6 months of maintenance dredging. After the channel shoaling constricts the navigation channel, the majority of commercial watermen travel an additional 10 miles round trip 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. This additional travel distance translates to increases in fuel consumption and fuel costs and to increased vessel maintenance costs. The increased operating costs incurred by commercial watermen is the primary problem resulting from the rapid formation of navigation-impeding shoals in the existing navigation channel.

The foremost need and opportunity is to identify alternatives to the existing Federal channel at Sheep Pen Gut that will reduce the rapid rate of shoal formation in the navigation channel. A secondary opportunity is to provide shoreline protection near the mouth of Sheep Pen to reduce erosion. There could also be an opportunity to create or restore marshland along the shoreline in the study area.

Section 4

PLAN FORMULATION

During the feasibility phase, planning efforts were directed toward formulating feasible alternatives and selecting a recommended plan to slow the sediment transport that has led to rapid shoaling of the navigation channel at Rhodes Point, Maryland, while minimizing the impact of construction on the natural environment.

4.1 FEDERAL OBJECTIVE

The Federal objective of water and related land resources planning is to contribute to the National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Resource planning must incorporate a multi-objective planning process where economic, social and environmental considerations must be equally weighted. During the formulation process associated with this study, alternative plans were formulated that would alleviate the identified problems at Rhodes Point in ways that contribute to both the Federal objective and the desires of the local sponsor. This approach is in compliance with the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, dated March 1983.

Generally, several alternative plans are formulated to address a particular set of water resource problems. The alternative plan that maximizes the net contribution (amount by which annual benefits exceed annual costs) to the NED objectives, consistent with environmental objectives, is defined as the NED plan. Given the fish and wildlife value of the area, alternative plans have been formulated to include environmental enhancement components. Although 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. These project features were considered separately. Also, the cultural and historical significance of Smith Island as well as its social character must be considered in all phases of study. Project alternatives must be appropriate to the island and the way of life.

4.2 PLANNING OBJECTIVES, CONSTRAINTS, AND CRITERIA

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, the study team developed the following objectives and constraints:

1) The alternative plans should be designed to reduce shoaling in the channel and to address the navigation problems resulting from insufficient depths.

2) Alternative plans should be adequately sized to accommodate present and future user needs and should not adversely affect the safe and continued usage of the channel.

3) Alternative plans should minimize adverse effects on terrestrial and aquatic habitats.

4) Alternative plans should minimize adverse effects on cultural resources.

5) Measures should be implemented that protect or enhance the value of existing environmental resources.

6) All alternatives considered to meet project needs should be presented in quantitative terms where possible.

7) Benefits should be expressed in terms of a time value of money and should exceed the economic costs of the project.

8) Alternative plans should minimize adverse social impacts.

9) Alternative plans should maintain consistency with state, regional and local land use and development plans, both public and private.

10) Provide opportunities for the beneficial use of dredged material.

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

4.3 MANAGEMENT MEASURES

A variety of structural and non-structural measures were considered to the navigation-related problems at Rhodes Point. The management measures include those that are within the implementing authority of the Federal government as well as those that are within the implementing authority and capability of the local sponsor and other agencies affiliated with Rhodes Point. Some of these measures are currently practiced in Rhodes Point, as noted below.

4.3.1 Non-Structural Measures

Non-structural measures oriented toward reducing shoaling and/or boat damages would be limited to changes in current fishing practices, increased maintenance dredging, or navigational changes such as timing travel with the tides as is currently done. Changes in current fishing practices could include relocating the harbor facilities.

Relocation of Harbor Facilities. Although relocating the harbors and other businesses is theoretically possible, it would imply a movement of all facilities to one of the other towns. Harbor space is not readily available at the other towns. A new harbor would require excavation of valuable wetlands and is unlikely to be permissible. This option was determined to be unfeasible.

Increased Maintenance. Historically, the Federal channel at Sheep Pen Gut has been dredged approximately every 3 years. After maintenance dredging, the channel typically forms shoals so quickly that boats have experienced damages attempting to navigate the channel after 3 to 6 months. A more frequent dredging cycle would alleviate the problem, but this would require maintenance 2-3 times per year, which is not feasible. Subsequently, this alternative was not selected for further evaluation.

4.3.2 Structural Measures

One solution to the navigation problem at Rhodes Point would be construction of a structure designed to reduce shoaling in the channel. Based on findings of the reconnaissance study, it was determined that rubblemound jetties could significantly reduce the problems in the navigation channel. Other structures that could potentially provide similar results include groins, breakwaters, revetments, and geotextile tube jetties.

4.3.2.a Groins. Groins are usually made of timber, steel, or stone and built as a single structure or in a series. A groin is a shore protection structure built perpendicular to the shoreline designed to trap littoral drift. Wooden groins contribute to poor water quality conditions by releasing chemicals, such as tar and chemicals used to preserve the wood. Timber and steel structures tend to have a shorter life than stone, or rubblemound, structures do. Groins tend to increase erosion and are not effective under conditions where longshore transport moves from opposing directions, as is experienced at Smith Island. Furthermore, a groin is designed to stop sediment transport close to the shoreline but is less effective against sediment transport moving a distance offshore, a common condition along the coast of Smith Island. For these reasons, groins were not evaluated further.

4.3.2.b Breakwater. A breakwater is a structure that is generally constructed parallel to the shoreline to reduce the amount of wave energy reaching the protected shoreline. Breakwaters can be a continuous length or intermittent segments and may be located at the shoreline or offshore. They can also have a high or low crest; although, low crested breakwaters are often submerged during storm events and their effects on waves in such conditions can be relatively small. Resulting changes in the longshore sediment transport and the onshore-offshore sediment transport, in the vicinity of the breakwater, determines the resulting shoreline response. Since the predominant sediment transport in the area of Rhodes Point is parallel to the shoreline, a breakwater would be appropriate only if it were high enough and impermeable enough to create conditions in the lee of the structure that would halt the transport of sediment. Since the distribution of the transport of sediment extends far offshore, it was determined that this scenario was impractical. To reduce the shoaling in the navigation channel, it is necessary to construct a structure perpendicular to the shoreline.

4.3.2.c Jetty Designs

Geotextile Tube Jetty. The structure required for Rhodes Point would have to be long enough to prevent the sediment transport along much of the length of the channel, be connected to the shoreline, have no breaks or spaces in the protection, and be of sufficient height to disallow most waves from overtopping the structure. One possibility is to construct a jetty out of sand-filled geotextile tubes. The tubes are of various heights and lengths and are filled with dredged material using a hydraulic dredge. The tubes could be laid in the shape of a "U" and then filled in the middle with more material. The material in the middle could be stabilized with vegetation and could even act as habitat for birds or small mammals. The tubes were determined not to be a viable solution for this application due to the questionable durability of the material. Geotextile tubes have not often been used as a jetty or breakwater in the Chesapeake Bay area but have been used to retain dredged material and often to create wetlands and habitat. A failure in a tube could result in tremendous quantities of material being released into the channel quickly. In addition, the life of the tubes has also not been accurately determined. Common practice dictates that tubes are to be used only as a temporary-retaining device.

Rubblemound Jetty. A jetty is a structure that extends into the water to prevent or reduce the shoaling of a channel or inlet by littoral movement. A jetty may also help to protect the harbor areas from storm-induced wave damage by stopping erosion at the mouth of Sheep Pen Gut that causes the town to be more exposed to storm energy over time. The stone material used to construct jetties is generally insoluble and can remain relatively stable over long periods of time. The length and height of the jetty as well as the placement and size of stone must be carefully evaluated to determine the design that will maximize benefits and minimize impacts to the environment. As part of this alternative, a realignment of the channel was also considered. A rubblemound jetty was recommended in the reconnaissance report as well.

4.3.2.d Revetment. Revetment structures consist of a continuous wall of armor stone or riprap, which stabilize a shoreline by dissipating wave energy on the revetment slope before it reaches the upland areas. Since revetments are shoreline protection and would have no effect on offshore sediment transport, this alternative was not considered further.

4.3.2.e Wetland Formation

The formation of wetlands is addressed as an environmental benefit in the May 2001 Feasibility Study. Wetland development using dredged material could reclaim some of the protective wetland adjacent to the Rhodes Point project area that is being lost by erosion. The wetland formation areas would have to be protected from erosion through the construction of sills or breakwaters, and the area would have to be manually planted. The inclusion of wetland formation provides a location for the deposition of the dredged material from the navigation project while adding both the environmental benefit of wetland creation at Smith Island and providing additional stabilization of the shoreline from future erosion of existing marsh land.

4.4 FORMULATION

4.4.1 Formulation and Evaluation Criteria

The selection of the best plan of improvement involves the comparison of the various alternative plans that solve the problems and needs of the study area and that meet the formulation and evaluation criteria as discussed in Section 4.2. Alternative plans are formulated and evaluated on the basis of technical, economic, social, and environmental criteria. These criteria, along with tangible considerations, permit the development of options that best respond to the planning objectives. The specific criteria considered in the formulation of alternative plans for the Rhodes Point, Maryland, feasibility study are as follows:

Technical Criteria:

1. Each alternative is designed as a complete project;

2. Analyses of benefits and costs are to be conducted in accordance with Corps of Engineers' regulations and must ensure that any plan is complete, efficient, safe, and economically feasible in terms of current prices; and

3. The project is engineeringly sound in accordance with Corps of Engineers guidelines.

Social and Environmental Criteria:

1. Public health, safety, and well being are protected;

2. Where possible, detrimental environmental impacts are avoided and/or features to minimize and mitigate adverse effects are included; and

3. Opportunities for environmental enhancement through beneficial use of dredged material should be pursued.

4.4.2 Alternatives Considered

During the preparation of the 1997 Smith Island reconnaissance report, alternative plans were formulated based on solutions to the problems and needs of the study area and that meet the formulation and evaluation criteria as discussed in Section 4.2. The recommended plans from the reconnaissance phase included shoreline stabilization, single jetty and twin jetty alternatives. These plans were used as a starting point for feasibility formulation efforts. Additional alternatives were also evaluated during the feasibility phase. This section provides a discussion of the project alternatives considered during the feasibility phase.

Plan 1- Shoreline Stabilization at the Mouth of Sheep Pen Gut

This alternative involves placing structural protection offshore to a crest elevation of +3 feet MLLW (mean lower low water). Figure 4-1 is a conceptual drawing of a shoreline stabilization project at the mouth of Sheep Pen Gut. The area between the structure and the existing shoreline would be filled with dredged material and planted with wetland vegetation. The dredged material could come from the existing channel or construction of a realigned channel. The use of the dredged material from the Rhodes Point navigation project to restore wetlands in areas adjacent to the navigation project site offers a method for providing environmental benefits incidental to the primary navigation purpose of the project. If a stabilization project were constructed to contain material dredged from the navigation channel, it would provide approximately 2 acres of additional area for wetland flora and fauna, and would stabilize approximately 1,500 feet of shoreline from erosion of existing marshland.

Although part of the shoreline of Hog Neck is currently being stabilized with the use of geotextile tubes as part of an ongoing maintenance of the Sheep Pen Gut channel and they seem to be providing adequate protection, the stability and uncertainty of using geotextile tubes has caused concern. Therefore, Plan 1 was investigated further considering only the use of stone for the structure.

Plan 1 does not address littoral drift, the identified cause of shoaling in the Sheep Pen Gut navigation channel. However, the plan does provide wetlands creation and shoreline protection benefits, and it was investigated in greater detail as a potential component of a project designed to protect the navigation channel from littoral drift.

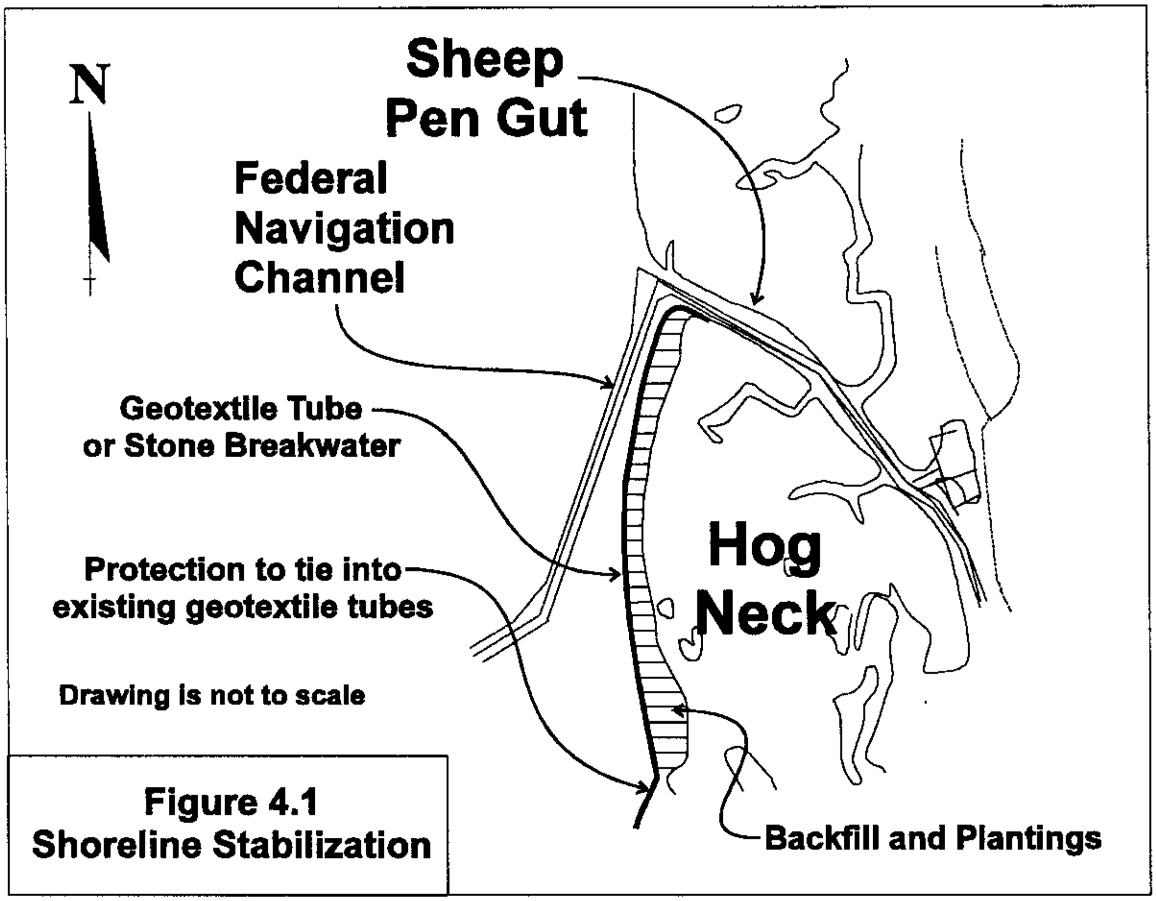


Figure 4.1
Shoreline Stabilization

Plan 2 - Jetty Alternatives

This alternative involves placing one or more rubblemound jetty structures parallel to the existing channel or to follow a new alignment of the existing channel. Figure 4.2 displays conceptual drawings of the 4 jetty alternatives considered during formulation.

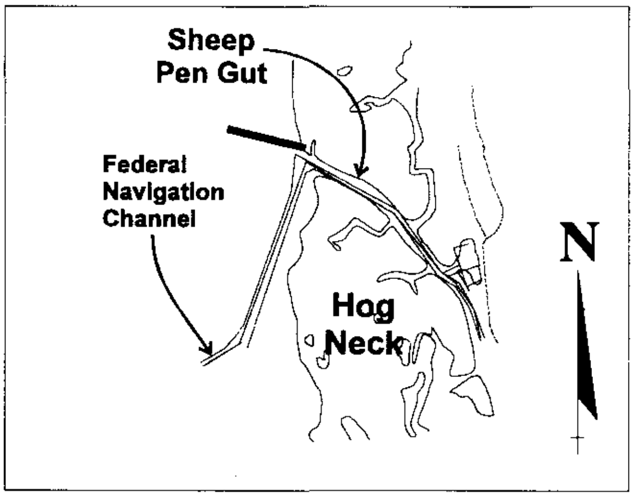
Plan 2a features a single jetty extending from the shoreline at a perpendicular angle and a continuation of the alignment of the existing Federal channel. Plan 2b features twin jetties and a continuation of the existing Federal channel. The north jetty of Plan 2b extends from the shoreline perpendicularly for a short distance and then bends sharply to follow the alignment of the channel. The south jetty of Plan 2b is a short structure extending from the shoreline perpendicularly. Its function is to stabilize the mouth of the channel where shoals tend to form. Plan 2c is a twin jetty system designed to protect a realigned navigation channel. The channel in Plan 2c was realigned to provide more direct access from Sheep Pen Gut to deep water in the Bay. Plan 2d features a single jetty extending from the shoreline north of a realigned navigation channel. The realigned channel is identical in design to the channel feature in Plan 2c.

When the existing Federal Sheep Pen Gut channel was designed, a more direct channel to fishing waters was not a feasible alternative due to the presence of wetlands. These wetlands have vanished since construction of the existing channel making a change in the channel alignment a feasible alternative. A realignment of the existing Federal navigation channel would require a shorter, less expensive structure to protect the area. In addition, the realignment would serve to reach the deeper water faster. For these reasons, the realignment of the channel was investigated further along with retaining the existing channel.

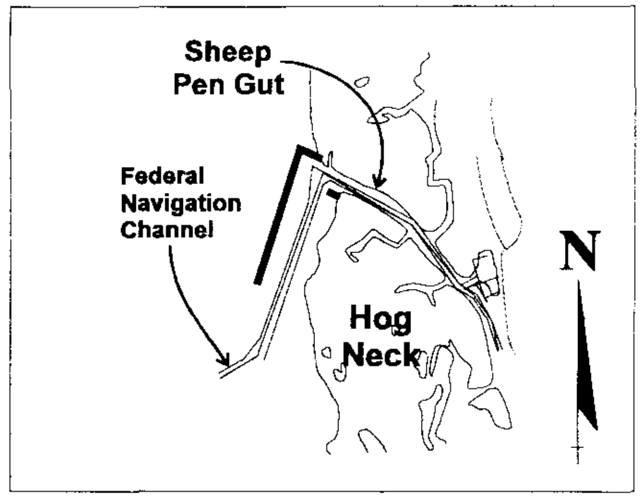
The feasibility of Plan 2a was not further evaluated because engineering investigations indicated the jetty structure in Plan 2a would not provide protection from shoaling along a sufficient length of the existing navigation channel. The feasibility of jetty alternatives 2b, 2c, and 2d was investigated in greater detail. The evaluation of these alternatives is documented in Section 5.

Plan 3 – No Action Plan - Continue Current Maintenance Dredging

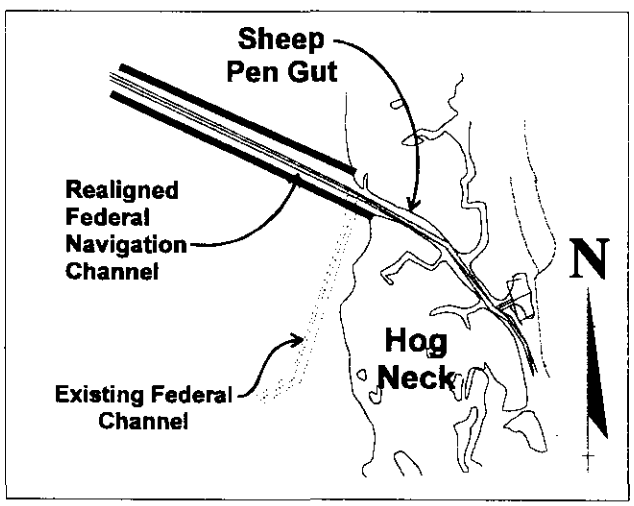
The existing maintenance dredging cycle occurs every three to five years. Within 3-6 months of being dredged, navigational use of the channel is hazardous because of shoal formation. This prevents the channel from being efficiently used for over three to four years at a time until the next maintenance dredging occurs. This alternative is the No Action plan against which the other potential plans will be compared. If no other alternative were found to be economically or environmentally acceptable, then the no-action alternative would be the recommended plan. The utilization of this alternative would lead to the continuation of the current condition of sedimentation in the Federal channel, and continued erosion in the gut and along the shoreline. There is no indication that these erosion and shoaling processes will cease.



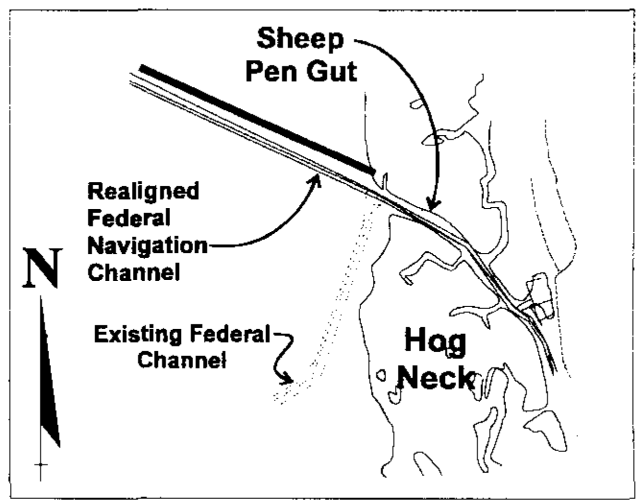
Plan 2a



Plan 2b



Plan 2c



Plan 2d

Drawings are not to scale

Figure 4.2
Jetty Alternatives
Rhodes Point

4.4.3 Initial Plan Evaluation and Selection

After establishing the type of structure to be evaluated, formulation efforts were concentrated on identifying various alignments and plan options to minimize potential impacts to the environment and project cost.

<u>Channel Realignment</u>

Some plans include realignment of the channel. Hydrographic surveys and anecdotal data suggest that the channel length, dredged material volumes, and ingress/egress times could be lessened by realignment.

<u>Jetty Alignment Considerations</u>

The general location of the jetty structure(s) was somewhat obvious due to the nature of the problem. The choice between a single jetty or twin jetties, and whether not to realign the channel is less obvious. The exact alignment, therefore, was a more critical element in the design of a feasible project. An alignment was chosen that tied into the mainland north of the channel perpendicularly and that runs parallel to the channel. Consideration was given to the distance the structure should be from the navigation channel and also to the effect of the structure on the remaining shoreline. It is assumed that the structure will impound material updrift and reduce the energy of the flow updrift as well. The accretion is not likely to have an effect on the navigation channel since any material that may eventually bypass will pass into deeper water areas in the Chesapeake Bay. Material accretion will also likely stop the existing erosion of 6-8 feet of wetlands in the vicinity of the proposed structure. A southern jetty was also considered since, although the net transport is to the south, material does move north during rising tides.

<u>Initial Plan Selection</u>

The selection of alternatives was based predominantly on the effectiveness of each structure, and the cost of each structure. The jetty alternatives discussed above represent the most cost-effective and engineeringly feasible alternatives and will be compared to the no-action alternative. A rubblemound jetty was chosen because of its effectiveness and minimal environmental impact.

Analysis of dredged material placement options showed that placement of material behind offshore stone breakwaters along the shoreline in the project area will provide an opportunity for valuable marshland creation and protection of highly erosive shoreline.

In the following section, the No Action alternative and 3 jetty alternatives, 2 with a realigned navigation channel, one with the existing channel alignment, are evaluated to identify the NED plan in accordance with Corps of Engineers policy. The NED plan is the plan that provides maximum net benefits. Each jetty alternative also includes the beneficial use of material dredged from the channel to restore wetlands in the project area. The optimum jetty length was evaluated as a function of the navigation benefits the jetty will produce as its length is varied, compared to the cost to construct a jetty of that same length.

Section 5

PLAN DESCRIPTION AND EVALUATION

The previous section contained a description of the plan formulation process used to identify feasible alternatives. Planning objectives and constraints were established, viable solutions for providing protection from shoaling were identified, and design criteria and assumptions were assembled. With this information, alternative plans were formulated and 3 viable alternatives to solve the navigation problem were identified. This section provides an integrated evaluation of the economic, social, environmental, and cultural impacts for these alternatives and identifies the recommended (NED) plan of improvement.

5.1 PLAN DESCRIPTION

Once the determination was made during formulation that a jetty was the best solution to the navigation problems at Rhodes Point, a detailed evaluation of three jetty alternatives was conducted to identify the recommended plan. The project benefits and costs of Plans 2b, 2c and 2d from Section 4 were evaluated and compared to the "without project" condition, the no action plan. The recommended, or NED, plan will be the alternative that maximizes the net benefits derived from implementation. If no plan realizes benefits in excess of costs, the no action plan will be recommended.

For the evaluation of alternatives, the numbers used to identify the alternatives was revised. In this section, the No Action alternative is identified as Alternative 1, Plan 2b from Section 4 is identified as Alternative 2, Plan 2d from Section 4 is identified as Alternative 3 and Plan 2c from Section 4 is identified as Alternative 4.

5.1.1 Alternative 1: No Action (Without Project Condition)

The without project scenario represents the best forecast of the expected environmental and economic conditions in the event that no action is taken at Sheep Pen Gut. The without project plan represents the base from which all changes are measured. It is the most probable future condition without implementation of any of the alternative plans discussed later in this section.
In the case of Sheep Pen Gut, the most likely future without a project alternative is continuation of the existing Federal navigation project. This alternative was identified as the No Action alternative in Section 4.

With the No Action alternative, the existing 3-4 year maintenance dredging cycle would be continued, and navigation-impeding shoals will continue to form in the navigation channel within 3 to 6 months of dredging. Other continuing impacts with the No Action alternative include the erosion of the mouth of Sheep Pen Gut and the probable increase over time in the magnitude of storm damages to the town of Rhodes Point.

The economic consequences of continuation of the existing project would include the continuation of shoal-induced navigational operating costs incurred by commercial watermen who use the channel. Table 5-1 presents the projected shoal-induced operating costs to commercial watermen for the without project condition for the 50-year period of analysis. The total cost is expected to be in excess of $8 million.

TABLE 5-1
Rhodes Point
Alternative 1 (No Action) Shoaling Costs
over 50-Year Project Life
(October 2001 P.L.)

Fish Boat Damages	Lost Labor Costs	Add. Fuel Costs	Incr. Ordinary Maint. Costs	Total 50-year costs
$114,000	$3,198,000	$4,012,000	$744,000	$8,068,000

Continuation of the existing Federal navigation project is not expected to significantly impact environmental conditions in the project vicinity or on the rest of Smith Island. The environmental conditions addressed in Section 2.1 of this report would likely prevail over the 50-year period of analysis. Alternative 1 is the No Action alternative.

5.1.2 Description of Jetty Alternatives

There were 3 jetty alternatives in addition to the No Action alternative evaluated to address channel shoaling navigation problems in the Sheep Pen Gut channel near Rhodes Point.

Alternative 2 consists of the construction of a single stone jetty north of a realigned navigation channel. The single jetty is 1,500 feet in length with a crest elevation of +4.5 feet MLLW parallel to the channel and protruding perpendicularly from the shoreline. The realigned channel would be about 1,500 feet long, requiring approximately 18,500 cubic yards of dredging to construct.

Alternative 3 features the construction of twin jetties and the continuation of the existing Federal channel. The north jetty would be about 1,600 feet long and extend from the shoreline perpendicularly for a short distance before bending sharply to the south to follow the alignment of the existing channel. The south jetty of Alternative 3 is approximately 500 feet long extending from the shoreline perpendicularly. Its primary function is to stabilize the mouth of the channel where shoals tend to form. The crest elevation of the jetties is +4.5 feet MLLW.

Alternative 4 consists of construction of twin jetties, one on either side of a realigned navigation channel. The jetty on the southern side would be 1,300 feet long and the jetty on the northern side would be 1,500 feet long. The jetties would follow the path of the realigned navigation channel. The crest elevation of the jetties is +4.5 feet MLLW. The twin jetties would be placed a minimum of 200 feet apart to provide adequate room for the channel and possible enlargement of the channel due to natural scour. The realigned channel would be about 1,500 feet long, requiring approximately 18,500 cubic yards of dredging to construct.

The length of the jetty structures in Alternatives 2,3 and 4 was determined as a result of engineering and economic analyses. The engineering investigations identified jetty lengths that would provide the optimum degree of protection from shoaling to the navigation channel. Modifications to the jetty lengths were made as a result of the economic evaluation that compared the life cycle costs of project construction and maintenance to the expected project benefits.

Alternatives 2 and 4 also include placement of material dredged from the realigned navigation channel behind 4 offshore breakwaters. The breakwaters will be 250 feet long with 125-foot gaps, and will be placed approximately 100 feet from the shoreline. The breakwaters were sized and placed to take advantage of the existing shoreline irregularities.

Besides providing a placement site for dredged material, the breakwaters will provide a protected environment for wetland plantings to restore 2 acres of marshland along the shoreline.

5.2 ECONOMIC EVALUATION OF ALTERNATIVES

As described in Section 5.1.2, the 3 alternatives brought forward from formulation to evaluation were the construction of a single jetty with a realigned navigation channel, the construction of twin jetties with the continued use of the existing Federal navigation channel and the construction of twin jetties with a realigned navigation channel. These alternatives were evaluated and compared to the No Action alternative in terms of their economic impact on the shoal-induced navigational problems currently being experienced by commercial watermen who use the Sheep Pen Gut channel.

5.2.1 Alternative 1- Continuation of Existing Project (No Action)

Alternative 1 consists of continuing the existing Federal dredging project. With this alternative, the existing 3-4 year maintenance dredging cycle would continue, and navigation impeding shoals will continue to form in the navigation channel within 3 to 6 months after dredging.

With a continuation of the current dredging cycle, the total operating costs to the Rhodes Point and Tylerton commercial watermen on an annual basis are $160,000. The costs were discounted and annualized using the current fiscal year 2002 interest rate of 6.125 percent. Table A-1 in Annex A presents a detailed analysis of operating costs to the commercial watermen with continuation of the existing project.

5.2.2 Alternative 2- Single Jetty with a Realigned Navigation Channel

Alternative 2 consists of construction of a single jetty north of the mouth of Sheep Pen Gut channel with construction of a realigned channel that provides more direct access to deeper water. Because the predominant transport of material from the Chesapeake Bay that deposits in and forms shoals in the channel is from the north to the south, the construction of a jetty on the north side of the channel would capture a significant portion of the material and prevent it from entering the navigation channel. With this alternative, there would still continue to be material emanating from the south that will be deposited in the navigation channel. The realigned navigation channel would provide a shorter and more direct route to water of sufficient depth for navigation for commercial vessels.

It is expected that with construction of the single jetty the existing 3-4 year dredging cycle would not be significantly decreased. Maintenance dredging would be required on an estimated 4-year cycle. However, the operating costs to the commercial watermen would decrease significantly with this alternative because the channel would remain shoal free for about 2 years prior to accumulation of navigation-impeding shoals. After construction and dredging of the realigned channel, it is expected that the for the first 2 years after dredging that the costs associated with the existing dredging cycle would be eliminated. By years 3 and 4 of the analysis period, shoals are expected to accrue and shoal-induced navigational costs will occur. Over the 50-year analysis period with the Alternative 2, the annual shoal-induced cost to the commercial watermen is expected to amount to $50,000. Table A-6 in Annex A presents a detailed analysis of operating costs to the commercial watermen with construction of the single jetty alternative.

5.2.3 Alternative 3- Twin Jetties with Continued Use of the Existing Navigation Channel

Alternative 3 consists of the construction of twin jetties with the continued use of the existing Federal channel. The construction of the jetty on the north and west sides of the existing channel will capture a significant portion of the material from the Chesapeake Bay that deposits in and forms shoals in the channel and prevent that material from entering the navigation channel. However, within 2.5 to 3 years of construction, material will begin to circumvent the structure and shoals will form. In addition, the short jetty to the south of the channel will not prevent the deposition of sediment from the south in the navigation channel.

It is expected that with construction of Alternative 3 the existing 3-4 year dredging cycle would not be significantly decreased. Maintenance dredging would still be required on an estimated 5-year cycle. However, the operating costs to the commercial watermen would decrease significantly with this alternative because the channel would remain shoal free for about 2-3 years prior to accumulation of navigation-impeding shoals. After construction of the jetties, it is expected that for the first 3 years after dredging that the costs associated with the existing dredging cycle would be eliminated. By years 4 and 5 of the analysis period, shoals are expected to accrue and shoal-induced navigational costs will occur. Over the 50-year analysis period with Alternative 3, the annual shoal-induced cost to the commercial watermen is expected to amount to $47,000. Table A-7 in Annex A presents a detailed analysis of operating costs to the commercial watermen with the construction of Alternative 3.

5.2.4 Alternative 4- Twin Jetties with a Realigned Navigation Channel

Alternative 4 consists of construction of twin parallel jetties on either side of the mouth of Sheep Pen Gut channel with construction of a realigned navigation channel that provides more direct access to deeper water. With construction of the twin jetty alternative with a realigned channel, the material deposited in the navigation channel from both the north and the south will be reduced substantially. With this alternative, it is expected that the frequency of dredging would be reduced to an 8-year cycle compared to the existing 3-4 year cycle. It is expected that navigation-impeding shoals will not form in the navigational channel until year 8 of the cycle. The annual shoal-induced operating cost to commercial watermen with this alternative is expected to amount to $6,000. Table A-8 in Annex A presents a detailed analysis of operating costs to the commercial watermen with construction of Alternative 4.

5.2.5 Alternatives Benefit Evaluation

Project navigation benefits are derived as the difference between the operating costs of the most probable future without project condition and the operating costs associated with alternative future conditions. The most likely future without project condition assumed for the evaluation of alternative benefits was continuation of the existing navigation project, the No Action plan. The benefits evaluation compared the annual shoal-induced operating costs of the without project continuation of the existing Federal navigation project at Sheep Pen Gut and the shoal-induced operating costs of the alternative future jetty alternatives. The benefits are an economic measure of the difference between the continuation of the existing project and the with project alternatives. Alternative 2 produces $110,000 of annual benefits compared to continuation of the existing project. Alternative 3 produces $113,000 of annual benefits compared to continuation of the existing project. Alternative 4 produces $154,000 of annual benefits compared to continuation of the existing project. Table 5-2 presents a summary of the computation of benefits attributable to Alternative 2, 3 and 4.

TABLE 5-2
Alternatives Benefit Summary

Alternative	Annual Navigation Operating Cost	Annual Benefits
Alternative 1	$160,000	N/A
Alternative 2	$50,000	$110,000
Alternative 3	$47,000	$113,000
Alternative 4	$6,000	$154,000

5.2.6 Project Cost Analysis of Alternatives

The cost associated with Alternative 1, the continuation of the existing Federal project, is the annualized cost of continuation of the current 3-4 year maintenance dredging cycle. Based on cost data from recent maintenance dredging events at Sheep Pen Gut, the annual cost of continuation of the existing Federal dredging project is $114,000.

Quantities and cost estimates were developed for Alternatives 2, 3 and 4 with suitable assumptions as necessary for cost estimating at the feasibility study level. The cost estimates are awardable contract amounts based on an October 2001 price level.

The construction cost estimates for Alternatives 2, 3 and 4 are based on District experience with similar projects and include formal estimates for construction management, preparation of plans and specifications and costs for lands, easements, rights-of-way, relocations, and dredged material placement sites (LERRD) which may be required for construction of the project. Costs for construction materials, including armor stone, bedding stone, and sand fill, were estimated based on delivery from a quarry.

Table 5-3 displays the estimated total project cost estimate for Alternatives 2, 3 and 4. The price level of the cost estimate is October 2001.

Table 5-3
Alternative Construction Cost Estimates (P. L. 10/01)
Rhodes Point Section 107 Navigation Project

Alternative	Project Construction Cost
Alternative 2	$2,548,000
Alternative 3	$2,288,000
Alternative 4	$3,163,000

The annual cost of the alternatives consists of the annual equivalent cost for a 50-year period of analysis using the FY 2002 water resources development interest rate of 6.125 percent plus the estimated annual operation and maintenance (O&M) cost for the alternative.

The O&M cost for each alternative was computed based on the expected dredging cycle with that alternative and the expected cost for maintenance dredging. Alternative 2 and Alternative 3 are each expected to require the removal of a volume of material essentially equivalent to the volume removed for maintenance dredging with the existing condition. Based on the two most recent dredging events at Sheep Pen Gut, the average volume of material removed was 31,500 cubic yards. The expected dredging cycle for Alternative 2 is 4 years. The expected dredging cycle for Alternative 3 is 5 years.

Because of its effectiveness at reducing the accumulation of material in the navigation channel, Alternative 4 is expected to require maintenance dredging on an 8-year cycle to remove approximately 800 cubic yards of material.

With implementation of any one of the 3 alternatives, maintenance dredging will take place simultaneous with maintenance dredging of the existing Federal navigation channels at Smith Island. With coincident mobilization and demobilization assumed, the economic cost attributable to dredging the Smith Island navigation channels is apportioned among the projects. For purposes of the O&M analysis it was assumed that one-half of the total mobilization and demobilization cost will be the economic cost attributable to the Sheep Pen Gut alternatives. The current total estimated cost for equipment mobilization and demobilization is $300,000. Therefore, the economic cost attributable to the Sheep Pen Gut maintenance dredging for mobilization and demobilization is $150,000. The current cost estimate for removal of material at Smith Island is $3.58 per cubic yard. O&M costs were evaluated for a 50-year period of analysis using the current FY 2002 water resources interest rate of 6.125 percent.

Table 5-4 presents a summary of the cost analysis for the Rhodes Point Section 107 jetty alternatives. For each alternative, the table displays the project construction cost, the interest during construction (IDC) cost for a 1-year construction period using the current interest rate of 6.125 percent, the equivalent annual cost of the project investment cost, the annual O&M cost and the total annual cost.

TABLE 5-4
Project Alternatives Cost Analysis
Rhodes Point Section 107 Project

	Alternative 2	Alternative 3	Alternative 4
Project Construction Cost (10/00 P.L.)	$2,548,000	$2,288,000	$3,163,000
Interest During Construction	$78,000	$70,000	$97,000
Total Investment Cost	$2,626,000	$2,358,000	$3,260,000
Equivalent Annual Cost	$170,000	$152,000	$210,000
Operation & Maintenance Cost	$46,000	$46,000	$15,000
Total Annual Cost	**$216,000**	**$198,000**	**$225,000**
Without Project Annual Cost	$114,000	$114,000	$114,000
Net Annual Cost of Alternative	**$102,000**	**$84,000**	**$111,000**

5.2.7 Benefit to Cost Analysis

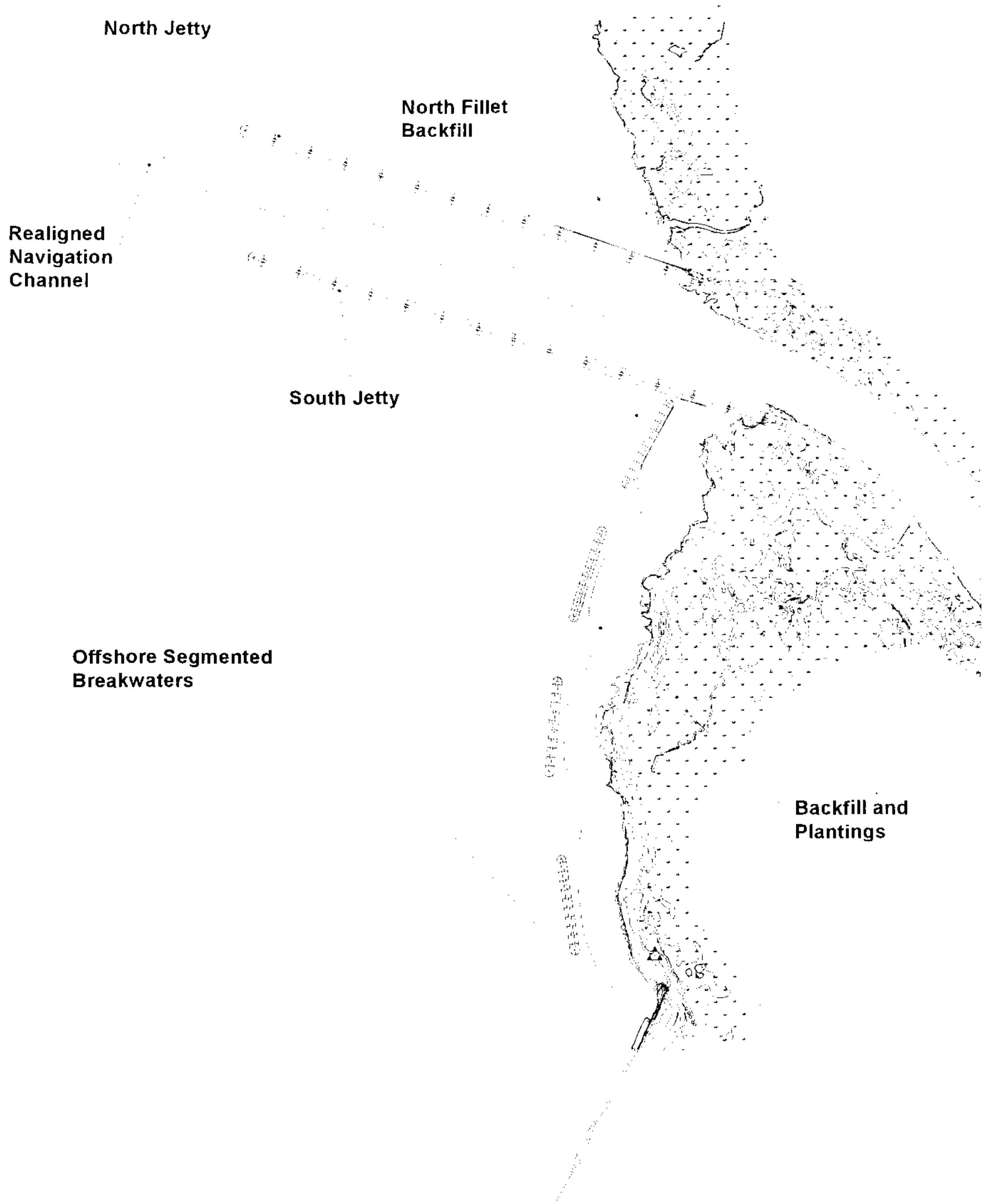
Table 5-5 displays the results of the economic analysis of alternatives investigated for the Rhodes Point Section 107 project. The table presents the annual benefits, annual costs, benefit to cost ratio and net benefits for each alternative.

The net benefits are the measure used to select the preferred alternative from an economic perspective. Net benefits represent the difference between the annual benefits and annual costs of an alternative. The twin jetty alternative is the alternative that is expected to produce the greatest difference between annual benefits and annual costs. This alternative produces annual net benefits of $43,000 and has a BCR of 1.37 to 1.0. These benefit and cost data identify the twin jetty alternative as the national economic development plan at Sheep Pen Gut. The twin jetty alternative with a realigned navigation channel is the recommended plan at Sheep Pen Gut. Figure 5-1 provides a plan view of the recommended plan of improvement at Sheep Pen Gut.

TABLE 5-5
Summary of Benefit-Cost Analysis and Net Benefits Analysis
Rhodes Point Section 107 Project

Alternative	NED Annual Benefits	NED Annual Costs	Benefit to Cost Ratio	Net Benefits
Alternative 2	$110,000	$116,000	.94	($6,000)
Alternative 3	$113,000	$84,000	1.35	$29,000
Alternative 4	$154,000	$111,000	1.37	$43,000

Figure 5.1
Recommended Plan at Sheep Pen Gut
Twin Jetties with Realigned Channel



Section 6

ENVIRONMENTAL CONSEQUENCES

6.0 PURPOSE OF ENVIRONMENTAL EVALUATION

This section reviews the recommended Federal action, and evaluates it against a variety of potential positive or negative environmental impacts. Potential project impacts were assessed with regard to the physical, chemical, and biological characteristics of the aquatic and terrestrial ecosystem, endangered and threatened species, hazardous and toxic materials, aesthetics and recreation, cultural resources, and the general needs and welfare of the public. The proposed project is expected to have minor environmental impacts, combined with long-term beneficial impacts to a variety of ecosystem habitats and functions.

The recommended project consists of the construction of twin jetties, one on either side of a 1,500 foot realigned navigation channel extending from the mouth of Sheep Pen Gut to deep water, and the construction of four offshore breakwaters south of the jetties along the shoreline. The jetty to the north of the channel will be 1,300 feet long, and the jetty to the south of the channel will be 1,500 feet long. Approximately 18,500 cubic yards of material dredged from the channel will be placed behind the breakwaters and planted with wetland plants. Most of the jetty and all of the breakwater construction will take place from barges in the waters in and around Sheep Pen Gut. The construction of the jetty tie-outs will take place on land in a 1-acre work area. Channel dredging will be done by means of a pipeline dredging operation. The project is expected to have minor, construction-related impacts to approximately one acre of wetlands and several acres of shallow water. These impacts are minimal as disturbed organisms can relocate to a variety of other suitable locations nearby.

Some beneficial ecological impacts are expected to occur with project construction. The jetties and the breakwaters would provide critical protection from the wave energy that currently funnels in from the Bay causing shoreline erosion and storm damages, and causing sedimentation in the Shanks Creek SAV beds. 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, as well as the social benefit of reduced storm damages to the community of Rhodes Point. The planting of wetland plants on material dredged from the channel and placed behind the breakwaters is expected to result in the restoration of approximately 2 acres of marshland along the shoreline.

Negative impacts associated with construction of jetties and breakwaters at Rhodes Point would include the loss of natural shoreline, interruption of littoral drift, 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.

6.1 PHYSICAL IMPACTS

6.1.1 Impacts to the Physical Setting and Physiography

The proposed undertaking, the construction of two jetties at Rhodes Point to keep the navigation channel from becoming filled with sediments and the construction of 4 off-shore breakwaters, will not alter the physical setting or physiography of the islands.

6.1.2 Sediment and Soils

The construction of the jetties and breakwaters may alter the sedimentation in the area immediately adjacent to Rhodes Point, but the area affected will be localized to those areas immediately adjacent to the jetties. Another probable construction impact is an expected reduction in the rate of shoreline erosion both inside the mouth of Sheep Pen Gut and along the shoreline south of the proposed jetties. An increase in scour along the slope of the structure is also likely to occur.

6.1.3 Tidal Data, Currents and Wave Action

The construction of jetties at Rhodes Point may alter the wave action immediately adjacent to the jetties, but any alteration is expected to be minimal. No impact to tidal currents is expected with project construction.

6.1.4 Prime Farmland

As stated in Section 2, there is no farming on Smith Island, and no prime farmland soils will be affected.

6.1.5 Climate

The addition of the jetties is not expected to alter the climate at Smith Island or elsewhere.

6.1.6 Air Quality

Although there will be a minimal amount of dust generated during the placement of the rocks at this location to construct the jetties and breakwaters, it is anticipated that the air quality will only be affected within the immediate construction area, and only during the period of construction. Aside from emissions generated by construction equipment, no impacts on air quality are expected. The vehicle emissions are expected to be minor and temporary. Following construction, the structures will be passive and will not generate any additional air pollutants. There will be no permanent impacts to air quality as a result of this project.

6.1.7 Noise

Noise during construction will be produced by construction equipment, such as dredges, bulldozers, trucks, and barges. Pursuant to consultation with resource agencies during the public review period for this feasibility report, environmental windows will be identified, and construction activity will be scheduled to avoid bird or fish breeding seasons.

Following construction, the structures will be passive, with no long-term noise impacts, except during periodic maintenance dredging of the channel. The structures are likely to become resting areas for pelicans and other shore birds.

6.1.8 Hydrology and Water Quality

Pipeline dredging of material from the navigation channel is not expected to produce excess turbidity in the water column. Turbidity produced by placement of backfill material behind the breakwaters is expected to be minimal. A minor increase in turbidity caused by placement of stone is expected in the area. Turbidity effects are expected to be temporary and localized and will have only a minor adverse impact on water quality and the aquatic ecosystem.

There will be a reduction in pollution from boats due to reduced fuel consumed since watermen will not have to use the alternate, longer route to fishing waters necessitated now by channel shoaling. It is not expected that the construction of twin jetties and breakwaters at Rhodes Point will alter in any way the hydrology and water quality at Smith Island.

6.2 SOCIAL AND ECONOMIC IMPACTS

6.2.1 Commercial and Recreational Fishery.

The dominant employment source for Smith Island lies in the commercial fishing and shellfish harvesting industry. The proposed project will stabilize the harbor at Rhodes Point, and benefit the commercial interests of Smith Island by reducing erosion and shoaling in this area.

6.2.2 Environmental Justice

This project is expected to comply with Executive Order 12989 - Environmental Justice in Minority Populations and Low-Income Populations, dated February 11, 1994. The project is located in close proximity to a low-income community, but no negative impacts are expected to occur in the community as a result of the project. Because the project will benefit commercial watermen, it is expected to have a positive impact on the community.

6.2.3 Aesthetics and Recreation

The construction of twin jetties at Rhodes Point will have a beneficial impact to the recreation in the area, providing for a more durable navigation channel into the Rhodes Point area of Smith

Island. The planting of approximately 2 acres of wetlands behind the offshore breakwaters will amend the aesthetic quality of the existing shoreline.

6.2.4 Environmental Impacts to Children

On April 21, 1997, the President issued Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, which recognizes that a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health and safety risks. This E.O. requires Federal agencies, to the extent permitted by law and mission, to identify and assess such environmental health and safety risks.

The proposed project will have beneficial effects on the people of Smith Island. The proposed navigation improvement will benefit all of Smith Island equally, regardless of income level; therefore, no adverse or disproportionate impacts will occur to this group.

6.2.5 Cultural Resources

Given the limited extent of the project, it was determined that the project would have no effect on cultural resources. A meeting between the Baltimore District and the submarine archeologists of the Maryland Historic Trust in July 2001 reviewed all of the potential projects the Corps of Engineers was proposing in the Smith Island complex. The SHPO concurred with the determination that no cultural resource investigation was warranted for this project.

6.2.6 Hazardous, Toxic and Radioactive Substances

No hazardous, toxic, radioactive substances are found within the project footprint. Best management practices will be used during construction to minimize oil and gas spills from equipment. If spills occur, or HTRW materials are found, appropriate measures will be taken to insure adequate clean up or removal.

6.3 BIOLOGICAL RESOURCE IMPACTS

6.3.1 Plankton

The footprint of the proposed construction project could displace phytoplankton and zooplankton inhabiting the water columns where structures will be placed. However, these organisms will relocate and the overall impact on the food chain will not be significant.

6.3.2 Benthos

The proposed construction of jetties with a realigned channel and offshore breakwaters will alter the existing project footprint. The realigned channel will extend perpendicularly out from the shore into an area not currently impacted by the project. Conversely, most of the footprint of the current navigation channel will no longer be impacted by maintenance dredging or vessel traffic.

The placement of the permanent jetty and breakwater structures on the bay bottom will displace localized bottom dwelling organisms, but the impacted bottom area is so small in relation to the total bay bottom area that the overall impact to benthic life will be minimal. The proposed project could disturb shellfish harvesting areas, but the impacts will be minimal and no long term impact on shellfish populations is expected. There are no oyster bars located in the area impacted by the project.

The planting of wetland plants along the shore behind the breakwaters is expected to produce approximately 2 acres of additional wetlands in the project area. This area will provide habitat beneficial to benthic organisms, including shellfish.

6.3.3 Fish

Although the proposed construction of jetties with a realigned channel and offshore breakwaters will alter the existing project footprint, it is not expected that project construction will adversely impact resident fish species. With the existing navigation project, periodic maintenance dredging takes place. The dredging impacts with the realigned channel are not expected to impact resident fish species beyond what occurs with the existing maintenance dredging. Because the food web in the project impact area is not expected to be adversely impacted and because fish species have the mobility to respond rapidly to possible displacement effects, project construction is not expected to adversely impact fish species.

The planting of wetland plants along the shore behind the breakwaters is expected to produce approximately 2 acres of additional wetlands in the project area. This area will provide habitat beneficial to species that provide sustenance to resident fish species.

Minor and short-term increases in turbidity will occur in the project area during construction. The turbidity effects are expected to be temporary and localized and will have only a minor adverse impact on fish species and the aquatic ecosystem. Use of best management practices during construction will minimize turbidity during construction. There are no long-term impacts to fish resources.

The Magnuson-Stevenson Fishery Conservation and Management Act requires that Essential Fish Habitat (EFH) areas be identified for each fishery management plan and that all Federal agencies consult with the National Marine Fisheries Service (NMFS) on all Federal actions that may adversely affect EFH. The EFH areas have been designated by the Fishery Management Councils and were published in March 1999 by National Oceanic and Atmospheric Administration (NOAA) and NMFS as the "Guide to Essential Fish Habitat in the Northeastern United States, Volume V: Maryland and Virginia." A Federal agency must identify the species of concern and prepare an analysis of the potential effects of the Proposed Action. The agency must also give its views regarding the effects of the Proposed Action and propose mitigation if applicable. The NMFS has suggested that the EFH analysis and determination be incorporated as part of the NEPA process rather than in a separate document such as a biological assessment, as is prepared for endangered species.

The Baltimore District evaluated impacts of the proposed project on EFH, and concluded that the project would comply with the provisions of the Magnuson-Stevens Act, as amended. Annex G of this report provides a more in depth EFH assessment of the summer flounder, bluefish and other identified species of concern.

6.3.4 Birds

Although some temporary noise impacts may disturb any resident birds, these impacts will be limited to the construction period, and will most likely only cause the birds to go to other parts of Smith Island during construction. Coordination with resource agencies during the public review of this document will identify whether time of year restrictions are appropriate to protect bird species.

The planting of wetland plants along the shore behind the breakwaters is expected to produce approximately 2 acres of additional wetlands in the project area. This area will provide habitat beneficial to species that provide sustenance to resident bird species.

Minor and short-term increases in turbidity will occur in the project area during construction. The turbidity effects are expected to be temporary and localized and will have only a minor adverse impact on bird species. Use of best management practices during construction will minimize turbidity during construction. There are no long-term impacts expected to bird resources.

6.3.5 Reptiles

Although the proposed construction of jetties with a realigned channel and offshore breakwaters will alter the existing project footprint, it is not expected that project construction will adversely impact resident reptile species.

Minor and short-term increases in turbidity will occur in the project area during construction. The turbidity effects are expected to be temporary and localized and will have only a minor adverse impact on reptile species. Use of best management practices during construction will minimize turbidity during construction.

The planting of wetland plants along the shore behind the breakwaters is expected to produce approximately 2 acres of additional wetlands in the project area. This area will provide habitat beneficial to reptile species.

6.3.6 Mammals

Although the proposed construction of jetties with a realigned channel and offshore breakwaters will alter the existing project footprint, it is not expected that project construction will adversely impact resident mammal species.

The planting of wetland plants along the shore behind the breakwaters is expected to produce approximately 2 acres of additional wetlands in the project area. This area will provide habitat beneficial to species that provide a food source for resident mammals.

6.3.7 Floral Resources

Wetlands

Minimal impact to wetlands located near the construction site for the jetty tie-outs is expected to occur. Approximately one-acre of wetlands could be impacted by this activity. Best management practices will be used during construction to avoid or minimize the impacts. After construction, any wetland habitat adversely impacted during construction will be graded and replanted to restore it to its pre-construction condition.

The planting of wetland plants along the shore behind the breakwaters is expected to produce approximately 2 acres of additional emergent wetlands in the project area.

Submerged Aquatic Vegetation (SAV) Beds

No SAV beds are currently present near the realigned channel footprint, near the jetty footprints or near the breakwater footprints. Therefore, no impacts are expected from the construction of these components. The placement of dredged material from the channel behind the breakwaters could impact an approximately one-acre site located along the western shoreline below the proposed south jetty. SAV maps of the project area indicate that this site had an SAV bed in 1999, but not in 2000. The decision on whether dredged material can be placed at this site will be coordinated with resource agencies during the public review period and final design of the proposed project.

A potential positive impact to SAV could result from the stabilization of the shoreline provided by the breakwaters. The expected reduction in sediment loading will improve water clarity offshore and in Shanks Creek, possibly benefiting SAV, especially within the interior creeks.

Upland Vegetation

The proposed jetties and breakwaters are to be located offshore of Rhodes Point, and no construction will take place from upland sites. Therefore, no upland vegetation will be impacted by the proposed construction.

6.3.8 Rare, Threatened and Endangered Species

Although a few transient Rare and Threatened species are know to visit Martin National Wildlife Refuge, no impacts to rare, threatened, or endangered (RTE) species are expected with construction of the jetties and breakwaters at Sheep Pen Gut. Coordination with the U.S. Fish and Wildlife Service during the preparation of the May 2001 Smith Island Feasibility Study resulted in a determination that the Smith Island environmental restoration project will not impact any resident rare, threatened or endangered species.

6.4 CUMULATIVE IMPACTS

Cumulative impacts consider the impacts of past, present and future actions. Currently, the Smith Island complex is being subjected to a large amount of erosion and submergence. This is a natural process that threatens to adversely impact the continuance of human existence at Smith Island. Several recent Baltimore District actions are expected to address the natural process and improve the quality of life for Smith Island residents.

The Baltimore District has recently constructed a 2,700-foot vinyl bulkhead at Tylerton on Smith Island. Another planned District project involves improvements to the wastewater treatment plants at Tylerton. Maintenance dredging of the Federal navigation channels at Twitch Cove, Big Thorofare and from Rhodes Point to Tylerton will take place in 2002. The Smith Island Environmental Restoration and Protection feasibility study recommended projects at numerous Smith Island locations. These projects will reduce the continuous loss of shoreline due to erosion on Smith Island. Construction of these improvements is scheduled in 2006. The proposed construction of the twin jetties with a realigned navigation channel, offshore breakwaters and wetland plantings at Sheep Pen Gut, like the aforementioned improvements, is designed to maintain the present condition of the island.

6.5 COMPLIANCE WITH ENVIRONMENTAL STATUTES

In addition to the environmental impacts discussed in this EA, a review of the proposed action has been made with regard to other potential areas of concern. Table 6-1 outlines the statutes and executive orders that are potentially applicable to the project, including the level of compliance. Due to the expected impacts, an evaluation of the proposed project on waters of the United States was performed pursuant to the guidelines promulgated by the Administrator, US EPA, under authority of Section 404 of the Clean Water Act. The evaluation is included as Annex F to this report. An application from the State of Maryland for a water quality certificate will be made.

Table 6-1: Rhodes Point Section 107 Navigation Project
Compliance of the Proposed Action with Environmental Protection Statutes
And Other Environmental Requirements

Federal Statutes	Level of Compliance
Anadromous Fish Conservation Act	Full
Archaeological and Historic Preservation Act	Full
Clean Air Act	Full
Clean Water Act	Full
Coastal Barriers Resource Act	Full

Coastal Zone Management Act	Full
Comprehensive Environmental Response, Compensation and Liability Act	Full
Endangered Species Act	Full
Estuary Protection Act	Full
Farmland Protection Policy Act	N/A
Federal Water Project Recreation Act	Full
Fish and Wildlife Coordination Act	Full
Land and Water Conservation Fund Act	Full
Magnuson-Stevens Act	Full
Marine Mammal Protection Act	Full
National Environmental Policy Act	Full
National Historic Preservation Act	Full
North American Wetlands Conservation Act	Full
Resource Conservation and Recovery Act	Full
Rivers and Harbors Act	Full
Water Resources Development Acts	Full
Water Resources Planning Act	Full
Watershed Protection and Flood Prevention Act	Full
Wild and Scenic Rivers Act	N/A
Wilderness Act	Full

Executive Orders, Memoranda, etc.

Protection and Enhancement of Environmental Quality (E.O.11514)	Full
Protection and Enhancement of Cultural Environment (E.O.11593)	Full
Floodplain Management (E.O.11988)	Full
Protection of Wetlands (E.O.11990)	Full
Prime and Unique Farmlands (CEQ Memorandum, 11 Aug. 80)	Full
Environmental Justice (E.O.12898)	Full
Recreational Fisheries (E.O. 12962)	Full

COMPLIANCE LEVEL DEFINITIONS:

a. Full Compliance (Full): Having met all requirements of the Statute, E.O., or other environmental requirements for the current stage of planning.
b. Partial Compliance (P/C): Not having met some of the requirements that normally are met in the current stage of planning.
c. Non-Compliance (N/C): Violation of a requirement of the Statute, E.O., or other environmental requirements.
d. Not Applicable (N/A): No requirements for the Statute, E.O., or other environmental requirements for the current stage of planning.

6.6 COORDINATION

The focus of coordination efforts with Federal and state resource agencies is to ensure that environmental factors are considered while planning and executing a prudent and responsible project. Coordination with many Federal and state agencies, conducted during the preparation of the May 2001 Feasibility Study, included an Essential Fish Habitat Analysis and other pertinent coordination efforts for all the potential environmental improvements at Smith Island. Coordination letters specific to the Rhodes Point 107 report and findings were recently mailed to key resource agencies. Copies of these letters are included in Annex E. Additional agency coordination will occur during the public review of this draft report and integrated EA.

6.7 CONCLUSION

The overall environmental impacts associated with the construction of twin jetties with a realigned navigation channel and offshore breakwaters at Sheep Pen Gut near Rhodes Point have been evaluated and assessed by the U.S. Army Corps of Engineers. Based on this assessment, the Corps does not anticipate any significant adverse environmental impacts associated with the proposed action. Resource agency comments on the proposed action will be addressed during the public review of the report and integrated EA. Alternatives to the proposed action have been described and evaluated in this document. Therefore, it has been determined that the preparation of an environmental impact statement is not warranted. The District has prepared a finding of no significant impact (FONSI), which is provided at the beginning of this report.

6.8 REAL ESTATE REQUIREMENTS

The project jetties, breakwaters and dredged material placement area will be constructed on State of Maryland owned lands below the mean high water line (MHWL). The project will require a permanent channel improvement easement for installation of the jetty tie-outs. With the exception of construction of the jetty tie-outs, all construction will take place from the water. The real estate plan, map of the required lands, and a cost estimate are provided in Annex C.

Section 7

PROJECT IMPLEMENTATION

7.1 COST ALLOCATION AND APPORTIONMENT

Cost allocation refers to the assignment of costs among various project purposes whereas cost apportionment refers to the division of these costs among project sponsors. The planned improvements described in Section 5 will serve the needs of navigation users under the authority of a Section 107 project. This section outlines the cost allocation and the division of the total project costs among the project participants.

Federal participation in the cost of navigation projects is limited to sharing costs for general navigation features, such as navigation channels, anchorage areas, and turning basins. Costs for general navigation features that do not modify depths, such as breakwaters and jetties, are shared based on the existing or authorized water depth, whichever is greater. Non-Federal participation includes sharing the costs of planning, design, and construction. In addition, the non-Federal sponsor is responsible for 100 percent of the costs for any lands, easements, rights-of-way, relocations, and the provisions of any dredged material placement areas (LERRD), that may be necessary for construction of the project.

Public Law 99-662 (Water Resources Development Act of 1986) has established the basis for Federal and non-Federal sharing of responsibility in the construction, operation, and maintenance of Federal water resources projects. For the construction of general navigation features where the water depths are 20 ft. or less, the non-Federal sponsor is required to pay 10 percent of the initial costs for project design and construction at the initiation of construction. The non-Federal sponsor is also required to pay an additional 10 percent of the costs following project implementation or with interest over a period not to exceed 30 years. The non-Federal sponsor is allowed credit for the value of LERRD, which may be used to offset the additional 10 percent contribution. Costs associated with maintenance dredging of the navigation channel and with maintenance of the jetty and breakwater structures are funded 100 percent by the Federal government. Maintenance of dredged material placement sites will be funded 100 percent by the Federal government.

The current Federal project at Rhodes Point consists of a channel 6-ft. in depth. The cost sharing responsibilities for the navigation improvement recommended by this report is based on the 6-ft. depth of the Federal channel and is shown in Table 7.1.

7.2 FINANCIAL ANALYSIS

Maryland Department of Natural Resources (DNR), the non-Federal sponsor, is willing and able to share the costs of project implementation. For the Rhodes Point project, the non-Federal share of the construction costs is currently estimated to be $632,600, which includes

$6,000 for LERRD. Maryland DNR has budgeted to fund the non-Federal share of the project costs.

A letter of intent from the local sponsor to sign the project cooperation agreement (PCA) is provided in Annex D of this report.

Table 7.1 Cost Apportionment
Rhodes Point Section 107 Small Navigation Project
(October 2001, fully funded)

Phase	Total Cost	Federal 90%	Non-Federal** 10%	10% payback
Plans and Specifications*	$243,000	$243,000	$0	$0
Construction	$2,914,000	$2,603,700	$310,300	$316,300
LERRD	$6,000	$0	$6,000	$0
Total Project Cost	**$3,163,000**	$2,846,700	$316,300	$316,300

Notes:
* The cost of Plans and Specifications is initially Federally-funded and distributed as a portion of the local share of project costs during construction
** Ten percent of the implementation cost is required during construction of the project. An additional ten percent is required at the end of construction, or this amount may be paid over time with interest, not to exceed 30 years. Note that the figures in this chart are rounded off to the nearest $100 and, therefore, may contain some rounding errors.

7.3 IMPLEMENTATION SCHEDULE

The draft report and EA were sent to the North Atlantic Division (NAD) for policy review in March 2002. The comments and recommendations from NAD will be incorporated into the report, and the report will be distributed for a 30-day public review process in May 2002. The report/EA will be revised and submitted for final review and approval in December 2002. Funding for the plans and specifications will be obtained following approval of the final report. The cost of plans and specifications is initially federally funded and the cost is shared with the sponsor during construction. It is anticipated that plans and specifications would be initiated in July 2002 and would be completed in approximately 5 months.

Following completion of plans and specifications and approval for construction by NAD, the PCA will be executed between the Federal government and the local sponsor. After all necessary LERRD has been obtained by the local sponsor and approved by the Federal government, solicitation of the construction contract may be initiated. Maryland DNR is aware of the LERRD requirements and is currently beginning their process which will lead to acquisition of lands after the PCA is executed. Advertisement is currently anticipated to begin in March 2003 with a construction contract being awarded in April 2003. Construction is anticipated to be completed within 12 months in April 2004. These dates are approximate estimations based on previous experience and on the current schedule for the review process.

The dates will also be affected by the environmental construction windows that will be coordinated and established during the public and agency review period.

Section 8

FINDINGS AND CONCLUSIONS

8.1 STUDY FINDINGS

The Corps of Engineers constructed the existing 6-foot deep, 50-foot wide Section 107 Federal navigation channel at Sheep Pen Gut in 1982. The channel was designed to provide safe, unimpeded access to Chesapeake Bay fishing waters for the commercial watermen of Rhodes Point and Tylerton. The channel is not functioning as designed. It develops navigation-impeding shoals within 3-6 months of maintenance dredging.

Information gathered from community meetings and interviews with the commercial watermen who use the existing channel documented that use of the channel drops off significantly within 6 months to 1 year after maintenance dredging as a result of rapid shoal formation in the channel. The watermen reported that they adjust to the failure of the existing project by frequently taking an indirect, circuitous navigational route to fishing waters in order to avoid the delays and navigational hazards encountered with use of the existing Federal channel. The adjustments triggered by failure of the existing channel lead to operating cost increases. These operating cost increases, incurred by commercial watermen, defined the economic impacts of the existing channel and provided a framework for the feasibility investigation.

The feasibility study investigated alternatives to the existing project that would reduce the rapid deposition of material in the navigation channel. A broad range of alternative improvements was investigated. Engineering studies indicated that of all the structural and non-structural methods that could be implemented, the most effective type of improvement to address the shoaling problem is the construction of a rubblemound jetty system. It was found that a twin jetty system that includes a realignment of the navigation channel will provide the greatest reduction in shoaling. The inclusion of construction of a series of offshore breakwaters provides a site for placement of dredged material from the channel and stabilization along the shoreline. Economic studies showed that the twin jetties with a realigned navigation channel alternative and offshore breakwater construction is the preferred alternative from an NED perspective.

NEPA documentation required for implementation of the proposed actions in the form of an environmental assessment (EA) with a finding of no significant impact (FONSI) is included in this report. A Section 404(b)(1) evaluation is included as Annex F to this report. A Phase I cultural survey has found no evidence of cultural resources in the area of the proposed jetty system.

8.2 CONCLUSIONS

Following a thorough process of problem identification, data collection, alternative plan formulation and alternative evaluation, an alternative plan that includes twin jetty construction with a realigned navigation channel and offshore breakwaters construction was identified as the optimum alternative improvement at Sheep Pen Gut.

The project components will be constructed from the shoreline around Sheep Pen Gut and in the offshore waters. As this feasibility report documents, the project will result in substantial benefits to commercial watermen who use the Sheep Pen Gut channel. In addition, the restoration of marshland will produce environmental benefits attributable to the project. The following components comprise the recommended project of this feasibility study:

- Construction of twin jetties, one on either side of a realigned navigation channel. The jetty on the northern side will be 1,300 feet long and the jetty on the southern side will be 1,500 feet long. The jetties will follow the path of the realigned navigation channel. The crest elevation of the jetties is +4.5 feet MLLW. The twin jetties will be placed a minimum of 200 feet apart to provide adequate room for the channel and possible enlargement of the channel due to natural scour. The realigned channel will be about 1,500 feet long, requiring approximately 18,500 cubic yards of dredging.

- Construction of four offshore-segmented breakwaters. The breakwaters will be 250 feet long with 125-foot gaps, and will be placed approximately 100 feet from the shoreline. The breakwaters were sized and placed to take advantage of the existing shoreline irregularities. The breakwaters will provide a dredged material placement site and 1,500 feet of shoreline stabilization.

- Backfill of material dredged from the realigned navigation channel behind the breakwaters.

- Wetland plantings behind the breakwaters to restore approximately 2 acres of marshland along the shoreline.

The total fully funded cost for this project is $3.2 million. More detailed designs and cost estimates will be done as part of the plans and specifications phase of the project.

8.3 VIEWS OF THE SPONSOR

As the non-Federal sponsor for the feasibility study, the State of Maryland DNR has expressed support for the investigation throughout the reconnaissance phase and the feasibility phase. The sponsor is aware of the items required for local cooperation including easements and rights-of-way, non-Federal funding requirements, and negotiation and execution of a project cooperation agreement. The sponsor has provided a letter of intent included in Annex D of this report.

The sponsor has participated throughout both the reconnaissance and the feasibility studies by providing information, attending study meetings, providing technical input, and reviewing preliminary findings.

SECTION 9

RECOMMENDATIONS

I have carefully reviewed the navigation problems in the existing Federal navigation channel at Sheep Pen Gut near Rhodes Point, Maryland, and the proposed solution as outlined in this report. The existing Federal channel is subject to rapid shoal formation shortly after maintenance dredging. As a result, commercial watermen avoid use of the channel and incur significant operating cost increases. Various alternatives have been investigated to address the shoaling problem. The alternatives have been evaluated for environmental, social, cultural, and economic impacts as well as technical feasibility. I find that the adverse effects caused by rapid shoal formation in the channel can best be reduced with the implementation of a twin jetty project with a realigned navigation channel.

The improved navigation system at Sheep Pen Gut described in this report will provide the commercial watermen of Rhodes Point and Tylerton with direct access to fishing waters through a navigation channel protected from rapid shoal formation by a jetty on either side of a realigned navigation channel.

On the basis of the foregoing findings and conclusions, I recommend that the improved navigation system for Sheep Pen Gut be authorized for implementation and consist of the following project components: construction of twin rubblemound jetties, a 1,300 foot-long jetty to the north and a 1,500 foot-long jetty to the south of a 1,500 foot-long realigned navigation channel, construction of four offshore-segmented breakwaters, backfill of material dredged from the channel behind the breakwaters, and the planting of 2 acres of marshland plants along the shoreline.

The recommended project is a modification to the existing Federal navigation project at Sheep Pen Gut and will be subject to cost sharing, financing and other requirements of the Water Resources Development Act of 1986 (Public Law 99-662). The estimated total project implementation cost (design and construction) of the recommended project (full funding) is \$3,163,000. Applying cost sharing policies outlined in Public Law 99-662, the estimated initial Federal funding outlay is \$2,846,700 (90 percent of total cost) and the initial estimated non-Federal funding outlay is \$316,300 (10 percent of total cost). The non-Federal sponsor will be required to pay back an additional 10 percent of costs, \$316,300, after project implementation. The estimated annual operation and maintenance costs of \$15,000 are a Federal responsibility.

CHARLES J. FIALA, JR.
Colonel, Corps of Engineers
District Engineer

ANNEX A

ECONOMIC EVALUATION

RHODES POINT SECTION 107 ECONOMICS EVALUATION

EXISTING CONDITIONS

The Corps of Engineers constructed and maintains the existing Federal navigation channel at Sheep Pen Gut on the western shore of Smith Island near the town of Rhodes Point. The channel was constructed in 1982 to provide access through a 6-foot deep channel to Chesapeake Bay fishing waters for commercial watermen in Rhodes Point and Tylerton. The Sheep Pen Gut channel is a key artery in the network of federally maintained channels that comprise the basic waterway transportation system for Smith Island watermen. There is an existing Federal navigation channel 6 feet deep and 50 feet wide providing navigation access between Tylerton and Sheep Pen Gut channel.

According to commercial watermen who use the channel to reach Chesapeake Bay fishing waters, navigation-impeding shoals develop in the channel within 3-6 months after a maintenance-dredging event. The existing Federal channel at Sheep Pen Gut is currently dredged every 3-4 years. There are 30 commercial fishermen who depend on the channel to access Chesapeake Bay fishing waters to the west of Smith Island. When the Sheep Pen Gut channel shoals in, these watermen use an alternate, indirect access route in order to avoid the shoal and the potential for vessel damages.

The Sheep Pen Gut navigation channel is dredged to an authorized depth of 6 feet and a width of 50 feet. The channel was most recently dredged in 1998 when 9,000 cubic yards of material was removed at a cost of $325,000. The material dredged from the channel was used to fill geotextile tubes along the Hog Neck Peninsula south of the channel. Previous to the 1998 maintenance dredging, the channel was dredged in 1995 and 54,000 cubic yards of material was removed at a cost of $515,000.

Watermen using the Sheep Pen Gut channel harvest a wide variety of fish and shellfish species, but the main cash species is the blue crab. For the 5-year period from 1994-1998, there was an average of 297,000 pounds of reported blue crabs landed by Smith Island commercial watermen. Over the same time period, the average annual harvest of oysters was about 16,000 pounds. Other important commercial species include striped bass, herring, and menhaden.

Vessel operators experience navigational difficulty and increased probability of accidents because of navigation-impeding shoals in the existing Federally maintained channel. Although shoals impact sections throughout the channel, the most prominent "hot spot" is near the mouth of the channel. This section shoals in rapidly after maintenance dredging of the channel. This shoaling section is the major source of navigational difficulties leading to increased shoal-induced operating costs for commercial watermen.

EXISTING CONDITIONS DAMAGES AND COSTS ANALYSIS

With continuation of the existing conditions shoaling pattern in Sheep Pen Gut channel, the navigation-impeding shoals will continue to form in the established "hot spots" and adversely impact the operations of commercial watermen using the navigation channel. The current rate of shoaling at the "hot spots" will continue to adversely impact the navigability of the channel within 3-6 months after a maintenance event. The economic effect of greatest magnitude the navigation-impeding shoals has on commercial boating operations is to divert commercial boating activity from Sheep Pen Gut channel to a much longer " daily commute" through Big Thorofare into the Chesapeake Bay. From the time the channel shoaling begins to impact navigation, commercial watermen decide to use the indirect, roundabout route through Big Thorofare to avoid potential boat damages and to avoid waiting for favorable tide conditions in the channel. As a result of this damage-avoidance strategy, watermen opt for increased travel time to reach fishing waters.

There are additional costs associated with the existing conditions cost-avoidance strategy. Table A-1 is a quantitative description of the costs to commercial users of the Sheep Pen Gut channel associated with continuation of the existing dredging cycle. The analysis in Table 1 assumes that the current commercial fleet will continue to use the channels and that additional Federal restrictions on fishing will not impact fishing operations. Table A-1 quantitatively represents the shoal-induced impacts to commercial fishing users of the Sheep Pen Gut channel from the existing 4-year maintenance dredging cycle. It was assumed that the rate of shoal formation in the channel restricts navigation and diminishes the authorized controlling depth within 3-6 months following maintenance dredging. This assumption is utilized in order to establish a framework for the evaluation of the economic costs associated with shoaling.

Table A-1 evaluates 4 of the most significant costs induced by shoaling under existing conditions. These costs include vessel damages; the cost of labor time lost; additional fuel cost; and increased vessel operation and maintenance costs. The total cost of these 4 categories on an annual basis ranges from $67,000 in year 1 of the 4-year dredge cycle to $195,000 in the remaining years of the dredging cycle. The overall period of analysis is 50 years, the conventional analysis period for evaluation of Federal navigation projects. The costs were discounted to the project base year using the current fiscal year 2002 interest rate of 6.125 percent. The total present value of shoal-induced costs over the 50-year period of analysis for the existing condition is $2.5 million and the average annual amount is $160,000. The assumptions and methodologies used to evaluate the operating cost categories are discussed below.

TABLE A-1

SMITH ISLAND SHEEP PEN GUT NAVIGATION FEASIBILITY

Continuation of Existing Navigation Projec

Shoaling Costs with 4-year Maintenance Dredging Cycle

FY 2001

Discount Rate 6.125%

Price Level Oct-01

Analysis Period	Fish Boat Damages	Lost Labor Cost	Incr. Fuel Cost	Incr. Ordinary Maint. Cost	Total Cost	P.W. Factor	P.W. of Tot. Cost
1	$4,500	$24,000	$32,000	$6,000	$66,500	0.94229	$62,662
2	$1,500	$78,000	$97,200	$18,000	$194,700	0.88790	$172,874
3	$1,500	$78,000	$97,200	$18,000	$194,700	0.83666	$162,897
4	$1,500	$78,000	$97,200	$18,000	$194,700	0.78837	$153,495
5	$4,500	$24,000	$32,000	$6,000	$66,500	0.74287	$49,401
6	$1,500	$78,000	$97,200	$18,000	$194,700	0.69999	$136,289
7	$1,500	$78,000	$97,200	$18,000	$194,700	0.65959	$128,423
8	$1,500	$78,000	$97,200	$18,000	$194,700	0.62152	$121,011
9	$4,500	$24,000	$32,000	$6,000	$66,500	0.58565	$38,946
10	$1,500	$78,000	$97,200	$18,000	$194,700	0.55185	$107,446
11	$1,500	$78,000	$97,200	$18,000	$194,700	0.52000	$101,244
12	$1,500	$78,000	$97,200	$18,000	$194,700	0.48999	$95,401
13	$4,500	$24,000	$32,000	$6,000	$66,500	0.46171	$30,704
14	$1,500	$78,000	$97,200	$18,000	$194,700	0.43506	$84,707
15	$1,500	$78,000	$97,200	$18,000	$194,700	0.40995	$79,818
16	$1,500	$78,000	$97,200	$18,000	$194,700	0.38629	$75,211
17	$4,500	$24,000	$32,000	$6,000	$66,500	0.36400	$24,206
18	$1,500	$78,000	$97,200	$18,000	$194,700	0.34299	$66,780
19	$1,500	$78,000	$97,200	$18,000	$194,700	0.32319	$62,926
20	$1,500	$78,000	$97,200	$18,000	$194,700	0.30454	$59,294
21	$4,500	$24,000	$32,000	$6,000	$66,500	0.28696	$19,083
22	$1,500	$78,000	$97,200	$18,000	$194,700	0.27040	$52,647
23	$1,500	$78,000	$97,200	$18,000	$194,700	0.25480	$49,609
24	$1,500	$78,000	$97,200	$18,000	$194,700	0.24009	$46,746
25	$4,500	$24,000	$32,000	$6,000	$66,500	0.22623	$15,045
26	$1,500	$78,000	$97,200	$18,000	$194,700	0.21318	$41,506
27	$1,500	$78,000	$97,200	$18,000	$194,700	0.20087	$39,110
28	$1,500	$78,000	$97,200	$18,000	$194,700	0.18928	$36,853
29	$4,500	$24,000	$32,000	$6,000	$66,500	0.17836	$11,861
30	$1,500	$78,000	$97,200	$18,000	$194,700	0.16806	$32,722
31	$1,500	$78,000	$97,200	$18,000	$194,700	0.15836	$30,833
32	$1,500	$78,000	$97,200	$18,000	$194,700	0.14922	$29,054
33	$4,500	$24,000	$32,000	$6,000	$66,500	0.14061	$9,351
34	$1,500	$78,000	$97,200	$18,000	$194,700	0.13249	$25,797
35	$1,500	$78,000	$97,200	$18,000	$194,700	0.12485	$24,308
36	$1,500	$78,000	$97,200	$18,000	$194,700	0.11764	$22,905
37	$4,500	$24,000	$32,000	$6,000	$66,500	0.11085	$7,372
38	$1,500	$78,000	$97,200	$18,000	$194,700	0.10445	$20,337
39	$1,500	$78,000	$97,200	$18,000	$194,700	0.09843	$19,164
40	$1,500	$78,000	$97,200	$18,000	$194,700	0.09275	$18,058
41	$4,500	$24,000	$32,000	$6,000	$66,500	0.08739	$5,812
42	$1,500	$78,000	$97,200	$18,000	$194,700	0.08235	$16,033
43	$1,500	$78,000	$97,200	$18,000	$194,700	0.07760	$15,108
44	$1,500	$78,000	$97,200	$18,000	$194,700	0.07312	$14,236
45	$4,500	$24,000	$32,000	$6,000	$66,500	0.06890	$4,582
46	$1,500	$78,000	$97,200	$18,000	$194,700	0.06492	$12,640
47	$1,500	$78,000	$97,200	$18,000	$194,700	0.06117	$11,911
48	$1,500	$78,000	$97,200	$18,000	$194,700	0.05764	$11,223
49	$4,500	$24,000	$32,000	$6,000	$66,500	0.05432	$3,612
50	$1,500	$78,000	$97,200	$18,000	$194,700	0.05118	$9,965

PRESENT WORTH OF COSTS OF CONTINUATION OF EXISTING PROJECT $2,471,213

AVERAGE ANNUAL COST $159,527

6 1/8%, 50 YEARS

Vessel Damage Computation

In order to assess the frequency and severity of damages to vessels navigating the channel, assumptions based on the physical characteristics of the channel derived from the existing conditions four-year dredging cycle were developed. The channel has an authorized depth of 6 feet, which is the controlling depth at the outset of the dredging cycle. As the channel "hot spots" shoal-in within 3-6 months following maintenance dredging, the challenge for the commercial users of the Sheep Pen Gut channel is to continue to use the channels while avoiding damage to the fishing vessel, which is essential to their livelihood as watermen. As stated earlier, the local watermen have adapted their operations to the conditions they encounter in order to avoid, to the extent possible, damage to their fishing vessels.

Although they are remarkably successful at avoiding vessel damage by using the tides to traverse shoals and not making second fishing runs on days when the tide depths are insufficient to safely traverse shoals, it is not possible for vessel damage to be totally eliminated. The damage control strategy minimizes the frequency and severity of damage, but even with less usage of the channel after shoaling, damage events are inevitable. The most common type of shoal-induced vessel damages incurred by commercial vessels, according to watermen and marina repairmen, is wheel and rudder damage from striking a shoal at a relatively high speed. The average repair cost for such an event is $1,500. For the purpose of this analysis, it was assumed that in year 1 of the 4-year dredge cycle, when the channel is still marginally usable, 3 of the vessels in the commercial fleet would incur wheel/rudder damage from striking a shoal. After navigation-impeding shoals develop in the channel, it was assumed that with diminished channel usage, the number of damage events would decrease to 1 during years 2-4 of the dredging cycle. The resulting damages amount to $4,500 in year 1 of the cycle and decrease to $1,500 in years 2-4 of the dredging cycle. This cycle of damage is expected to continue as long as the current dredging cycle continues. Table A-2 displays expected shoal-induced vessel damage costs over the 4-year existing dredge cycle.

TABLE A-2
Sheep Pen Gut Vessel Damage Cost
With Continuation of Existing Project

Year	# Vessels Damaged	Cost Per Vessel	Total Annual Damage
1	3	$1,500	$4,500
2	1	$1,500	$1,500
3	1	$1,500	$1,500
4	1	$1,500	$1,500

Computation of Labor Time Lost Costs

Column 2 of Table A-1 presents a quantitative approximation of the economic inefficiencies resulting from fishing time lost awaiting favorable tides and fishing time lost avoiding channel usage in order to avoid vessel damages. Avoiding use of Sheep Pen Gut channel by accessing fishing waters through Big Thorofare Channel is the primary tactic used by watermen to avoid vessel damage. As noted in the earlier discussion of vessel damages, this tactic is, for the most part, a highly successful one. It minimizes damages incurred to fishing vessels, the lifeblood of the fishing industry.

The cost involved in implementation of the shoal-avoidance strategy is that watermen lose valuable fishing time. This loss is a direct by-product of navigating through Big Thorofare as an alternate route, and to a lesser degree, waiting for the tides to shift in the channel. The watermen interviewed for this study indicated that they prefer to navigate the additional distance to Chesapeake Bay through Big Thorofare to avoid vessel damages after the shoals form in Sheep Pen Gut channel. On many fishing days, the watermen are unable to return to the fishing waters for a second harvest because of time lost awaiting the tide change during their return from their first fishing trip of the day or because of time lost due to the increased navigating distance associated with use of Big Thorofare as an alternate navigation route. An even more insidious cost, because it seems relatively insignificant, is the day-by-day cumulative costs of hours and fractions of hours of labor lost to increased travel time. The watermen are aware of the fact that they lose time, but it has become a conditioned aspect of their operational routine and they hardly notice that there is a real economic cost associated with the shoal avoidance strategy.

The lost labor cost equation is dependent on the additional time it takes to avoid usage of the navigational channel by using the alternate route through Big Thorofare. Watermen estimate they lose on average 1 hour per fishing day to avoid the shoals in Sheep Pen Gut channel. Because the controlling depth of the Sheep Pen Gut channel is reduced significantly and almost immediately after maintenance dredging under existing conditions, most of the standard vessels which draw 4 feet light-loaded will experience navigational problems within 3-6 months following a maintenance dredging event. The following set of assumptions was made in order to evaluate the costs attributable to lost labor.

1.The channel shoals develop within 3-6 months of maintenance dredging and effectively reduce the controlling depth from an authorized 6 feet to 3-5 feet.

2. According to data from watermen, most of the commercial fishing vessels operate an average of 36 weeks per year, 6 days per week. This frequency of operation was factored into the analysis.

3. Each boat employs 2 watermen to operate normally. The lost fishing time was calculated as a loss to 2 watermen per boat.

4. The average hourly wage rate earned by these watermen is $18 per hour. The proxy amount used in the analysis is equal to 1/3 the hourly wage rate or $6 per hour. This amount represents the leisure time proxy used in Federal evaluations of the value of lost labor time.

Based on information collected from the watermen, it was assumed that the navigation channel controlling depth for the first 6-9 months after maintenance dredging will be the authorized 6 feet and avoidance of channel usage will not be necessary to avoid vessel damages. After this initial timeframe, the shoal becomes the controlling factor and the watermen begin to avoid using the channel. They will continue to avoid the channel for the most part until the next maintenance event.

The actual cost associated with fishing time lost was the product of the number of vessels impacted x 2 watermen per boat x $6 per hour (proxy time value) x number of fishing days. Table A-3 provides a summary of the evaluation of the cost of labor lost due to delays and avoidance of the channel.

TABLE A-3
Lost Labor Cost
With Continuation of Existing Project
Sheep Pen Gut Channel

Year	Hours of Lost Labor	Hourly Cost of Lost Labor	Lost Labor Cost
1	4,000	$6.00	$24,000
2	13,000	$6.00	$78,000
3	13,000	$6.00	$78,000
4	13,000	$6.00	$78,000

Computation of Additional Fuel Cost

Additional fuel cost is a cost directly related to the time spent by watermen waiting for the tide to shift to avoid the shoals and the distance traveled while navigating through Big Thorofare to avoid the Sheep Pen Gut channel shoals. All of the watermen consulted regarding the inefficiencies of their current operations mentioned the fact that while waiting a favorable tide or steaming around to Big Thorofare instead of using Sheep Pen Gut to avoid a shoal in the channel, they are burning additional engine fuel. This is a cost of doing business, borne by the users, directly attributable to the channel shoaling. The magnitude of this cost is in direct proportion to the distance traveled by the watermen and the average price per gallon of fuel. Based on information provided by the watermen, the average additional distance traveled to access Chesapeake Bay through the jetties at Big Thorofare is 5 miles one-way. The roundtrip distance per fishing trip is 10 miles. Engine fuel is consumed at a rate of approximately 1-gallon per mile traveled. The price per gallon used in the computation of additional fuel cost is $1.50 per gallon. Each commercial vessel consumes an additional 2,160 gallons of fuel per year during years 2-4 of the existing dredging cycle in order to navigate through the jetties at Big Thorofare instead of using the channel at Sheep Pen Gut. Table A-4 presents the factors used to compute this cost. Additional fuel cost is an operational inefficiency and a real cost of doing business for watermen avoiding use of Sheep Pen Gut channel under the existing condition.

TABLE A-4
Additional Fuel Cost
With Continuation of Existing Project
Sheep Pen Gut Channel

Year	Additional Fuel Consumed (Gallons)	Dollars per Gallon	Added Fuel Cost
1	21,400	$1.50	$32,000
2	64,800	$1.50	$97,200
3	64,800	$1.50	$97,200
4	64,800	$1.50	$97,200

Increased Ordinary Maintenance Cost

Watermen report that under existing conditions, the frequency of maintenance required is 3 times per year. This frequency is an increase in comparison to the semi-annual ordinary maintenance required when Sheep Pen Gut channel is shoal-free. This increase in maintenance frequency is directly attributable to increased traveling distance to avoid using Sheep Pen Gut channel. The estimated average cost per vessel of an ordinary maintenance event is $600. Therefore, the cost to the 30 vessel commercial fleet for ordinary maintenance is $54,000 for years 2-4 of the existing dredging cycle, which is the product of the number of vessels in the commercial fleet (30), the frequency of ordinary maintenance (3), and the cost per maintenance event ($600). Table A-5 presents a tabular display of the factors used in computation of ordinary maintenance cost with continuation of the existing dredging cycle.

TABLE A-5
Sheep Pen Gut Increased Ordinary Vessel Maintenance Cost
With Continuation of Existing Project

Year	Cost per Maintenance Event	# of Additional Maintenance Events	Increased Maintenance Cost
1	$600	10	$6,000
2	$600	30	$18,000
3	$600	30	$18,000
4	$600	30	$18,000

Summary of Continuation of Existing Project

Rhodes Point and Tylerton commercial watermen using the Smith Island navigation system operate, and will continue to operate, their businesses in the face of economic inefficiencies and increased operating costs that are a direct result of rapid deposition of shoal material in the existing Federal navigation channel. The national economic development (NED) costs associated with this existing condition are expected to continue to impact commercial fishing operations with continuation of the existing project. The average annual total cost to the commercial fleet of Sheep Pen Gut users amounts to $160,000 using the current 6.125 percent FY 2002 discount rate for a 50-year period of analysis.

PROJECT ALTERNATIVES EVALUATION

The following alternatives were evaluated to address the navigational problems currently being experienced by commercial watermen who use the Sheep Pen Gut channel. The 4 alternatives investigated were continuation of the existing Federal dredging project (the No Action plan), construction of a single jetty with a realigned navigation channel, construction of twin jetties with continued use of the existing navigation channel, and construction of twin jetties with a realigned navigation channel.

The alternatives were evaluated in terms of their effects on the 4 categories of operating costs evaluated in the future without a project analysis.

Alternative 1- Continuation of Existing Project (No Action Plan)

Alternative 1 consists of continuing the existing Federal dredging project. With this alternative, the existing 3-4 year maintenance dredging cycle would be continued. The economic costs associated with the continuation alternative were evaluated and presented in Table A-1. The annual operating costs with this alternative amount to $160,000.

Alternative 2- Single Jetty with Realigned Navigation Channel

Alternative 2 consists of construction of a single jetty north of the mouth of Sheep Pen Gut channel with construction of a realigned channel that provides more direct access to deeper water. Because the predominant transport of material from the Chesapeake Bay that deposits in and forms shoals in the channel is from the north to the south, the construction of a jetty on the north side of the channel would capture a significant portion of the material and prevent it from entering the navigation channel. With this alternative, there would still continue to be material emanating from the south that will be deposited in the navigation channel. The realigned navigation channel would provide a shorter and more direct route to water of sufficient depth for navigation for commercial vessels.

It is expected that with construction of Alternative 2, the existing 3-4 year dredging cycle would not be significantly decreased. Maintenance dredging would be required on an estimated 4-year cycle. However, the operating costs to the commercial watermen would decrease significantly with this alternative because the channel would remain shoal free for about 2 years prior to accumulation of navigation-impeding shoals. Table A-6 displays the expected economic costs with construction of the single jetty alternative. After construction and dredging of the realigned channel, it is expected that the for the first 2 years after dredging that the costs associated with the existing dredging cycle would be eliminated. By years 3 and 4 of the analysis period, shoals are expected to accrue and shoal-induced navigational costs will occur. Over the 50-year analysis period with the single jetty alternative, the annual shoal-induced cost to the commercial watermen is expected to amount to $50,000.

Alternative 3- Twin Jetties with Continued Use of Existing Navigation Channel

Alternative 3 consists of construction of twin jetties on opposite sides of the existing Federal navigation channel at Sheep Pen Gut. Because the predominant transport of material from the Chesapeake Bay that deposits in and forms shoals in the channel is from the north to the south, the construction of a jetty on the north side of the existing channel would capture a significant portion of the material and prevent it from entering the navigation channel. With this alternative, there would still continue to be material emanating from the south that will be deposited in the navigation channel.

It is expected that with construction of Alternative 3, the existing 3-4 year dredging cycle would be decreased to a 5-year dredging cycle. In addition, the operating costs to the commercial watermen would decrease significantly with this alternative because the channel would remain shoal free for about 2.5 to 3 years prior to accumulation of navigation-impeding shoals. Table A-7 displays the expected economic costs with construction of the single jetty alternative. After construction and dredging of the realigned channel, it is expected that the for the first 3 years after dredging that the costs associated with the existing dredging cycle would be eliminated. By years 4 and 5 of the analysis period, shoals are expected to accrue and shoal-induced navigational costs will occur. Over the 50-year analysis period with the single jetty alternative, the annual shoal-induced cost to the commercial watermen is expected to amount to $47,000.

Alternative 4- Twin Jetties with a Realigned Navigation Channel Alternative

Alternative 4 consists of construction of a twin parallel jetties on either side of the mouth of Sheep Pen Gut channel with construction of a realigned navigation channel that provides more direct access to deeper water. With construction of Alternative 4, the material deposited in the navigation channel from both the north and the south will be reduced substantially. With this alternative, it is expected that the frequency of dredging would be reduced to an 8-year cycle compared to the existing 3-4 year cycle. It is expected that navigation-impeding shoals will not form in the navigational channel until year 8 of the cycle. The annual shoal-induced operating cost to commercial watermen with this alternative is expected to amount to $6,000. Table A-8 displays the expected shoal-induced costs with construction of this alternative over the 50-year period of analysis.

TABLE A-6

SMITH ISLAND SHEEP PEN GUT NAVIGATION FEASIBILITY

Alternative 2 Economic Evaluation (6 ft. authorized channel)

Shoaling Costs with 4-year Maintenance Dredging Cycle

FY 2002

Discount Rate 6.125%

Price Level Oct-01

Analysis Period	Fish Boat Damages	Lost Labor Cost	Incr. Fuel Cost	Incr. Ordinary Maint. Cost	Total Cost	P.W. Factor	P.W. of Tot. Cost
1	$0	$0	$0	$0	$0	0.94229	$0
2	$0	$0	$0	$0	$0	0.88790	$0
3	$4,500	$24,000	$32,000	$6,000	$66,500	0.83666	$55,638
4	$1,500	$78,000	$97,200	$18,000	$194,700	0.78837	$153,495
5	$0	$0	$0	$0	$0	0.74287	$0
6	$0	$0	$0	$0	$0	0.69999	$0
7	$0	$0	$0	$0	$0	0.65959	$0
8	$4,500	$24,000	$32,000	$6,000	$66,500	0.62152	$41,331
9	$1,500	$78,000	$97,200	$18,000	$194,700	0.58565	$114,027
10	$0	$0	$0	$0	$0	0.55185	$0
11	$0	$0	$0	$0	$0	0.52000	$0
12	$0	$0	$0	$0	$0	0.48999	$0
13	$4,500	$24,000	$32,000	$6,000	$66,500	0.46171	$30,704
14	$1,500	$78,000	$97,200	$18,000	$194,700	0.43506	$84,707
15	$0	$0	$0	$0	$0	0.40995	$0
16	$0	$0	$0	$0	$0	0.38629	$0
17	$0	$0	$0	$0	$0	0.36400	$0
18	$4,500	$24,000	$32,000	$6,000	$66,500	0.34299	$22,809
19	$1,500	$78,000	$97,200	$18,000	$194,700	0.32319	$62,926
20	$0	$0	$0	$0	$0	0.30454	$0
21	$0	$0	$0	$0	$0	0.28696	$0
22	$0	$0	$0	$0	$0	0.27040	$0
23	$4,500	$24,000	$32,000	$6,000	$66,500	0.25480	$16,944
24	$1,500	$78,000	$97,200	$18,000	$194,700	0.24009	$46,746
25	$0	$0	$0	$0	$0	0.22623	$0
26	$0	$0	$0	$0	$0	0.21318	$0
27	$0	$0	$0	$0	$0	0.20087	$0
28	$4,500	$24,000	$32,000	$6,000	$66,500	0.18928	$12,587
29	$1,500	$78,000	$97,200	$18,000	$194,700	0.17836	$34,726
30	$0	$0	$0	$0	$0	0.16806	$0
31	$0	$0	$0	$0	$0	0.15836	$0
32	$0	$0	$0	$0	$0	0.14922	$0
33	$4,500	$24,000	$32,000	$6,000	$66,500	0.14061	$9,351
34	$1,500	$78,000	$97,200	$18,000	$194,700	0.13249	$25,797
35	$0	$0	$0	$0	$0	0.12485	$0
36	$0	$0	$0	$0	$0	0.11764	$0
37	$0	$0	$0	$0	$0	0.11085	$0
38	$4,500	$24,000	$32,000	$6,000	$66,500	0.10445	$6,946
39	$1,500	$78,000	$97,200	$18,000	$194,700	0.09843	$19,164
40	$0	$0	$0	$0	$0	0.09275	$0
41	$0	$0	$0	$0	$0	0.08739	$0
42	$0	$0	$0	$0	$0	0.08235	$0
43	$4,500	$24,000	$32,000	$6,000	$66,500	0.07760	$5,160
44	$1,500	$78,000	$97,200	$18,000	$194,700	0.07312	$14,236
45	$0	$0	$0	$0	$0	0.06890	$0
46	$0	$0	$0	$0	$0	0.06492	$0
47	$0	$0	$0	$0	$0	0.06117	$0
48	$4,500	$24,000	$32,000	$6,000	$66,500	0.05764	$3,833
49	$1,500	$78,000	$97,200	$18,000	$194,700	0.05432	$10,575
50	$1,500	$78,000	$97,200	$18,000	$194,700	0.05118	$9,965
PRESENT WORTH OF SINGLE JETTY COSTS							$781,666
AVERAGE ANNUAL COST							$50,460
					6 1/8%, 50 YEARS		

TABLE A-7

SMITH ISLAND SHEEP PEN GUT NAVIGATION FEASIBILITY

Alternative 3 Economic Evaluation (6 ft. authorized channel)

Shoaling Costs with 5-year Maintenance Dredging Cycle

FY 2002

Discount Rate 6.125%

Price Level Oct-01

Analysis Period	Fish Boat Damages	Lost Labor Cost	Incr. Fuel Cost	Incr. Ordinary Maint. Cost	Total Cost	P.W. Factor	P.W. of Tot. Cost
1	$0	$0	$0	$0	$0	0.94229	$0
2	$0	$0	$0	$0	$0	0.88790	$0
3	$0	$0	$0	$0	$0	0.83666	$0
4	$4,500	$24,000	$32,000	$6,000	$66,500	0.78837	$52,426
5	$1,500	$78,000	$97,200	$18,000	$194,700	0.74287	$144,636
6	$0	$0	$0	$0	$0	0.69999	$0
7	$0	$0	$0	$0	$0	0.65959	$0
8	$0	$0	$0	$0	$0	0.62152	$0
9	$4,500	$24,000	$32,000	$6,000	$66,500	0.58565	$38,946
10	$1,500	$78,000	$97,200	$18,000	$194,700	0.55185	$107,446
11	$0	$0	$0	$0	$0	0.52000	$0
12	$0	$0	$0	$0	$0	0.48999	$0
13	$0	$0	$0	$0	$0	0.46171	$0
14	$4,500	$24,000	$32,000	$6,000	$66,500	0.43506	$28,932
15	$1,500	$78,000	$97,200	$18,000	$194,700	0.40995	$79,818
16	$0	$0	$0	$0	$0	0.38629	$0
17	$0	$0	$0	$0	$0	0.36400	$0
18	$0	$0	$0	$0	$0	0.34299	$0
19	$4,500	$24,000	$32,000	$6,000	$66,500	0.32319	$21,492
20	$1,500	$78,000	$97,200	$18,000	$194,700	0.30454	$59,294
21	$0	$0	$0	$0	$0	0.28696	$0
22	$0	$0	$0	$0	$0	0.27040	$0
23	$0	$0	$0	$0	$0	0.25480	$0
24	$4,500	$24,000	$32,000	$6,000	$66,500	0.24009	$15,966
25	$1,500	$78,000	$97,200	$18,000	$194,700	0.22623	$44,048
26	$0	$0	$0	$0	$0	0.21318	$0
27	$0	$0	$0	$0	$0	0.20087	$0
28	$0	$0	$0	$0	$0	0.18928	$0
29	$4,500	$24,000	$32,000	$6,000	$66,500	0.17836	$11,861
30	$1,500	$78,000	$97,200	$18,000	$194,700	0.16806	$32,722
31	$0	$0	$0	$0	$0	0.15836	$0
32	$0	$0	$0	$0	$0	0.14922	$0
33	$0	$0	$0	$0	$0	0.14061	$0
34	$4,500	$24,000	$32,000	$6,000	$66,500	0.13249	$8,811
35	$1,500	$78,000	$97,200	$18,000	$194,700	0.12485	$24,308
36	$0	$0	$0	$0	$0	0.11764	$0
37	$0	$0	$0	$0	$0	0.11085	$0
38	$0	$0	$0	$0	$0	0.10445	$0
39	$4,500	$24,000	$32,000	$6,000	$66,500	0.09843	$6,545
40	$1,500	$78,000	$97,200	$18,000	$194,700	0.09275	$18,058
41	$0	$0	$0	$0	$0	0.08739	$0
42	$0	$0	$0	$0	$0	0.08235	$0
43	$0	$0	$0	$0	$0	0.07760	$0
44	$4,500	$24,000	$32,000	$6,000	$66,500	0.07312	$4,862
45	$1,500	$78,000	$97,200	$18,000	$194,700	0.06890	$13,414
46	$0	$0	$0	$0	$0	0.06492	$0
47	$0	$0	$0	$0	$0	0.06117	$0
48	$0	$0	$0	$0	$0	0.05764	$0
49	$4,500	$24,000	$32,000	$6,000	$66,500	0.05432	$3,612
50	$1,500	$78,000	$97,200	$18,000	$194,700	0.05118	$9,965
PRESENT WORTH OF SINGLE JETTY COSTS							$727,162
AVERAGE ANNUAL COST							$46,941
					6 1/8%, 50 YEARS		

TABLE A-8

SMITH ISLAND SHEEP PEN GUT NAVIGATION FEASIBILITY

Alternative 4 Economic Evaluation (6 ft. authorized channel)

Shoaling Costs with 8-year Maintenance Dredging Cycle

FY 2002

Discount Rate 6.125%

Price Level Oct-01

Analysis Period	Fish Boat Damages	Lost Labor Cost	Added Fuel Cost	Incr. Ordinary Maint. Cost	Total Cost	P.W. Factor	P.W. of Tot. Cost
1	$0	$0	$0	$0	$0	0.942285	$0
2	$0	$0	$0	$0	$0	0.887901	$0
3	$0	$0	$0	$0	$0	0.836656	$0
4	$0	$0	$0	$0	$0	0.788368	$0
5	$0	$0	$0	$0	$0	0.742868	$0
6	$0	$0	$0	$0	$0	0.699993	$0
7	$0	$0	$0	$0	$0	0.659593	$0
8	$1,500	$24,000	$32,000	$6,000	$63,500	0.621525	$39,467
9	$0	$0	$0	$0	$0	0.585653	$0
10	$0	$0	$0	$0	$0	0.551852	$0
11	$0	$0	$0	$0	$0	0.520002	$0
12	$0	$0	$0	$0	$0	0.48999	$0
13	$0	$0	$0	$0	$0	0.461711	$0
14	$0	$0	$0	$0	$0	0.435063	$0
15	$0	$0	$0	$0	$0	0.409953	$0
16	$1,500	$24,000	$32,000	$6,000	$63,500	0.386293	$24,530
17	$0	$0	$0	$0	$0	0.363998	$0
18	$0	$0	$0	$0	$0	0.34299	$0
19	$0	$0	$0	$0	$0	0.323194	$0
20	$0	$0	$0	$0	$0	0.304541	$0
21	$0	$0	$0	$0	$0	0.286965	$0
22	$0	$0	$0	$0	$0	0.270402	$0
23	$0	$0	$0	$0	$0	0.254796	$0
24	$1,500	$24,000	$32,000	$6,000	$63,500	0.240091	$15,246
25	$0	$0	$0	$0	$0	0.226234	$0
26	$0	$0	$0	$0	$0	0.213177	$0
27	$0	$0	$0	$0	$0	0.200873	$0
28	$0	$0	$0	$0	$0	0.18928	$0
29	$0	$0	$0	$0	$0	0.178356	$0
30	$0	$0	$0	$0	$0	0.168062	$0
31	$0	$0	$0	$0	$0	0.158362	$0
32	$1,500	$24,000	$32,000	$6,000	$63,500	0.149222	$9,476
33	$0	$0	$0	$0	$0	0.14061	$0
34	$0	$0	$0	$0	$0	0.132495	$0
35	$0	$0	$0	$0	$0	0.124848	$0
36	$0	$0	$0	$0	$0	0.117642	$0
37	$0	$0	$0	$0	$0	0.110852	$0
38	$0	$0	$0	$0	$0	0.104455	$0
39	$0	$0	$0	$0	$0	0.098426	$0
40	$1,500	$24,000	$32,000	$6,000	$63,500	0.092745	$5,889
41	$0	$0	$0	$0	$0	0.087393	$0
42	$0	$0	$0	$0	$0	0.082349	$0
43	$0	$0	$0	$0	$0	0.077596	$0
44	$0	$0	$0	$0	$0	0.073117	$0
45	$0	$0	$0	$0	$0	0.068897	$0
46	$0	$0	$0	$0	$0	0.064921	$0
47	$0	$0	$0	$0	$0	0.061174	$0
48	$1,500	$24,000	$32,000	$6,000	$63,500	0.057643	$3,660
49	$0	$0	$0	$0	$0	0.054317	$0
50	$0	$0	$0	$0	$0	0.051182	$0
PRESENT WORTH OF COSTS TWIN JETTIES							$98,267
TWIN JETTY PROJECT AVERAGE ANNUAL COST							$6,343.56
					6 1/8%, 50 YEARS		

Alternatives Benefit Evaluation

Project benefits are derived as the difference between the operating costs of the most probable future without project condition and the operating costs associated with alternative future conditions.

The most likely future without project condition assumed for the evaluation of alternative benefits was continuation of the existing Federal navigation project. The benefits evaluation compared the annual shoal-induced operating benefits and costs of the without project existing Federal navigation project at Sheep Pen Gut and the shoal-induced operating benefits and costs of the alternative future projects. The benefits are an economic measure of the difference between the continuation of the existing project and the project alternatives. Alternative 2 produces $110,000 in annual benefits compared to continuation of the existing project. Alternative 3 produces $113,000 in annual benefits compared to continuation of the existing project. Alternative 4 produces $154,000 in annual benefits compared to continuation of the existing project. Table A-9 presents a summary of the computation of benefits attributable to the alternatives.

TABLE A-9
Alternatives Benefit Summary
Rhodes Point Section 107 Project

Alternative	Annual Benefits
Alternative 2	$110,000
Alternative 3	$113,000
Alternative 4	$154,000

Alternatives Cost Analysis

Cost estimates were generated for each alternative. The cost estimates include all project costs, including those costs associated with construction of breakwaters along the shoreline south of the mouth of the Sheep Pen Gut channel for each alternative, and the costs associated with backfill of dredged material from the channel with wetlands creation landside of the breakwaters for Alternative 2 and Alternative 4. Table A-10 displays the estimated project cost estimate for each alternative. The price level of the cost estimate is October 2001.

TABLE A-10
Alternative Construction Cost Estimates (P. L. 10/01)
Rhodes Point Section 107 Navigation Project

Alternative	Project Construction Cost
Alternative 2	$2,548,000
Alternative 3	$2,288,000
Alternative 4	$3,163,000

Interest During Construction (IDC)

Interest during construction is an economic cost to account for the foregone opportunity cost of the capital invested during the project construction period. The estimated construction period for the section 107 navigation project is 1 year. The IDC computations for the project alternatives were made using the FY 2002 water resources development interest rate of 6.125 percent. The computed IDC was added to the economic cost of the alternative to obtain the real investment cost for the alternative.

Average Annual Equivalent Cost

The equivalent annual cost for the alternatives was computed based on the total investment cost for each alternative. The period of analysis used for computation of the annual cost of each alternative was 50 years, and the interest rate used was the FY 2002 water resources development interest rate of 6.125 percent.

Operation and Maintenance (O&M) Cost

The O&M cost for each alternative was computed based on the expected dredging cycle with that alternative and the expected average cost for maintenance dredging.

Alternative 2 is expected to require the removal of a volume of material equivalent to the volume removed for maintenance dredging with the existing condition. Based on the two most recent dredging events at Sheep Pen Gut, the average volume of material removed was 31,500 cubic yards. The expected dredging cycle for the single jetty alternative is 4 years.

Alternative 3 is expected to require the removal of a volume of material equivalent to the volume removed for maintenance dredging with the existing condition. Based on the two most recent dredging events at Sheep Pen Gut, the average volume of material removed was 31,500 cubic yards. The expected dredging cycle for the single jetty alternative is 5 years.

Alternative 4 is expected to require maintenance dredging every 8 years to remove approximately 800 cubic yards of material.

With implementation of any one of the 3 alternatives, maintenance dredging would take place simultaneous with maintenance dredging of the existing Federal navigation channels at Smith Island. A single equipment mobilization and demobilization would be needed to provide maintenance dredging for all the Smith Island navigation channels. With coincident mobilization and demobilization assumed, the economic cost attributable to dredging Sheep Pen Gut would be diminished. For purposes of the O&M analysis it was assumed that one-half of the mobilization and demobilization cost would be the economic cost attributable to the Sheep Pen Gut alternatives. The current total estimated cost for equipment mobilization and demobilization is $300,000. Therefore, the economic cost attributable to the Sheep Pen Gut maintenance dredging for mobilization and demobilization would be $150,000. The cost per cubic yard of material removed use for the analysis was $3.58. A 50-year period of analysis was used and costs were evaluated using the current FY 2002 water resources interest rate of 6.125 percent.

Summary of Alternatives Cost Analysis

Table A-11 presents a summary of the cost analysis for the Rhodes Point Section 107 project alternatives. For each alternative, the table displays the project construction cost, its excludable cost, the IDC cost, equivalent annual cost, the O&M cost and the total annual cost. In order to compute the national economic development (NED) cost of the alternatives, the annual cost, $114,000, attributable to the O&M cost of the without project condition, continuation of the existing Federal navigation project, was subtracted from the total annual cost of the alternative. The resulting net annual cost for Alternative 2 is $116,000, for Alternative 3 is $84,000 and for Alternative 4 is $111,000.

TABLE A-11
Project Alternatives Cost Analysis
Rhodes Point Section 107 Project

	Alternative 2	Alternative 3	Alternative 4
Project Construction Cost (10/00 P.L.)	$2,548,000	$2,288,000	$3,163,000
Interest During Construction	$78,000	$70,000	$97,000
Total Investment Cost	$2,626,000	$2,358,000	$3,260,000
Equivalent Annual Cost	$170,000	$152,000	$210,000
Operation & Maintenance Cost	$60,000	$46,000	$15,000
Total Annual Cost	**$230,000**	**$198,000**	**$225,000**
Without Project Annual Cost	$114,000	$114,000	$114,000
Net Annual Cost of Alternative	**$116,000**	**$84,000**	**$111,000**

Benefit to Cost Ratio (BCR) and Net BenefitsAnalyses

Table A-12 displays the results of the economic analysis of alternatives investigated for the Rhodes Point Section 107 project. The table presents the annual benefits, annual costs, benefit to cost ratio and net benefits for each alternative. Annual benefits and annual costs represent the difference between the without project annual benefits and annual costs and the annual benefits and annual costs of the alternative.

Net benefits are the measure used to select the preferred alternative (NED plan) from an economic perspective. Net benefits represent the difference between the annual benefits and annual costs of an alternative. The twin jetty alternative with a realigned navigation channel is the alternative that is expected to produce the greatest difference between annual benefits and annual costs. This alternative produces annual net benefits of $43,000 and has a BCR of 1.37 to 1.0. These benefit and cost data establish the twin jetty with a realigned navigation channel alternative as the economically preferred alternative and identify it as the national economic development plan at Sheep Pen Gut.

TABLE A-12
Summary of Benefit-Cost Analysis and Net Benefits Analysis
Rhodes Point Section 107 Project

Alternative	NED Annual Benefits	NED Annual Costs	Benefit to Cost Ratio	Net Benefits
Alternative 2	$110,000	$116,000	.94	($6,000)
Alternative 3	$113,000	$84,000	1.35	$29,000
Alternative 4	$154,000	$111,000	1.37	$43,000

Risk and Uncertainty of Project Outputs and Costs

With continuation of the existing Federal navigation project at Sheep Pen Gut, there is a high probability that existing project outputs and costs will closely approximate the established pattern. The formation of navigation-impeding shoals within 3-6 months of maintenance dredging and the shoal-induced navigation costs incurred by Rhodes Point and Tylerton commercial watermen are parameters that have been recurring for nearly 20 years with the existing project. The quantitative assessments of shoal-induced costs were derived within the framework of the well-established characteristics of shoal formation in the channels and its cost to the operations of commercial watermen.

The assumption regarding the decreased frequency of dredging with implementation of the jetty alternatives is a key determining factor in the evaluation of project benefits. This assumption impacts both project benefits and project costs. Project benefits increase the longer the navigation channels stays shoal-free. Project costs decrease with less frequent maintenance dredging.

The assumptions used in the economic evaluation regarding dredging frequency were based on the results of engineering modeling studies to assess the impact of the alternatives on material deposition, and subsequent shoal formation, in the navigation channel. The models indicate that with the twin jetty alternative with a realigned navigation channel alternative, the rate and volume of material deposition in the channel would be reduced significantly and thus the frequency of needed maintenance dredging of the channel would be greatly reduced.

The 8-year dredging cycle represents the assumption used in the economic evaluation. With an 8-year dredging cycle, annual benefits would exceed annual costs with the twin jetty alternative by $43,000. Even if dredging were required every 6 years, net benefits would still be $28,000.

Summary

With continuation of the existing Federal channel at Sheep Pen Gut, commercial watermen will continue to incur vessel damages cost, lost fishing time cost, increased fuel consumption cost and increased ordinary maintenance cost attributable to the formation of navigation-impeding shoals in the channel within 3-6 months after maintenance dredging. The annual cost of the shoal-induced effects is $160,000.

Three alternative future projects were formulated and evaluated: construction of a single jetty with a realigned navigation channel, construction of twin jetties with continuation of the existing Federal navigation channel and construction of twin jetties with a realigned navigation channel. If the existing Federal project were continued, the annual shoal-induced cost to commercial watermen would amount to $160,000. Annual shoal-induced costs would decrease to $50,000 with construction of the single jetty alternative, decrease to $47,000 with construction of the twin jetties with continuation of the existing navigation channel and decrease to $6,000 with construction of the twin jetty alternative with a realigned navigation channel.

Benefits attributable to the alternatives were derived as the difference between shoal-induced navigation operating costs to commercial watermen with continuation of the existing Federal project at Sheep Pen Gut and the shoal-induced costs with construction of the jetty alternatives. The single jetty alternative is expected to produce annual benefits of $110,000, the twin jetty alternative with continuation of the existing navigation channel is expected to produce annual benefits of $113,000 and the twin jetty alternative with a realigned navigation channel is expected to produce annual benefits of $154,000.

The cost to construct the general navigation features of the alternatives was $2,548,000 for the single jetty alternative, $2,288,000 for the twin jetty alternative with continuation of the existing navigation channel and $3,163,000 for the twin jetty alternative with a realigned channel. Total annual costs included the equivalent annual cost of the project investment cost, and the O&M costs of periodic maintenance dredging with the alternatives, less the annual maintenance cost of the existing Federal project, $114,000. Annual costs for the single jetty alternative amounted to $116,000, for the twin jetty alternative with continuation of the existing navigation channel amounted to $84,000 and for the twin jetty alternative with a realigned navigation channel amounted to $111,000.

The annual benefits produced by each alternative were compared with the annual costs to determine the benefit to cost ratio and the net benefits. The twin jetty alternative with a realigned navigation channel produces a BCR 1.37 to 1.0 and net benefits of $43,000. The twin jetty alternative with a realigned navigation channel was identified as the NED plan.

ANNEX B

ENGINEERING AND DESIGN DATA

GENERAL

During the reconnaissance phase of this study, the Rhodes Point navigation project was identified as a critical need to the watermen of Smith Island. Currently, there is an existing Federal channel that connects Tylerton and Rhodes Point to the Chesapeake Bay through Sheep Pen Gut (Figure 1). The mouth of the Gut, as well as the entire western shoreline of Smith Island, is highly erosive. The littoral movement of eroded sediments causes the channel to shoal within months after maintenance dredging. The watermen are forced to travel through Tyler Creek and Big Thorofare in order to get to prime crabbing grounds in the Bay. This trip is time-consuming and requires much additional fuel.

The following sections present engineering, design, and cost data pertaining to studies to determine the advisability of providing improvements to the Rhodes Point area on Smith Island, Maryland in the interest of shoreline erosion and navigation. Data presented relate to engineering investigations, design, and cost considerations for detailed plans developed during the feasibility stage of the study. The recommended project includes stabilization of the mouth of Sheep Pen Gut, realignment of the channel, and protection of the channel from shoaling by twin jetties.

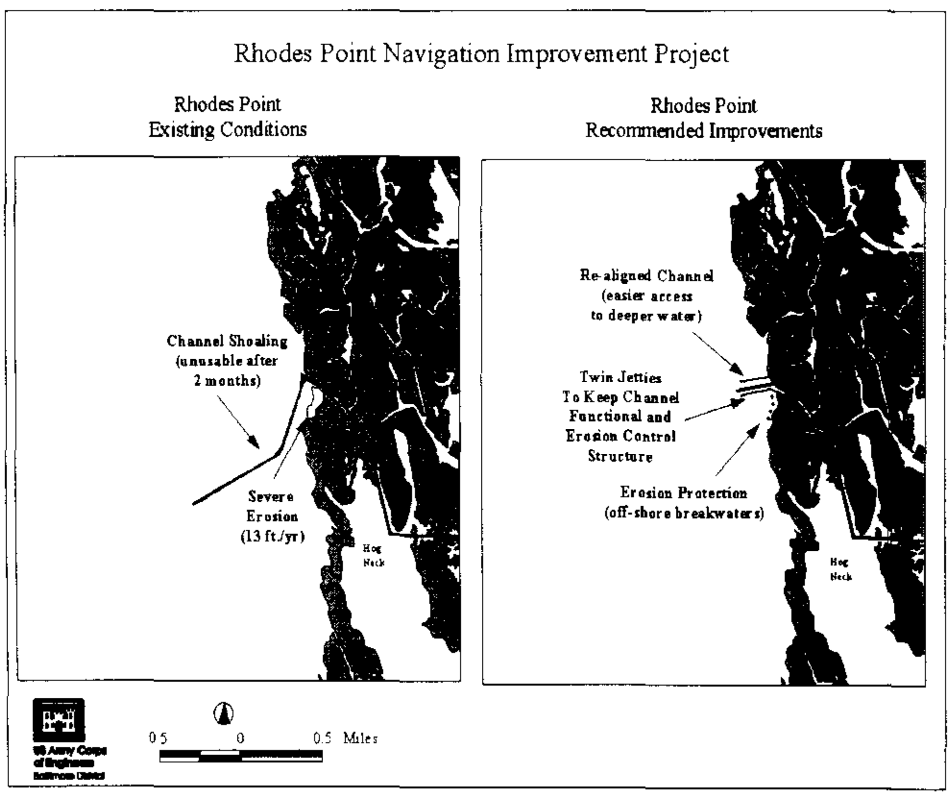


Figure 1 - Rhodes Point Navigation Project

PHYSICAL PROCESSES

Water Levels

Normal water level variations at Smith Island are generally dominated by astronomical tides, although wind effects can be important. Astronomical tides at Smith Island are semi-diurnal tides, with a period of approximately 12.5 hours, resulting in two high tides and two low tides each day. Tide ranges are published by the National Oceanic and Atmospheric Administration (NOAA). Tidal datum characteristics based on short-term statistics for Ewell, Smith Island reported by NOAA are presented in Table 1. Mean Lower Low Water (MLLW) will serve as the datum for this project. The Mean Tide Level (MTL) is .9 feet above MLLW with the mean tide range being 1.6 feet. Spring tides, which occur semi-monthly at or near the time of a new or full moon, result in increased tidal ranges and currents. The spring tidal range at Ewell is 1.9 feet.

TABLE 1
Astronomical Tidal Datum Characteristics at Ewell, Smith Island

Tidal Datum	Elevation in feet MLLW
MEAN HIGHER HIGH WATER (MHHW)	1.9
MEAN HIGH WATER (MHW)	1.7
MEAN SEA LEVEL (MSL)	0.9
MEAN TIDE LEVEL (MTL)	0.9
MEAN LOW WATER (MLW)	0.1
MEAN LOWER LOW WATER (MLLW)	0.0

Tide datum characteristics based on Crisfield tide statistics, are listed in Table 2. Short-term tide statistics developed by NOAA at Ewell on Smith Island (MHW of 1.7 feet, MHHW of 1.9 feet MLLW) indicate that tide ranges on Smith Island may be slightly lower than at Crisfield. However, it is not known if this is due to tidal attenuation within the island interior or if it also applies to the outer shorelines of the island. In either case, the use of the Crisfield statistics will result in slightly more conservative elevations when used for placing shore protection structure or jetty structure crest elevations.

During storm conditions, water levels are dominated by storm surge and wave setup in combination with the astronomical tide. Storm surge is a temporary rise in water level generated either by large-scale extratropical storms know as northeasters or by hurricanes. The rise in water level results from wind stresses, the low pressure of the storm disturbance and the Coriolis force. Wave setup is a term used to describe the rise in water level due to wave breaking. A comprehensive evaluation of storm-induced water levels for several Chesapeake Bay locations has been conducted by the Virginia Institute of Marine Science (1978) as part of the Federal Flood Insurance Program.

TABLE 2
Astronomical Tidal Datum Characteristics at Crisfield, MD

DATUM	ELEVATION (ft MLLW)
Mean Higher High Water (MHHW)	2.2
Mean High Water (MHW)	2.0
Mean Tide Level (MTL)	1.1
Mean Low Water (MLW)	0.1
Mean Lower Low Water (MLLW)	0.0

Storm surges result in more extreme water levels, which affect flooding, overtopping of structures and maximum expected depth limited wave heights in shallow areas. The closest station location to Smith Island is Crisfield, approximately 9 miles due east. The results for Crisfield are summarized in Table 3. It has been assumed that these water levels will apply to Smith Island.

TABLE 3
STORM SURGE ELEVATIONS[1]

RETURN INTERVAL	ELEVATION (ft MLLW)
5 year	4.2
10 year	4.6
25 year	5.1
50 year	5.5
100 year	5.8

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

Winds

There are no wind records available for Smith Island. Wind data for the Patuxent Naval Air Station for the period from 1945 to 1995 were obtained from the National

Oceanic and Atmospheric Administration, National Climatic Data Center. Hourly one minute average wind speed and direction data were provided. The elevation of the wind instruments varied over the period of record and therefore had to be adjusted to 33 feet. A Fortran program was written which made the appropriate adjustments for elevation and extracted the highest observed wind speed for each year of record and direction from the data set. These maximum annual wind speeds are presented in Table 4.

Using these data, various return interval wind speeds for each of the principal compass directions were calculated. The approach used to estimate the return intervals was to divide the wind observations into sixteen principal compass directions, i.e. north, north northeast, northeast, etc. 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 5 shows the various return interval wind speeds by direction.

The percent frequency of occurrence for various wind speed bands for all months of the year (annual distribution) was also of interest. A Fortran program was written to extract the number of wind occurrences within specified wind speed and direction bands from the data set. The number of wind occurrences within 5 mile per hour wind speed bands for each principal compass direction is provided in Table 6. These data indicate that the winds from the WNW through the N directions (clockwise) are both more frequent and of a greater magnitude.

The percent frequency of occurrence for various wind speed bands by month was also examined. A Fortran program was written to extract the number of wind occurrences within specified wind speed bands versus each month of the year for the entire period of record. The number of wind occurrences within 5 mile per hour wind speed bands for each month is provided in Table 7. This table demonstrates that winter storms, generally known as "northeasters", dominate storm generated coastal processes in the Chesapeake Bay region. Hurricane season typically extends from June through November, but in the local region, their greatest frequency is in the August-September time period.

Furthermore, Maryland's seacoast is situated geographically and geologically as to escape the frequent and extreme impacts associated with the full brunt of a hurricane's destructive path. Consequently, most tropical storms recorded in Maryland actually have been gales or fringe effects from hurricanes. Gale winds range down from 74 to 39 miles per hour. As can be seen from Table 7, there have been 58 recorded occurrences of winds greater than or equal to 40 miles per hour at the Patuxent Naval Air Station. Of those, 42 occurred between the months of December through May which is typically the time frame associated with the winter storm season, although northeaster's have occurred as early as October (e.g. Halloween Storm of October, 1991).

Of the 18 recorded occurrences of wind speeds greater than or equal to 40 miles per hour during the hurricane months, nine appear to have been generated by tropical storms. During Hurricane Hazel (October 1954), winds in excess of 40 miles per hour were recorded for six consecutive hours with a maximum occurrence of 62 miles per hour from the southeast. Two other hurricanes, namely Connie (August, 1955) and Flossy

TABLE 4
PATUXENT NAVAL AIR STATION
ONE MINUTE AVERAGE
MAXIMUM WIND SPEED (MPH at 33 feet)
PER YEAR AND PRINICIPAL 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	26	28	31	24	43	41	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	36	40	35
1948	33	40	30	22	18	22	25	26	25	28	24	23	30	35	37	47
1949	25	30	28	20	20	29	28	24	25	25	25	24	30	38	40	35
1950	35	23	22	18	20	35	30	30	20	30	26	22	35	35	39	31
1951	40	27	25	20	28	26	30	30	28	20	25	23	24	45	33	35
1952	32	25	22	20	22	37	38	32	20	21	25	24	34	38	32	30
1953	35	30	25	18	20	18	25	26	26	22	23	30	26	30	35	35
1954	31	32	30	20	20	49	62	23	30	20	29	50	24	30	38	32
1955	30	25	30	36	30	48	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	31	23	25	23	47	29	29	29	25	25	37	22	26	36	47	31
1958	34	29	27	23	29	18	22	27	29	23	26	29	27	34	38	42
1959	25	27	25	26	19	19	25	23	26	23	25	27	27	36	38	35
1960	29	26	28	39	26	24	26	30	26	28	37	30	29	46	46	39
1961	24	24	21	36	37	34	30	30	24	22	34	34	29	37	36	36
1962	30	28	30	18	29	31	20	22	21	26	26	26	26	34	33	26
1963	24	21	20	21	16	26	24	22	24	24	25	24	29	29	31	26
1964	34	37	33	24	39	26	34	29	22	29	34	33	33	31	37	39
1965	26	29	26	21	29	31	29	24	28	31	39	29	31	42	39	34
1966	24	21	26	24	24	25	26	24	26	26	29	33	45	31	29	25
1967	25	26	22	21	18	22	24	26	26	31	26	37	29	34	39	29
1968	34	39	26	30	26	22	21	28	24	34	28	29	33	33	43	34
1969	24	24	24	21	26	21	26	29	25	26	28	24	26	34	31	26
1970	25	21	18	21	18	24	25	29	34	21	31	34	36	29	37	34
1973	31	24	26	18	21	20	22	26	24	26	29	33	30	26	26	29
1974	25	22	22	33	37	34	26	24	24	25	29	29	34	26	25	28
1975	29	18	21	18	21	29	24	25	28	30	31	30	43	42	43	39
1976	20	20	18	18	16	18	20	21	21	26	24	21	24	29	29	31
1977	22	26	18	29	35	22	22	26	24	26	26	26	29	31	34	29
1978	24	28	36	26	23	18	23	32	26	39	39	39	32	39	33	36
1979	22	19	21	26	23	26	31	28	26	28	36	28	26	31	28	36
1980	31	26	18	17	19	28	22	24	26	28	32	27	28	39	33	28
1981	26	23	19	19	21	18	24	31	28	23	23	26	72	37	28	26
1982	23	22	24	22	23	22	19	23	26	23	26	24	32	39	36	26
1983	26	26	21	22	23	22	26	28	21	22	31	26	31	36	31	36
1984	19	19	36	27	18	22	26	25	22	23	45	25	25	35	32	26
1985	21	21	17	16	45	21	28	23	23	26	26	26	28	36	35	36
1986	26	26	22	26	26	35	21	25	25	26	36	26	26	34	31	31
1987	26	28	23	23	22	23	26	22	23	26	26	34	39	34	34	34
1988	34	21	21	18	21	21	21	26	26	26	28	31	28	31	31	27
1989	23	23	23	21	26	23	21	21	26	26	30	28	36	30	31	30
1990	28	26	26	16	18	18	28	21	34	26	26	26	28	31	31	39
1991	28	31	26	18	19	17	16	34	21	28	32	26	32	28	31	34
1992	39	39	22	39	24	26	36	23	30	32	28	31	34	32	39	39
1993	33	31	21	31	28	22	22	21	31	39	24	26	23	42	31	30
1994	31	27	26	22	31	17	21	26	28	31	33	28	28	31	31	39
1995	28	19	21	19	71	23	22	37	27	23	23	26	27	24	39	33

TABLE 5
PATUXENT NAVAL AIR STATION
ONE MINUTE AVERAGE WIND SPEED (mph)
ADJUSTED to 33 Feet ELEVATION

DIRECTION	RETURN PERIODS (years)				
	5	10	25	50	100
N	30.91	34.18	38.31	41.38	44.42
NNE	29.03	32.39	36.63	39.78	42.90
NE	26.75	29.58	33.16	35.81	38.44
ENE	27.66	31.71	36.82	40.61	44.38
E	31.93	37.66	44.89	50.25	55.58
ESE	29.74	34.32	40.12	44.42	48.69
SE	30.02	34.15	39.38	43.25	47.10
SSE	28.43	31.17	34.64	37.20	39.75
S	26.68	28.89	31.68	33.76	35.81
SSW	28.28	30.93	34.27	36.76	39.22
SW	31.54	34.77	38.85	41.87	44.87
WSW	30.64	33.88	37.97	41.00	44.02
W	34.51	38.71	44.02	47.95	51.86
WNW	36.96	40.14	44.15	47.12	50.07
NW	38.18	41.59	45.90	49.10	52.27
NNW	36.02	39.40	43.66	46.83	49.97

TABLE 6
PATUXENT NAVAL AIR STATION
WIND OCCURRENCES VS. DIRECTION
NO. of OBSERVATONS 1945 to 1995

Direction/Occurrences	ONE MINUTE AVERAGE WIND SPEED (MPH at 33 feet)										
	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	>45	TOTAL
N	4733	12457	7158	2788	721	156	40	6	1	0	28060
NNE	2934	10248	5518	2060	540	93	18	6	2	0	21419
NE	3184	10292	4392	1444	331	52	9	2	0	0	19706
ENE	2491	7016	2920	761	110	33	18	10	1	0	13360
E	3236	8082	2931	717	124	41	11	9	0	3	15154
ESE	2281	6729	2678	712	151	60	17	7	1	3	12639
SE	3119	11793	7144	2454	453	57	20	2	0	2	25044
SSE	3360	11329	7066	2950	455	57	10	1	1	0	25229
S	5971	15842	6847	2179	420	48	4	1	0	0	31312
SSW	3362	11405	7000	2872	453	69	10	2	0	0	25173
SW	3524	12410	8585	4282	1002	154	22	6	0	1	29986
WSW	2795	8407	5650	2550	523	117	31	4	0	1	20078
W	4674	10648	5536	2429	622	171	37	8	3	1	24129
WNW	4031	9266	5028	3590	1468	622	187	50	12	2	24256
NW	5354	12003	7972	6122	3479	1235	381	79	13	3	36641
NNW	4371	11439	7999	4821	1658	466	107	31	6	2	30900
TOTAL	59420	169366	94424	42731	12510	3431	922	224	40	18	383086

NODATA = 4682
CALM = 37387

TABLE 7 PATUXENT NAVAL AIR STATION WIND OCCURRENCES VS. MONTH NO. of OBSERVATIONS 1945 to 1995											
	ONE MINUTE AVERAGE WIND SPEED (MPH at 33 feet)										
Month/Occurrences	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	>45	TOTAL
JAN	4959	12287	7529	4433	1779	577	151	28	6	0	31749
FEB	4231	11293	7242	4211	1589	561	186	41	4	0	29358
MAR	3856	12466	8931	5339	2004	653	170	34	10	4	33467
APR	3511	12512	9117	5388	1559	365	79	35	6	2	32574
MAY	4755	14977	9129	3530	734	103	19	8	1	0	33256
JUN	5250	15550	8183	2622	417	50	11	4	0	2	32089
JUL	6159	17152	7218	1921	260	40	21	2	0	1	32774
AUG	6659	17405	6517	1623	268	56	21	2	1	1	32553
SEP	5626	15096	7290	2294	461	91	37	11	1	0	30907
OCT	4995	14690	7841	3095	725	126	32	8	3	6	31521
NOV	4452	13012	7884	3898	1265	335	80	22	1	0	30949
DEC	4967	12926	7543	4377	1449	474	115	29	7	2	31889
TOTAL	59420	169366	94424	42731	12510	3431	922	224	40	18	383086

NODATA = 4682
CALM = 37387

(September 1956) produced the three other occurrences of recorded winds between 40 and 50 miles per hour. Examination of historic records indicate an absence of tropical storm activity being associated with the remaining nine occurrences of winds greater than or equal to 40 miles per hour during the warm weather months. These recordings are believed to be associated with local weather disturbances such as thunderstorms, frontal squall lines, or extratropical storm activity.

These data bear out the fact that historically the Chesapeake Bay region is generally subjected to winds between gale and hurricane force. There was not one recorded occurrence of a wind speed greater than 74 miles per hour in the data set examined. The wind speed frequency distributions derived from these data indicate wind speeds range between 35 and 50 miles per hour for the 25 to 50 year return intervals, respectively. It was judged these conditions to be appropriate for design as waves and water levels caused by extreme wind events would result in inundation and overtopping of any protective structures and salt mash.

Offshore Waves

The numerical wave model WISWAVE set up for the Chesapeake Bay was used to convert extreme wind velocities to design deep water wave heights. The results are shown in the Table 8. The Patuxent Naval Air Station site is considered to be representative of the open bay area, although it is known that each site on the bay has its own local effects due to surrounding land masses and islands. However, Smith Island is a very exposed location and wind statistics should be similar to those at Patuxent.

The wind time history was used to generate a gridded hourly wind field over the Chesapeake Bay that would then drive the wave model WISWAVE. The wave model is a time-stepping directional spectral model that simulates the wave generation and transformation over open water fetches. Because of the omnidirectional nature of the wind fields, a half-plane model like STWAVE was not considered easy to implement unless many wave grids were used. The results were saved at the location of Smith Island for transformation to local areas using more appropriate techniques. The wind was assumed to be spatially uniform at each time step. The waves were simulated for the 1992-1994 time period over the region shown in Figure 2.

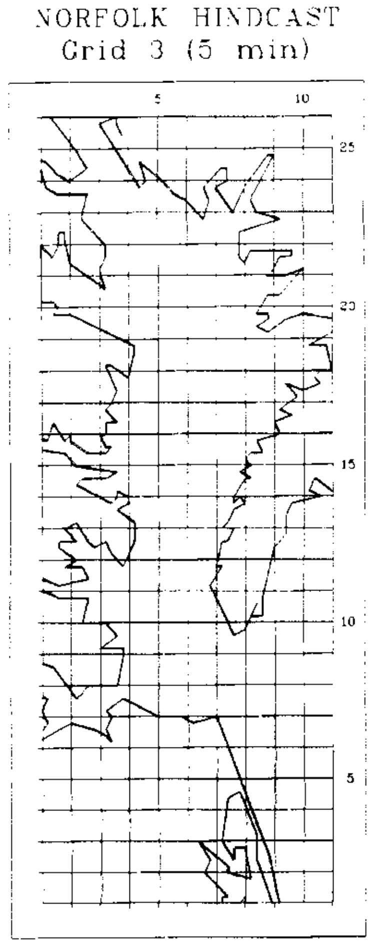


Figure 2. Chesapeake Bay Wave Model Grid Areas (Large Grid 5nmi) An Interior Grid (1nmi) was Used Locally around Smith Island

Wave model bathymetry was developed using NOAA navigation charts for offshore wave modeling. Wave transformations to local shallow water project areas were done using bathymetry developed with a combination of NOAA charts and survey data collected as part of this study. Offshore wave simulations were performed with a water level of approximately MHW, although water level position would not affect these results because wave model output was archived outside of any depth-limitation on the waves. Locations (7,19), (7,20), (8,19), and (8,20) were used as offshore wave points from which waves were transformed to the nearshore.

A lack of local wave data prevented a localized validation of the wave model; however, the model has been widely used for applications throughout the world, including the

Chesapeake Bay. The nearest validation of the model was for the Chesapeake Bay Entrance NOAA wave gauge, shown for a February 1998 storm event in Figure 3, where both ocean swell and local sea (generated in the Chesapeake Bay) are present. The processes simulated by the model are therefore assumed appropriate for application to the Smith Island site.

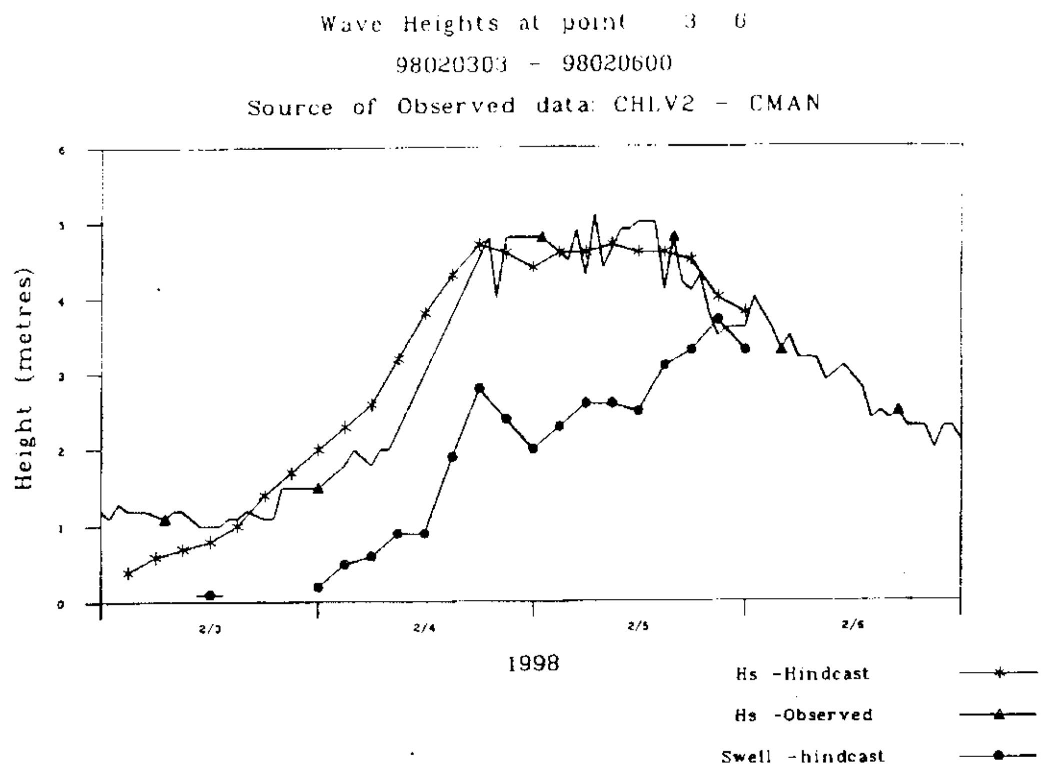


Figure 3. Wave Model Validation at Chesapeake Light for February 1998 Northeaster. Hindcasted Significant Wave Height, Hs-Hindcast, compares favorably to measurements, Hs-Observed. Swell indicates portion of wave energy entering the bay from the ocean.

The time history output from the wave model was reviewed to identify long term (near steady state) wind events that provided fully-developed sea states generated from dominant wind directions. Those conditions were tabulated for the direction ranges shown in Table 8 and extrapolated to the extreme wind speeds. Note that the extremes provided in Table 8 are zero-moment wave height, Hmo, are not maximum wave heights.

TABLE 8 OFFSHORE WAVE HEIGHTS						
WIND ANGLE RANGE (FROM)	**WAVE ANGLE RANGE (TO, CCW FROM EAST)**		**RETURN PERIOD, YEARS**			
			5	**10**	**25**	**50**
315 to 15 (Northwest to North)	75 to 135	**Wind (mph)**	38	42	46	49
		Wave Ht (ft)	**6.9**	**8.2**	**8.8**	**9.2**
		Wave Pd (sec)	7.7	8.1	8.4	8.6
310 to 225 (Westerly)	140 to 225	**Wind (mph)**	33	37	41	44
		Wave Ht (ft)	**4.9**	**5.9**	**6.2**	**6.6**
		Wave Pd (sec)	5.0	5.3	5.5	5.7
220 to 170 (Southerly)	170 to 320	**Wind (mph)**	27	30	33	36
		Wave Ht (ft)	**4.6**	**4.9**	**5.2**	**5.6**
		Wave Pd (sec)	4.8	5.0	5.2	5.4
160 to 130 (Southeasterly)	290 to 320	**Wind (mph)**	29	33	37	41
		Wave Ht (ft)	**5.2**	**6.2**	**6.6**	**7.2**
		Wave Pd (sec)	5.8	6.2	6.4	6.7
120 to 23 (Easterly)	330 to 67	**Wind (mph)**	29	34	38	42
		Wave Ht (ft)	**4.9**	**5.2**	**6.2**	**7.9**
		Wave Pd (sec)	4.8	5.3	5.9	6.9

Nearshore Waves

Because of the variable bathymetry and wave breaking conditions, the waves are converted to local, nearshore wave heights using the Goda wave transformation methodology. The offshore wave grid was not used for nearshore wave transformation because the grid was not fine enough to resolve fine nearshore details and wave breaking processes in this type of environment are better resolved using programmed analytical techniques. For water depths of 10 feet or more, the ACES (Automated Coastal Engineering System, Version 1.07f), wave transformation technique was used. Because the ACES program does not support wave transformation calculations for depths less than 10 feet, the tables from the paper by Seelig and Ahrens, "Estimating Nearshore Conditions for Irregular Waves," 1980, were used for shallower depths.

Wave transformation calculations were made with waves from the north, northwest, west, southwest and south. For most of the areas under consideration, northerly winds create the most severe wave condition at the shoreline because of the greater wave fetch.

The wave transformation included the effects of wave refraction due to the angle of approach of the waves relative to the shoreline, as well as shoaling and wave breaking.

Wave heights are calculated for water depths of 6 feet, which corresponds to a bottom depth of –3 feet MLLW and a structure crest at +3 feet MLLW (nearshore breakwater), or a bottom depth of –2 feet MLLW and a structure crest at +4 feet MLLW (shallow portion of the Sheep Pen Gut jetty). These depths were chosen since a water level at the crest of a stone structure is often the most severe design condition. Table 9 shows nearshore design waves that result from transforming the northerly offshore waves. These waves are the most severe and are used for structural design.

Wave heights are also calculated along the Sheep Pen Gut jetty alignment for water depths of 8, 10 and 12 feet, corresponding to bottom depths of -4, -6, and -8 feet MLLW, with a jetty crest elevation of +4 feet MLLW. The latter condition might apply to the jetty head in –6 feet of water after future scour deepened the water seaward of the structure. Table 9 shows nearshore design waves that result from transforming the northerly offshore waves. These waves are the most severe and are used for structural design.

TABLE 9
NEARSHORE DESIGN WAVES

Water Depth (ft)	25 Year Design Wave Condition			50 Year Design Wave Condition		
	T_s (sec)	H_s (ft)	H_{10} (ft)	T_s (sec)	H_s (ft)	H_{10} (ft)
6	8.8	4.3	5.2	9.2	4.4	5.3
8	8.8	4.8	5.8	9.2	4.9	5.9
10	8.8	5.0	5.9	9.2	5.1	6.0
12	8.8	6.1	7.1	9.2	6.1	7.2

Hydrodynamic Numerical Modeling

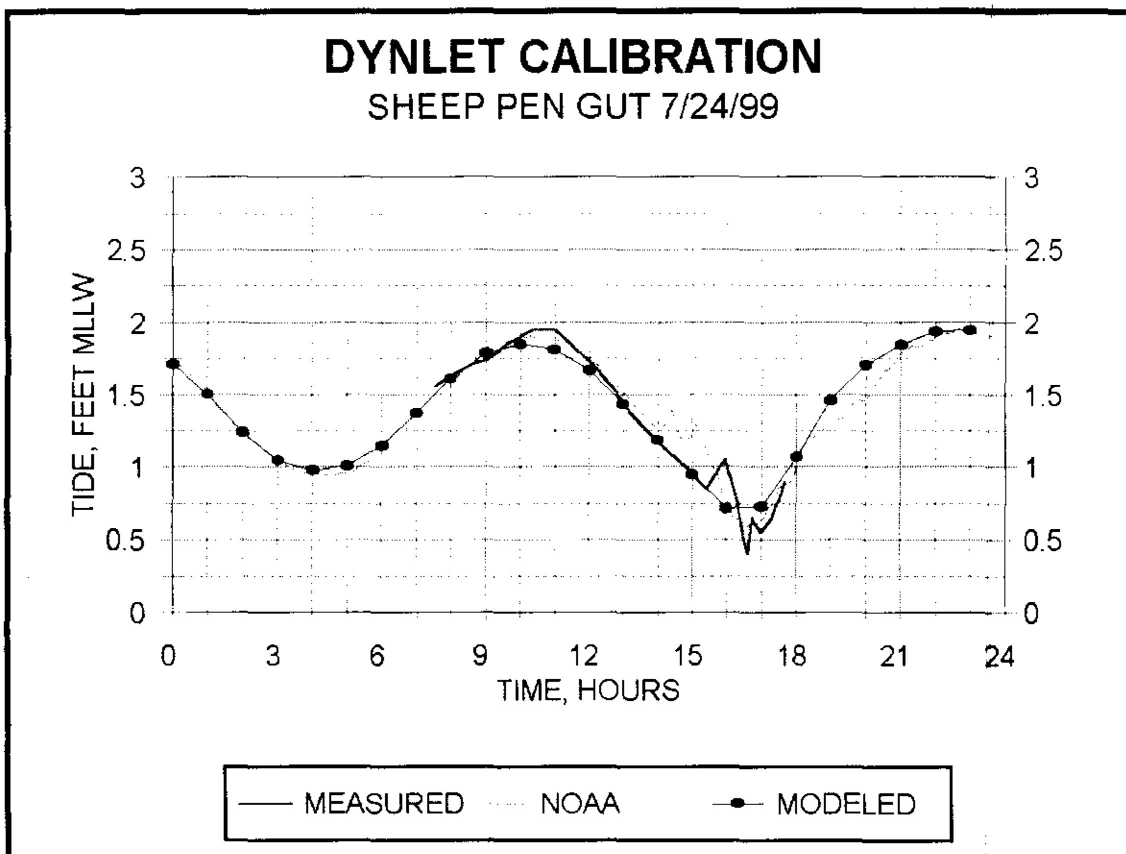
A series of numerical tidal current models were set up to simulate the tidally driven currents in Sheep Pen Gut and in the near-shore region of Chesapeake Bay near the mouth of Sheep Pen Gut. The models include the one-dimensional flow model DYNLET, set up over a large area of the bay, which was used to provide boundary conditions for the near shore model. For the near shore region, the two-dimensional flow model TWO-D was used to examine the details of flow near the mouth of Sheep Pen Gut.

The DYNLET model was driven with NOAA measured tide time histories from Windmill Point to the south, and Solomons Island to the north. The channels through

Smith Island, including Sheep Pen Gut, were simulated by a simplified channel system in the DYNLET model.

The DYNLET model was calibrated using tide and current measurements taken over a tide cycle at the mouth of Sheep Pen Gut for this project on 24 July 1999. The tide elevations measured at the mouth of Sheep Pen Gut, NOAA tide measurements from Lewisetta on the Western shore of the Chesapeake Bay, and the calibrated DYNLET model at the mouth of Sheep Pen Gut are shown in Figure 4.

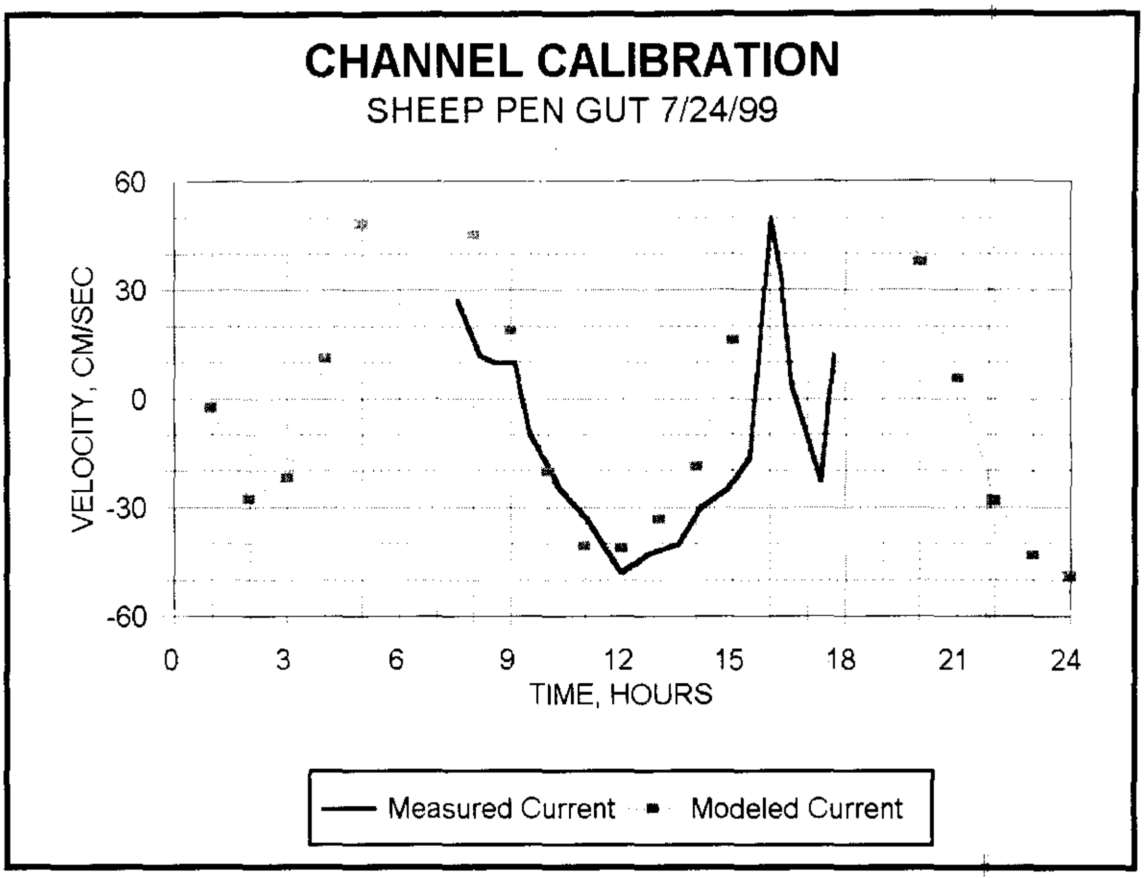
Figure 4 - DYNLET TIDE CALIBRATION



The irregular signal in the NOAA measurements and the Sheep Pen Gut measurements are due to a front moving through the measurement area from west to east, accompanied by strong winds. The strong winds and pressure changes apparently caused the Bay to slosh, first affecting the western shore at the NOAA Lewiston Gage, and then the Sheep Pen Gut measurement area. Nevertheless, the calibrated tidal signal shows excellent agreement with the measurements.

The measured currents at the mouth of Sheep Pen Gut were also compared with the DYNLET model results, shown in Figure 5.

Figure 5 - DYNLET CURRENT CALIBRATION



The impact of the passing front was more dramatic for the tidal currents than for the tidal elevations. While the ebb tide velocities are well behaved and well simulated by the DYNLET model, during the flood tide the measured current direction temporarily reversed and began flowing out of the gut. The model did not simulate this event because it was local, and not reflected in the boundary conditions further north and south in the bay. However, based on the good tidal elevation calibration and the good ebb current simulation, it is believed that a good calibration of the DYNLET model was achieved.

Historic Erosion Rates

For marsh islands such as Smith Island, land loss occurs through edge erosion and interior degradation. Edge erosion occurs when chunks of marsh peat are undermined by normal daily wave energy and are subsequently broken off by waves which occur during small storms, causing a horizontal recession. During larger storms, the storm surge may actually overtop the marsh allowing the wave energy to dissipate across the marsh surface rather than at the edge. The larger storms may actually cause less erosion.

The barrier island west of the community of Rhodes Point has generally been eroding at a rate of 4 to 8 feet per year with some areas experiencing rates as high as 10 feet per year.

Sediment Transport

Analysis of the wind records indicates that the wave driven sediment transport is fairly evenly split between transport to the south and transport to the north, with transport to the south exceeding transport to the north by about 12 percent. This is based on an analysis of winds in the northwest and southwest quadrants that contribute to wave generation and wave driven transport along the western shoreline of Smith Island. Actual wave driven transport quantities will depend on the availability of sand sized particles in the nearshore area, orientation of the local shoreline, and local wave refraction effects.

Analysis of surveys of the offshore navigation channel at Sheep Pen Gut indicates that about 6 cubic yards/year/foot of material is trapped by the channel, leading to infilling rates of 2 to 3 feet per year for the years immediately following dredging. Over the 1500-foot length of the channel this is equal to 9000 cubic yards per year for the offshore region of the bar. This figure does not include the transport along the shoreline.

Sea Level Rise

Based on long-term records (100 years) at Baltimore, Maryland, the rate of sea level rise is approximately 3.5 mm (.011 feet) per year. Local sea level rise has been documented to be about .013 feet per year and .012 feet per year at Atlantic City, New Jersey and Norfolk, Virginia, respectively. The Baltimore value is generally accepted as the current rate of rise in the Chesapeake Bay region. Assuming that this rate continues, at the end of the project life of 25 years, the total sea level rise would be about 3 inches. This rate of change is deemed to be within the uncertainty associated with the design methodologies, data measurements and construction procedures, and did not influence the design of the protective structures.

STRUCTURE SECTION DESIGN

Shoreline Protection Breakwater Section

Low crested structures such as those proposed for shoreline protection for this project will generally be submerged during design storm events. Moreover, Van der Meer (1991) observed that overtopped breakwaters are more stable than non-overtopped breakwaters due to the fact that a large part of the wave energy can pass over the structure. Analysis of several data sets suggests applying a reduction factor to the median stone size to account for the increase in stability.

The procedure is to first establish the stability of the low crested breakwater assuming it is a non-overtopped structure. For the proposed breakwater design a nearshore 25-year wave height (H_{10}) of 5.7 feet and 25-year the water level at the crest of the structure were chosen as the design conditions. Hudson's stability formula was then used to determine the required stone diameter as if it were a non-overtopped structure. The armor stone size was calculated using the ACES breakwater design computer program and was selected using the following equation:

$$W = \frac{W_r H_{10}^3}{K_D (S_r - 1)^3 \cot\theta}$$

where:

W = weight (lbs.) of individual armor unit in the primary core layer
W_r = unit weight of armor rock (165 lbs./cubic ft)
H_{10}= design wave height (5.7 feet)
S_r = specific gravity of armor unit relative to water (2.58)
θ = angle of structure side slope measured from the horizontal (degrees)
K_D= stability coefficient that varies primarily with the shape of the armor units, roughness of the armor unit surface, sharpness of the edges, and degree of interlocking obtained in placement. K_D values are selected for a breaking wave condition based on depths and slopes at the structure; K_D = 2.0

Based on a design wave height of 5.7 feet for the 25-year return period, the median stone weight is calculated to be 2600 pounds with a median stone diameter (D_{n50}) of 2.5 feet for the non-overtopped condition. Van der Meers reduction factor (r) for D_{n50} was then applied as follows:

$$r = 1/(1.25 - 4.8R_p^*)$$

for $0 < R_p^* < 0.052$

where:

R_p^* = dimensionless freeboard, $R_c/H_s(S_{op}/2\pi)^{0.5}$
R_c = crest freeboard, level of crest relative to still water level
S_{op} = fictitious wave steepness, $2\pi H_s/gT_p^2$
T_p = peak wave period

Using the above equation results in a reduction factor of .8 in the diameter of the median stone size required for the non-overtopped case. This results in a mean stone diameter of 2.0 feet, which equates to a median stone size of 1300 pounds. The range of weight of stone is 975 to 1625 pounds with at least 50% of the stones weighing more than 1300 pounds. The bedding layer stone was calculated to be W_{10}, or 130 pounds. The range of bedding stone is 90 to 170 pounds.

The crest width of the breakwater section was calculated from the equation:

$$B = nK_d(W_a/W_r)^{1/3}$$

where:

B = crest width (ft)
n = number of stones (3)
K_d = layer thickness coefficient (1.0)
W_a = weight of armor unit in primary cover layer
W_r = unit weight of armor unit (165 lb./cubic foot)

The minimum crest width was calculated to be 6.0 feet.

The thickness of the armor layer was computed from the equation:

$$r = nK_d(W_a/W_r)^{1/3}$$

where:

r = average thickness (ft)
n = number of layers (2)
W_a = weight of the individual armor unit (1300 lbs.)
K_d = layer thickness coefficient (1.0)

The armor thickness was calculated to be 4.0 feet or 2.0 feet per individual armor unit.

Sheet 3 shows a typical structure cross-section with a 4-foot armor stone layer thickness (1300 pound stones), with 1.5:1 side slopes and a six-foot crest width. This structure would be appropriate for shorelines landward of the –2 or –3 foot contour. For soft bottom conditions it may be desirable to extend a one-foot minimum thickness of base stone beneath the armor stone to insure that individual stones do not sink into the bottom.

One of the design goals for wetland/restoration type projects is to use the minimum amount of structural protection necessary. For that reason, a low crest structure is proposed for shoreline protection measures along the Smith Island shoreline. As was discussed previously, a low crested structure will reduce the transmitted wave by 50% or more for frequent events. While not being as effective in attenuating the wave height during more extreme events, the impact to the shoreline will not be as significant, since the marsh shoreline will likely be inundated during such events. In such cases, the wave energy will pass over the marsh, and be dissipated, and not directly impact the marsh edge itself. Consequently, a structure crest height of +3.5 feet MLLW , which includes .5

feet for anticipated settlement, was selected for any shore protection measures. This is generally about one foot above the existing marsh shoreline.

Jetty Sections

It is recommended that the crest of the jetties be placed at an elevation of +4.5 feet MLLW, which includes .5 feet for anticipated settlement. This is about the 5-year recurrence elevation for storm surge, insuring that the crest will be above the still water level for most storm events, while maintaining an economical section for construction. A large portion of the bar over which the jetties will be built has a bottom between –2 and -3 feet MLLW. Therefore, over most of the jetty length the structure height will be between 6.5 and 7.5 feet.

For the jetty sections, 50-year return interval waves with a water level at the crest of the structure was chosen as the design condition. As discussed in the nearshore waves section, the nearshore H_{10} design waves range from 6.3 feet at the head of the jetty to 5.3 feet inshore of the –2.0-foot MLLW contour. This results in design stone sizes from 2000 pounds for the nearshore areas to 3700 pounds for the structure head. Because the structure crest is at the still water level for design conditions, the stone sizes can be reduced by 50 percent, since a large portion of the design wave energy will pass over the structure, reducing armor stone forces (van der Meer, 1993). However, because the section requires a certain thickness to achieve the desired crest height, it will often be as economical not to reduce the stone weight, and maintain a conservative design stone size. For the sake of consistency, the stone weight and associated cross section for the inshore jetty section was chosen to be the same as the conventional breakwater section (W_{50} = 1300 lbs). Using the same methods to determine the standard breakwater section and as described previously the W_{50} for the outer jetty section was determined to be 1850 pounds with a range from 1390 to 2300 pounds

It important to construct the jetties to be sand tight at least up to the +2 foot MLLW elevation over most of the jetty length. Because of the shallow depths, there will be significant sediment being transported by wave and current action adjacent to the jetties, which will move through a porous structure. In addition, it is likely that a portion of the jetty will have a fillet of material accumulate adjacent to the jetty. This can lead to large amounts of sediment moving through the jetty at the shoreline of the fillet. Seaward of the –3 or –4-foot contour the sand tightness of the jetty becomes less important.

It is proposed to substitute a 2-foot high by 3-foot wide concrete block for one of the armor stones in the inner layer. By keying the concrete blocks end-to-end, a sand tight layer can be created. The same concept would apply to the outer jetty section. A typical jetty section is shown on sheet 3 .

Jetty Alignment

To assess the alignment of the proposed navigation improvement project at Sheep Pen Gut a two-dimensional flow model was utilized. The calibrated DYNLET model previously described provided the boundary conditions for the two-dimensional flow model at the southern, northern, and Sheep Pen Gut boundaries. It is assumed that the flow along the western boundary is zero, i.e. the flow in the offshore portion of the bay is strictly north-south in direction. The two-dimensional model covers an area 10,000 feet in the east-west direction and 8000 feet in the north south direction, with a 200-foot grid size. The model was run with typical tide stage time histories and storm tide time histories. Various geometries were simulated, including existing conditions, one jetty to the north of the proposed navigation channel, and two jetties protecting the proposed channel. Cases with and without the dredged channel were run to evaluate the ability of the channel to scour itself clear if it were to be filled by a major storm event.

The model provided two-dimensional flow patterns across the shallow bar in the area of the proposed channel, flow velocities through the channel for the various jetty configurations, and flow patterns in the vicinity of the proposed jetties. Representative vector plots are shown in Figures 6 through 8 for ebb currents for the cases of no jetty, one jetty, and two jetties.

Figure 6 – Ebb Current. No Jetty

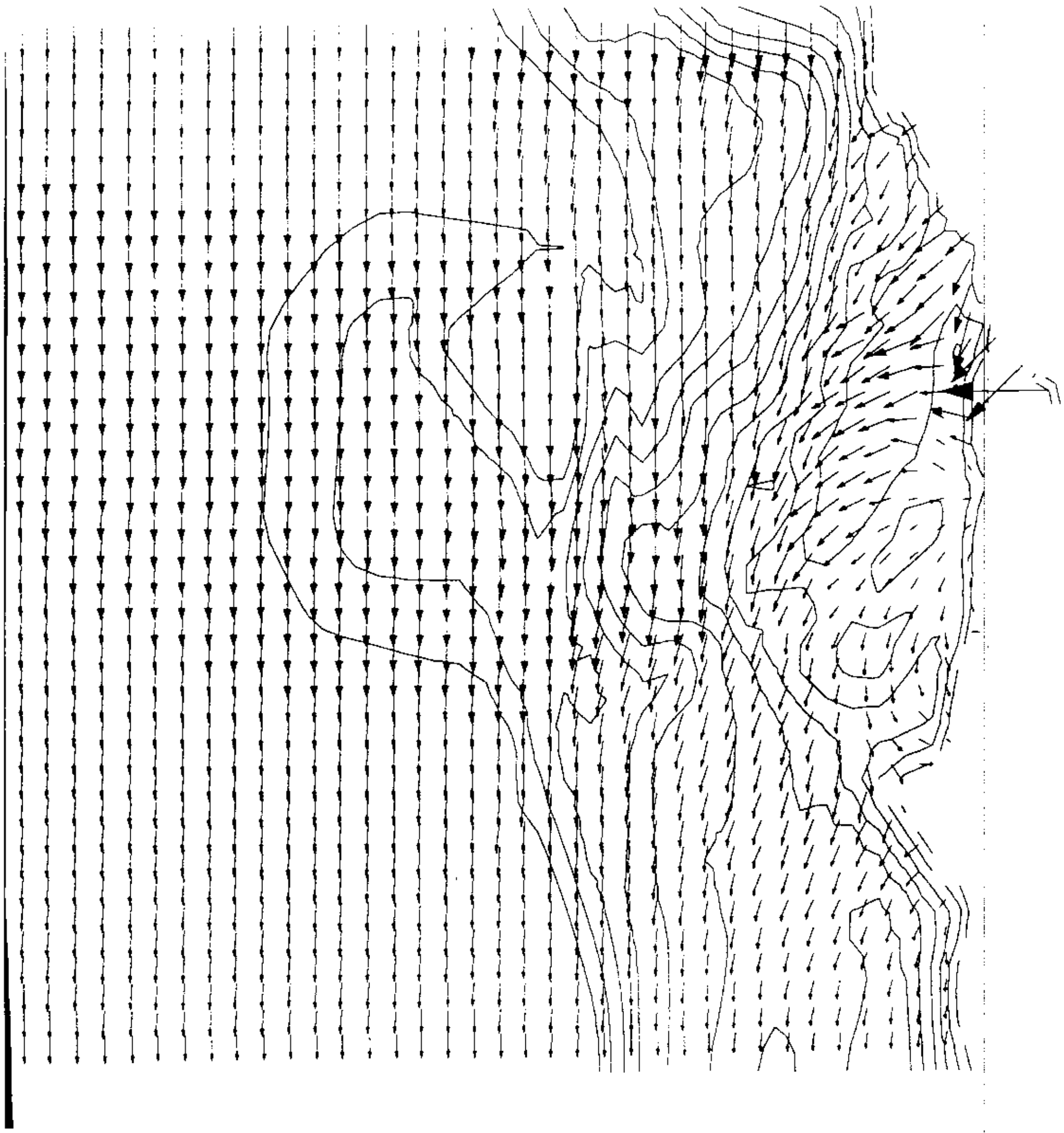


Figure 7 – Ebb Current, One Jetty

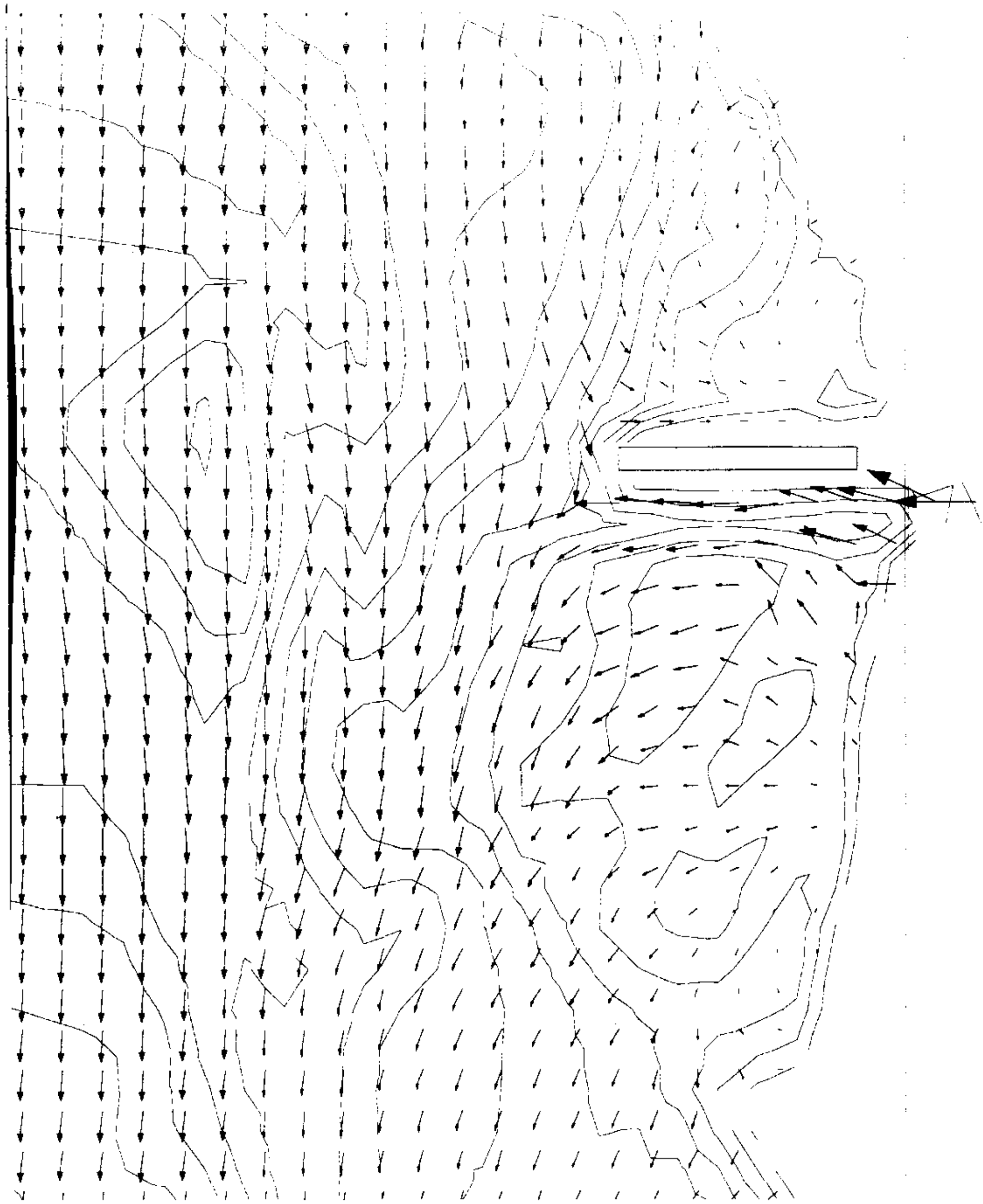
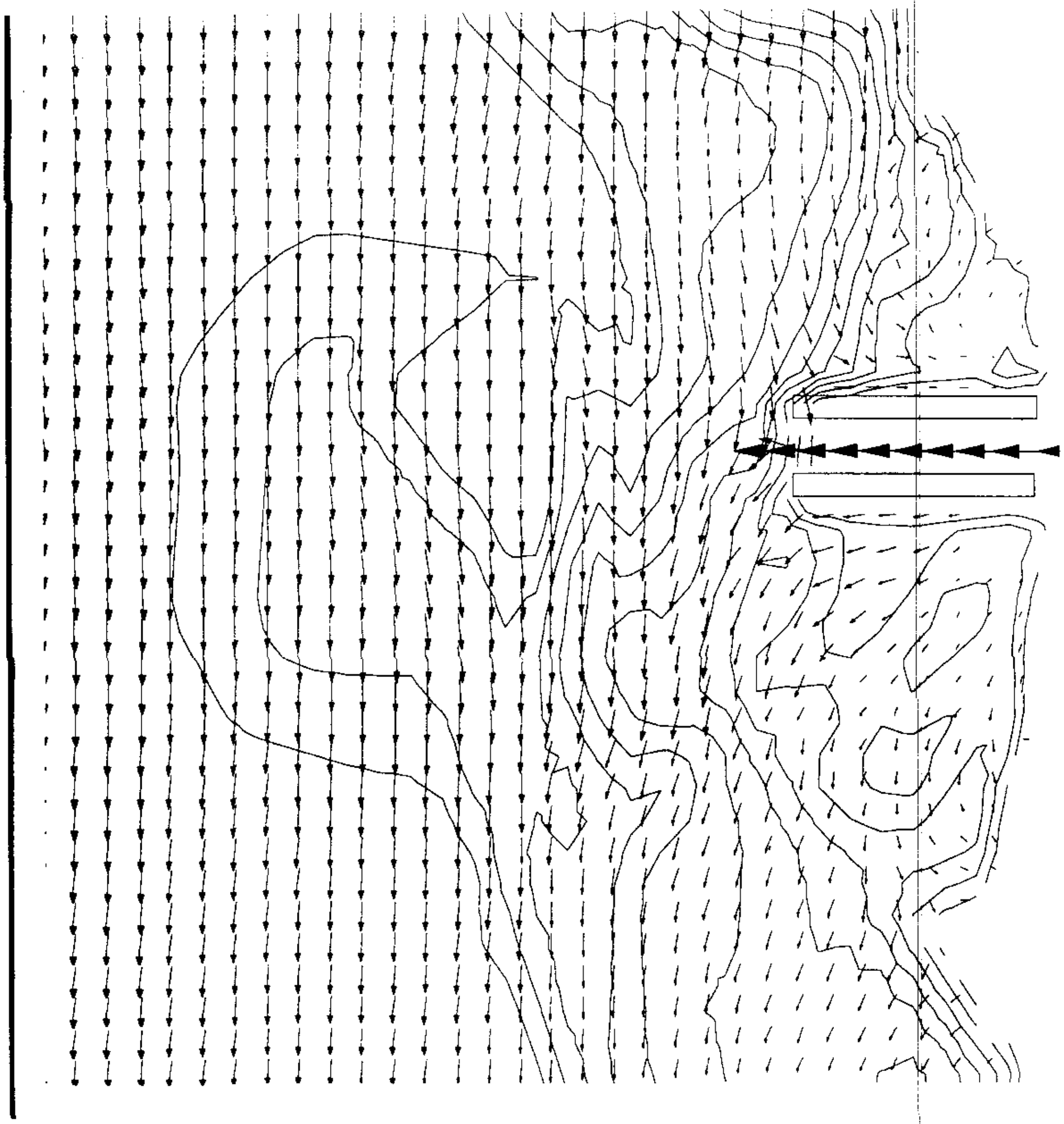


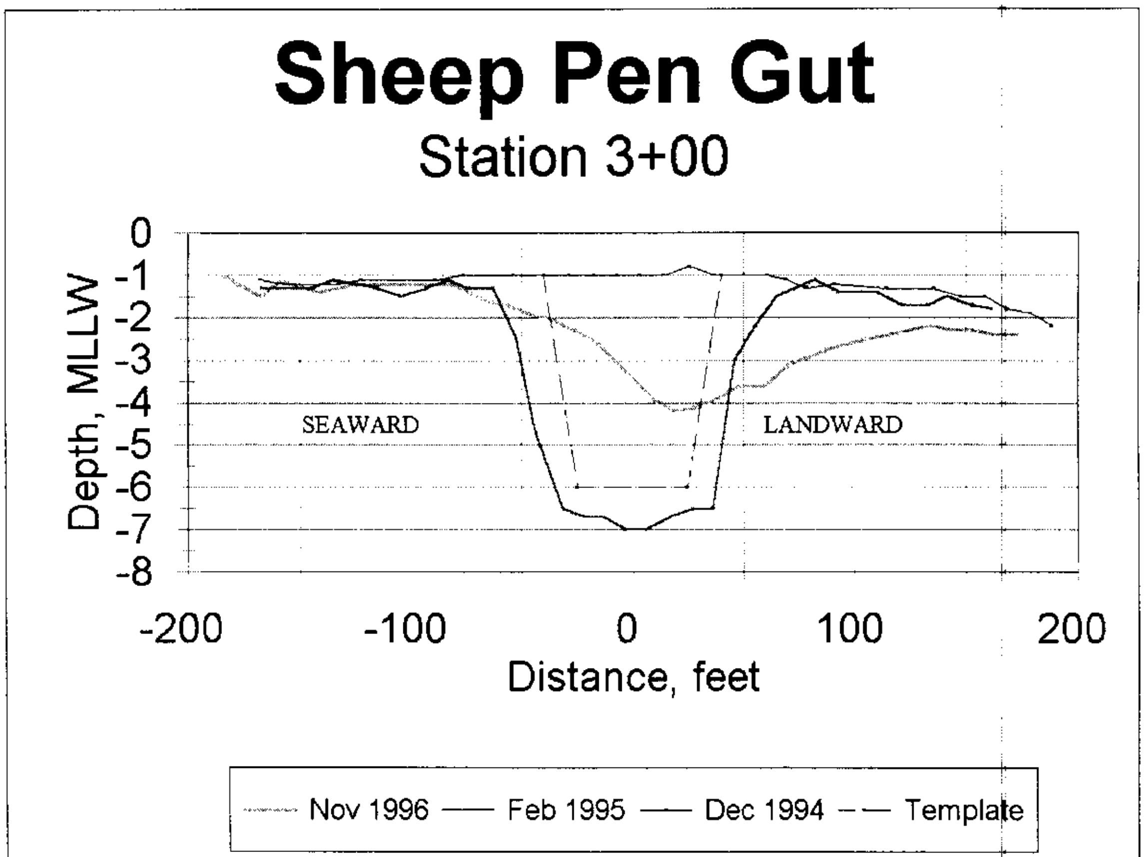
Figure 8 – Ebb current. Two Jetties



Channel Infilling Analysis

Surveys taken by the Baltimore District, Corps of Engineers, related to the existing navigation project at Sheep Pen Gut, have been examined for insights into channel infilling rates in the vicinity of Sheep Pen Gut. Of importance were surveys taken in December 1994, shortly prior to dredging the existing channel; February 1995, shortly after the channel was dredged; and November 1996, approximately one year and nine months after the channel was dredged. Representative survey sections across the channel were chosen for analysis in two locations. The first was at Station 3+00, which is representative of the portion of the existing channel that is parallel to the shoreline, and Station 5+00, which is representative of the portion of the channel that is perpendicular to the shoreline. The measurements, along with the theoretical channel template (channel bottom at –6 feet MLLW, 50 foot width at the bottom, 3:1 side slopes), are shown in Figures 9 and 10.

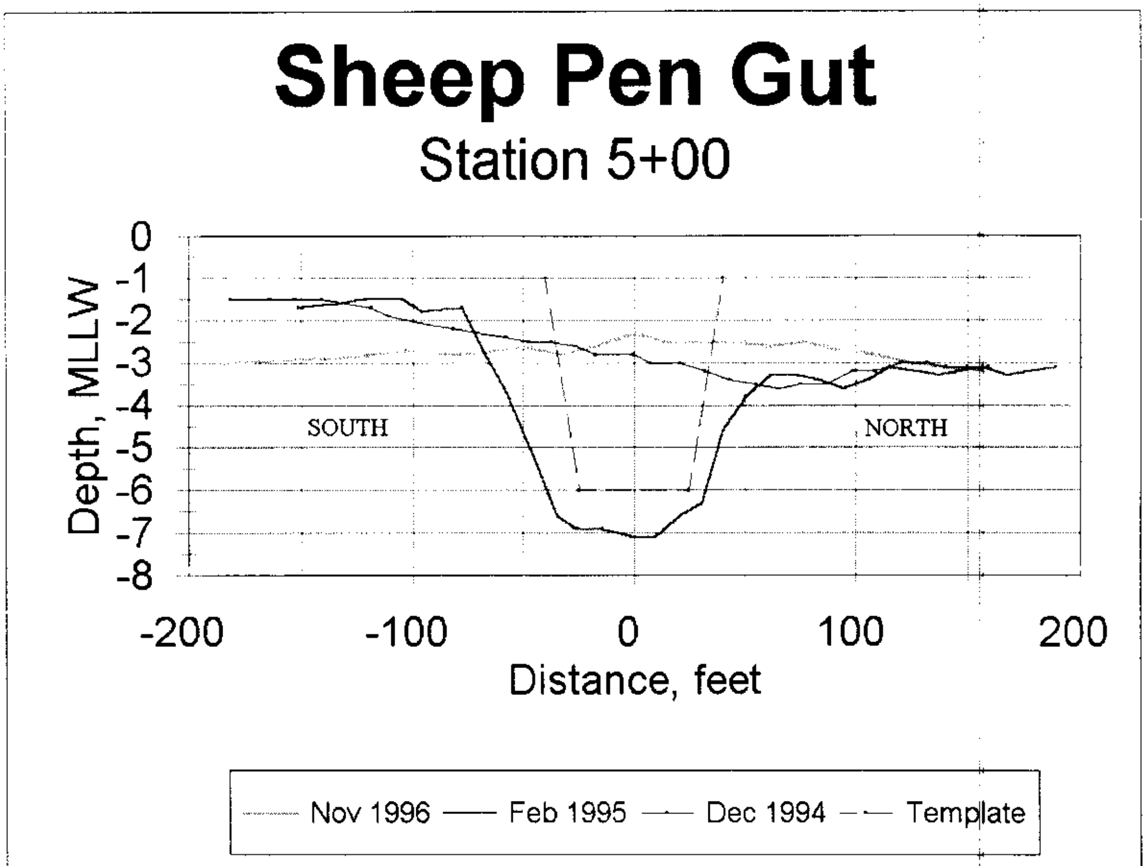
Figure 9



Analysis of the data from Figure 9 indicates that approximately 22 cubic yards per foot of channel were excavated during the dredging. Note that this included over-dredging to –7 feet MLLW and additional width as compared to the template.

Based on the conditions in November 1996 as compared to February 1995, approximately eleven cubic yards of material per foot had entered the channel in the 1-3/4 year period, resulting in an infilling rate of about six cubic yards per year. Because the channel filled completely on the seaward side of the channel and eroded on the landward side of the channel, it is apparent that there was a landward movement of material in this area.

Figure 10



The section at Station 5+00 filled completely between the dredging and the survey 1-¾ years later, in November 1996. Thus, an estimate of the infilling rate of the channel cannot be obtained, except to note that it is greater then 4.5 feet in 1-¾ years, or over 2.5 feet per year. Based on the measurements, it appears that the infilling in this case may have taken place from the south, since the bottom to the south of the channel has been eroded by the time of the November 1996 survey, relative to the previous surveys.

The channel proposed to replace the existing channel runs straight offshore, west-northwest, from the mouth of Sheep Pen Gut. This orientation is roughly the same as the offshore portion of the existing channel. Because the orientation, depths, tidal currents, and exposure to wave transport are similar, it is assumed that the infilling for the new channel would be similar to the offshore portion of the existing channel if it is not protected by a jetty. Jetties prevent the movement of current and wave driven sediment into the dredged channel, preventing infilling. In addition, the jetties can channel the flow, increasing the velocity of the tidal currents so that the typical tidal currents can scour out the channel if it begins to become filled in.

One of the items this study was asked to address is whether a single jetty could be configured to maintain the channel depths sufficient for navigation, either indefinitely or for a sufficiently long period to reduce the channel dredging requirements. It assumed that the most logical position for a single jetty is on the north side of the channel, since the wave driven transport is greatest from the north. The questions are then 1) how rapidly will a channel that is protected by a single jetty on its north side fill in, and 2) will normal tidal currents be sufficient to keep the channel scoured out, or can the tidal currents scour out the channel if it is filled in by a storm event.

1) Channel infilling:

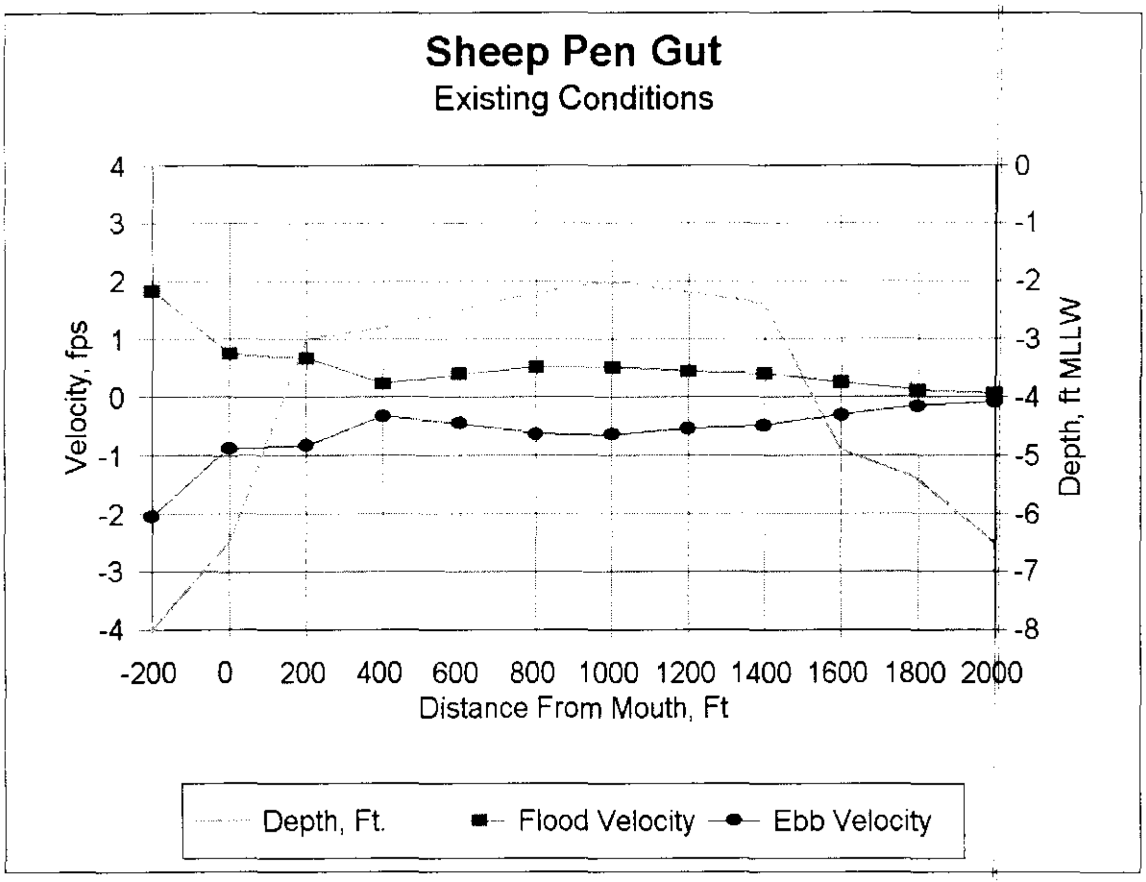
Previously in this report, the results of the numerical modeling indicated that the tidal currents are of similar magnitudes running in the north and south directions. Also, the wave driven sediment transport was found to be similar in magnitude for the northerly and southerly directions, with a slightly greater transport to the south. Because the outer portion of the existing channel apparently fills in very rapidly (probably within a year based on the survey results, and possibly much faster based on anecdotal reports from local watermen), it appears likely that a channel protected on the north will still fill in quickly. If the rate of infilling is cut in half by the jetty on the north side of the channel, the channel would still fill in within two years, and possibly much sooner.

2) Channel Scouring:

It is likely that the channel infilling takes place rapidly during a storm event, since typical tidal currents are not sufficient to carry large quantities of sediment. Therefore, it is necessary for the channel velocities to be great enough after the channel has been filled in by the storm to erode the material away. In order to assess the potential for channel scour for various channel and jetty configurations, the two-dimensional current model results were analyzed for current velocities along the channel centerline. The velocities for the peak ebb current and the peak flood currents were plotted along the proposed channel alignment in Figures 11 through 15. In addition to the current velocities, the channel depths were plotted in each figure.

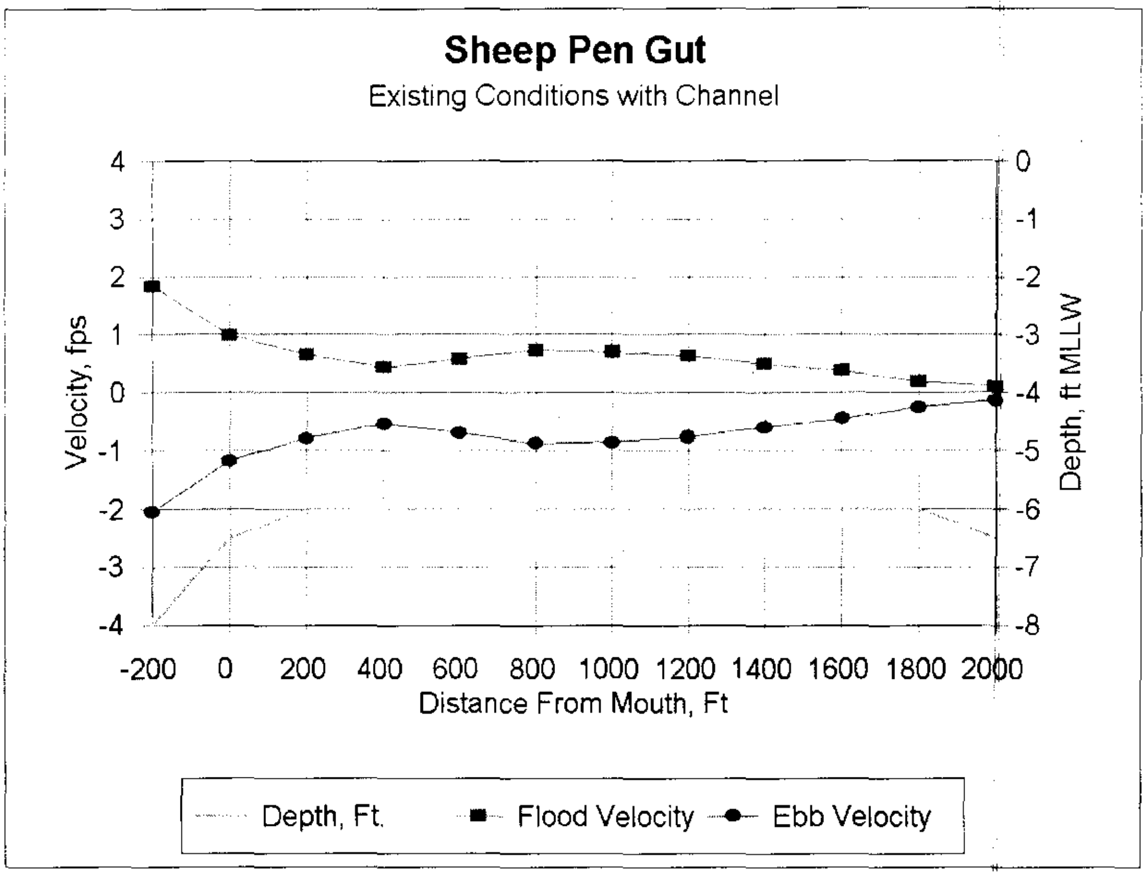
In Figure 11 the velocities along the channel alignment for the existing condition are plotted. The existing depths along the proposed channel range from –8 feet MLLW at the mouth of Sheep Pen Gut (at a distance of –200 feet from the mouth) to –2 feet at the midpoint of the channel before reaching –6 feet approximately 1900 feet from the mouth. Peak velocities range from about 2 fps at the mouth to less than 0.3 fps 400 feet from the mouth, as the flow diverges as it exits Sheep Pen Gut. The flow accelerates slightly as it passes over the shallow bar, and then slows again as it reaches deep water. As would be expected for the existing condition, the velocities are not sufficient to erode the bottom material, which would require velocities in the range of 0.8 to 1.0 fps for the fine grained material in this area.

Figure 11 – Tidal Velocities Along the Centerline of Proposed Channel
Existing Conditions



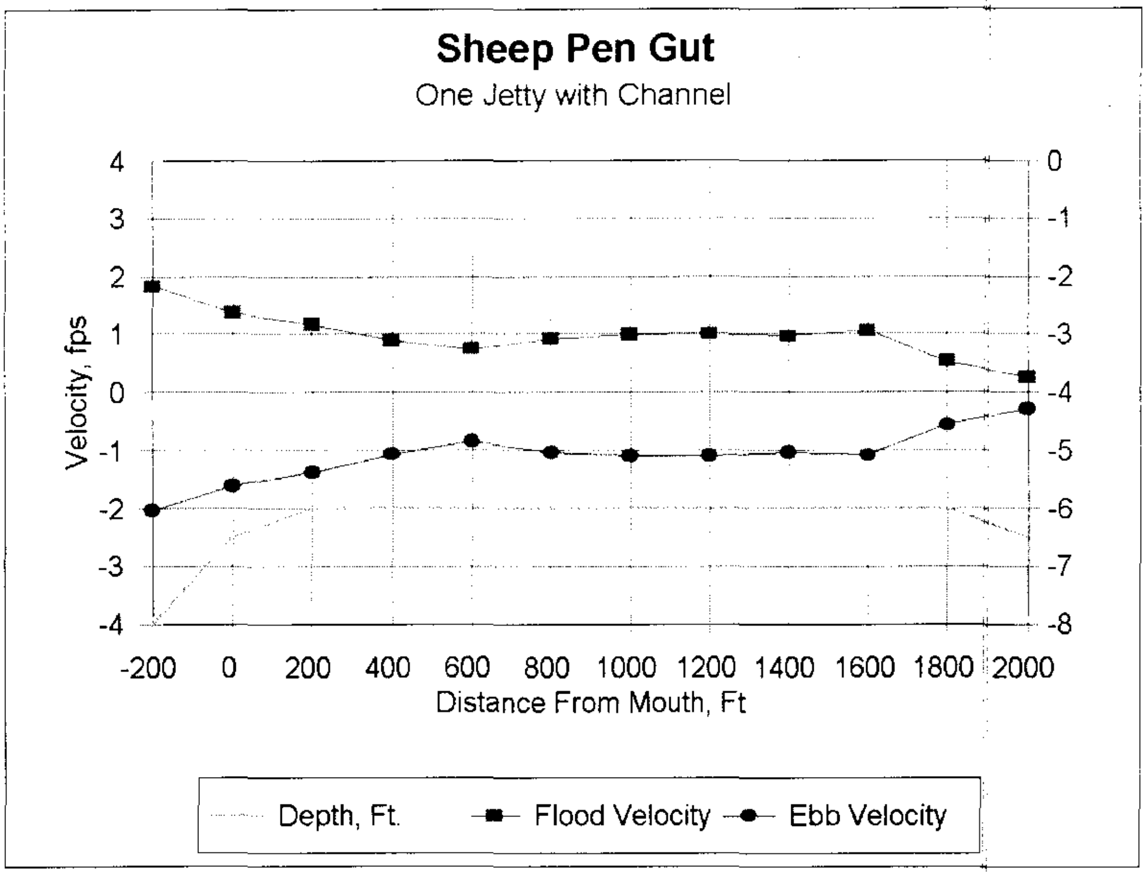
Although it is not proposed that a new channel be dredged through the bar from the mouth of Sheep Pen Gut directly to the west, this configuration would likely require less dredging, and remain open for navigation equally well as the existing, much longer channel. This condition was run with the two-dimensional model to determine if the tidal currents could maintain an open channel. The results are shown in Figure 7. It can be seen that the velocities drop below one-half fps near the mouth of the channel, before increasing in the middle of the channel as the flow across the shallow bar concentrates in the dredged channel. At the outer end of the channel the velocities drop as the flow spreads out over the deepening bar. This channel would quickly silt in at each end of the channel where the tidal velocities are below one-half fps. The channel also would not scour itself out when filled by a storm event.

Figure 12 – Dredged Channel, No Jetties



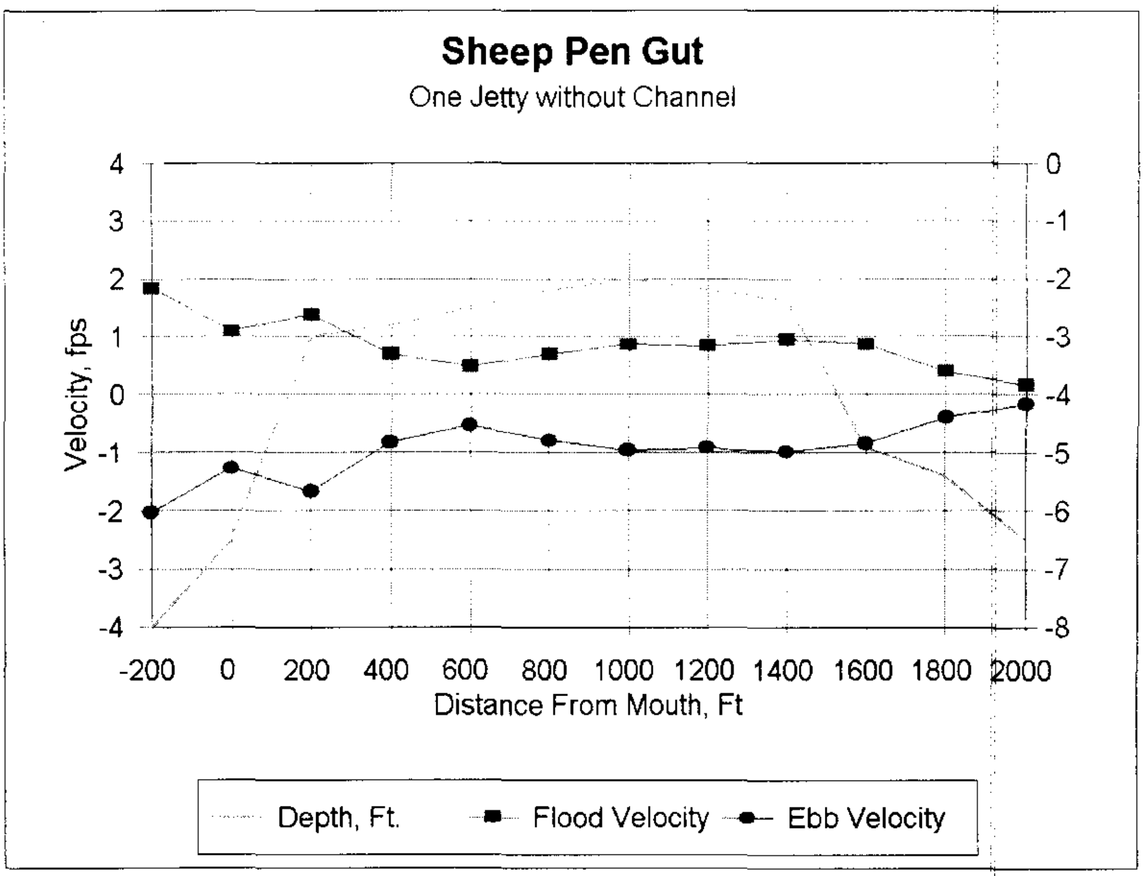
The case of one jetty on the north side of the dredged channel is shown in Figure 13. In this case the velocities have been increased between 40 and 60 percent over the dredged channel with no jetty, due to the partial confinement of the flow over the bar by the jetty. In this case the minimum velocity in the channel is about 0.8 fps, at the lower limit of scour for the bottom material in the vicinity of the channel. Typical tidal velocities are about 1.0 fps. Therefore it is likely that the dredged channel protected by a single jetty would maintain itself during normal conditions.

Figure 13 – Dredged Channel, One Jetty



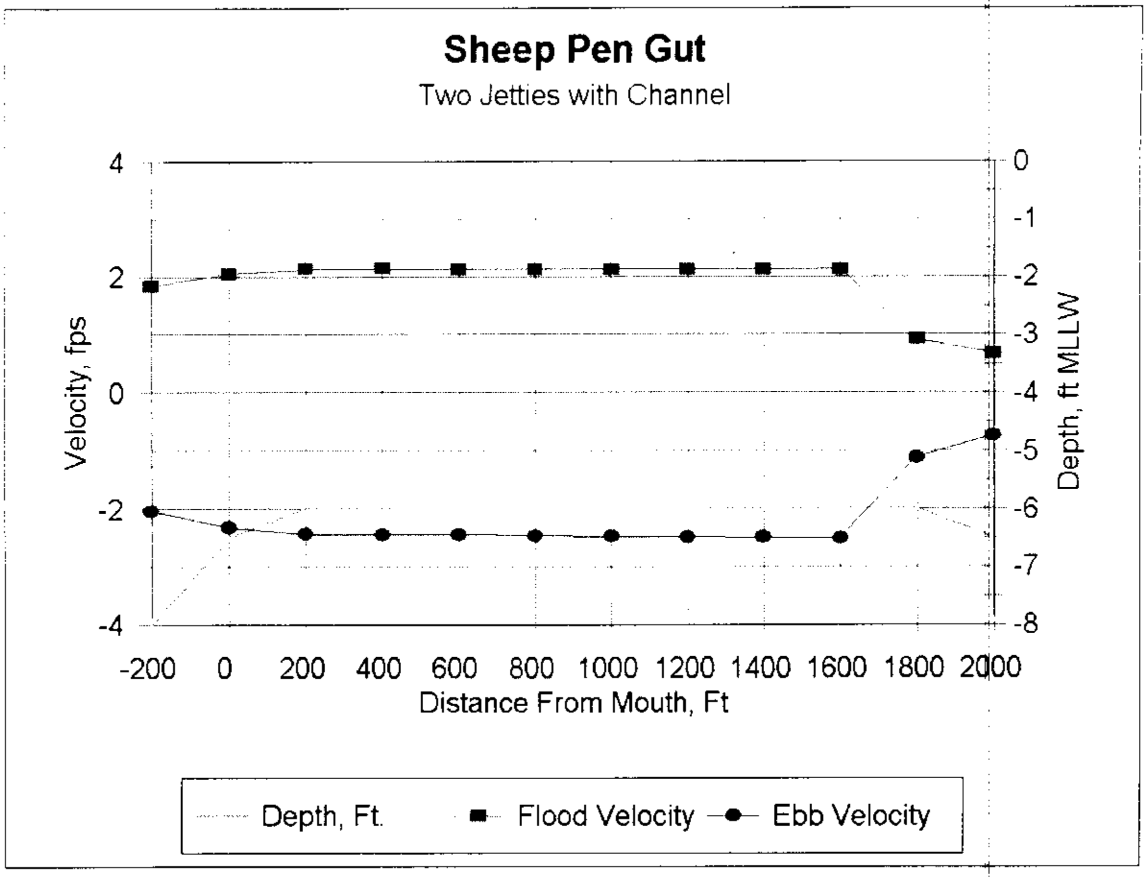
The case of one jetty with a filled in channel is shown in Figure 14. This represents the situation after the channel has been filled with sediment by a storm event. In this case the velocity drops to about 0.5 fps near the mouth, but in general remains above 0.8 fps over most of its length. Therefore, it appears that the ability of the channel with one jetty to scour itself out after a storm event is marginal. The area near the mouth with the low velocities may not scour naturally after a storm event.

Figure 14 – Filled Channel with One Jetty



As a final configuration, the case of two jetties with the dredged channel is shown in Figure 15. In this case, the velocities increase slightly after leaving the mouth of the channel because the dredged channel has somewhat less cross-sectional area than does the existing natural Sheep Pen Gut channel. The velocity remains relatively constant because the jetties prevent the spreading of the current over the surrounding bar. For the case of two jetties with a filled channel (not shown), the velocities increase even further because of the reduced cross-section of the channel and the confinement of the jetties. In this case, the channel can scour itself over its entire length.

Figure 15 – Dredged Channel, Two Jetties



In conclusion, it appears that the one jetty configuration is marginal in terms of maintaining its channel without regular maintenance dredging. Typical storm activity will deposit sediments into the channel, and the normal tidal velocities may not be sufficient to scour out the channel. It should be expected that dredging would be required on at least a two-year cycle to maintain the navigation channel. The channel would likely become filled during a major storm event, and remain filled until a dredge operation was mobilized

The two jetty configuration should be able to maintain an open channel under all conditions, requiring only limited maintenance dredging, if any. To be conservative, limited maintenance dredging should be assumed on an eight to ten year cycle. This maintenance dredging would likely require less volume than the full channel dredging currently required.

Recommended Plan

Based on the results of the numerical modeling and the bathymetry from 1998, a jetty and shoreline protection layout for the vicinity of Sheep Pen Gut is shown on Sheets 1 and 2.

The jetties consist of a 1300-foot north jetty and a 1500-foot south jetty. The jetties are placed a minimum of 200 feet apart to provide adequate room for the channel and possible enlargement of the channel due to natural scour. The dredged channel would be about 1500 feet long, requiring approximately 18,500 cubic yards of dredging.

Dredge spoils could be placed in the fillet to the north of the jetties, providing shoreline protection and creating approximately 2 acres of marsh if planted with appropriate vegetation. This material should be stable, except for winnowing of fine silt sized particles along the shoreline, because it is confined from movement by waves and currents from the north by the jetty to its south, and protected from waves and currents from the south.

South of the jetties four offshore segment breakwaters are proposed. As proposed, the breakwaters are 250 feet long with 125-foot gaps, placed approximately 100 feet from the shoreline between the gaps. The breakwaters were sized and placed to take advantage of the existing shoreline irregularities. Additional channel dredge material could be placed along the shoreline to provide a sand beach and possible additional marsh area.

GEOTECHNICAL INVESTIGATIONS AND ANALYSES

General

Geotechnical investigations were performed throughout for the Rhodes Point Section 108 Project. These investigations were performed to determine foundation conditions for potential offshore structures. Laboratory testing was performed on selected samples obtained from the investigations in order to quantitatively assess the material properties.

Rhodes Point Investigations (Sheep Pen Gut)

Between 9/24/98 and 10/07/98, nineteen (19) holes were drilled near the existing federal channel at Sheep Pen Gut, on the western coast to investigate foundation conditions for a potential realignment of the channel and potential jetty to the north of the new channel. The drilling effort also included investigation of foundation conditions for potential erosion protection structures (offshore breakwaters) south of the new channel. Drill holes were performed to depths of 26.5 feet for structure foundation holes. Channel foundation holes were drilled to depths of 11.5 feet.

The three drill holes for the erosion protection structures found layers of sand and silt generally to a depth of 16 feet, underlain by a soft lean clay layer to the bottom of the hole. The foundation conditions are thought to be suitable for placement of a structure. Undisturbed samples should be obtained for performing a settlement analysis, but most likely the structures would only need to be overbuilt, not relocated.

The eight drill holes for the potential realignment of the federal channel show mostly a sandy silt material, occasionally interspersed with clay lenses. This material is only proposed to be dredged, and dredging this material appears feasible.

The eight drill holes for the potential jetty north of the proposed channel realignment generally show a sandy silt material overlying a soft clay. The thickness of the clay layer varies from 8 feet to unknown depths continuing past the bottom of the drill hole. As with the erosion protection structures, this foundation material does not appear to be unsuitable. Undisturbed samples should be obtained for performing a settlement analysis, but most likely the structure would only need to be overbuilt, not relocated.

Since the initial phase of drilling was performed, a twin-jetty alignment has been recommended. In this alignment, the north jetty has a slightly different alignment. Additional drilling has been recently (October 2001) performed. It shows a soft foundation area near the end of the alignment of the jetties. Testing of the undisturbed samples will be performed to determine material properties for foundation design. Results will be evaluated for potential impacts on the current design.

Geotechnical Design Requirements

For stone structures that may be used on this project, several features will be required. A high strength geotextile will be required under any stone structure that is constructed. The geotextile will minimize local shear failures and excessive differential settlement by distributing the loads from the structures more uniformly and by adding some tensile strength to the foundation. A minimum of 6" overbuild will be required for any breakwater or jetties as well, depending on the results from the next set of subsurface investigations. This is to account for potential settlement and other construction uncertainties. If the next investigations show the potential for more than 6" of settlement, then a larger overbuild may be required.

Future Geotechnical Analyses Required

In the final design phase, additional testing and analyses will be required. Due to the shift in the alignment of the Rhodes Point jetties, and the addition of one jetty, additional testing will be required for foundation analysis. Performing unconfined compressive strength tests and consolidation tests on undisturbed samples will be necessary to determine material strength values and to estimate settlement. Necessary foundation design, including geotextile design, will,be performed. Specifications will be written for appropriate areas of work, such as stonework and geotextile.

Cost Engineering

1. General. The following methodology was used in the preparation of the cost estimate for **Rhodes Point Feasibility Study, Somerset County, Maryland.**

a. The estimate is in accordance with the guidance contained in ER 1110-2-1302, Civil Works Cost Engineering.

b. The estimate is presented in the standard Work Breakdown Structure.

c. The price level for the estimate is 1 October 2001.

d. Construction costs developed by Cost Engineering Branch are based on input/quantities from Design Branch, Engineering Division. Unit costs were developed using the M-CACES for Windows estimating software containing the 2001 Unit Price Book and from historic data from similar projects. Dredging costs were developed using the Corp of Engineers Dredge Estimating Program. The estimate is documented with notes to explain the assumed construction methods, crews, productivity, and other specific information.

e. Labor costs are based on the NAT01 database contained in the M-CACES program.

f. Operations Division provided costs for Construction Management.

g. Engineering and Design costs were provided by Engineering Division.

h. LERRD costs were provided by Real Estate Division.

2. Estimate Scope. The estimate reflects the cost for constructing a 1500-foot jetty and a 1300-foot jetty. The jetties are placed 200 feet apart to provide adequate room for the new channel alignment. The channel will be 1500 foot long and will require approximately 18,470 cubic yard of dredging. Dredged material will be placed in the fillet to the north of the jetties and planted with appropriate vegetation. South of the jetties four offshore segment breakwaters are proposed. The breakwaters are 250 feet long with 125-foot gaps, placed 100 feet from shoreline. The area behind the breakwaters may be filled and planted.

3. Contingency. Contingency amounts for the construction cost items are based on uncertainties within individual project elements. Considering these uncertainties, contingencies were assigned too individual cost items or groups of related cost items to protect against the risk of potential cost increases. The following is a list by element of the uncertainties that were identified and the corresponding contingency percentage.

a. Planning, Engineering, and Design - 10%.
The uncertainty associated with the planning, engineering and design costs are low to moderate. However, design changes could be triggered by a variety of future conditions, including local sponsor requested changes due to unanticipated public pressure, new Federal or local regulations, and site changes due to storm damage prior to construction. For now, a contingency of 10 percent is considered reasonable.

b. Construction Management -- 10%.
The uncertainty associated with the construction management cost is moderate. The base cost for construction management is based on 6% of the construction cost. Since construction is a future task, and plans and specifications are not completed, changes in the proposed administration of the construction contracts may occur. For now, a contingency of 20 percent is considered reasonable and inline with the contingency assigned to the construction items.

c. Channels and Canals Cost Items -- 15%. The uncertainties associated with the quantities are relatively moderate since they were based on partially completed designs. For now, a contingency of 15 percent is considered reasonable.

TOTAL PROJECT COST SUMMARY

THIS ESTIMATE IS BASED ON THE DRAFT FEASIBILITY STUDY, DATED 31 DEC 01

PROJECT: RHODES POINT FEASIBILITY STUDY — PREPARED BY : CENAB-EN-C OLIVER LEIMBACH

LOCATION : SMITH ISLAND, MARYLAND — P.O.C.: FRANK C. BENVENGA, ACT CHIEF, COST ENGINEERING BRANCH

ACCOUNT NUMBER	ITEM DESCRIPTION	CURRENT MCACES ESTIMATE 18 Dec 01 EFFECTIVE PRICING LEVEL 1OCT 01				AUTHORIZ./BUDGET YEAR * EFFECTIVE PRICING LEVEL:			FULLY FUNDED ESTIMATE		
		COST ($K)	CNTG ($K)	CNTG %	TOTAL ($K)	COST ($K)	CNTG ($K)	TOTAL ($K)	COST ($K)	CNTG ($K)	FULL ($K)
09	CHANNELS AND CANALS	$2,387	$362	15.2%	$2,749	$2,387	$362	$2,749	$2,387	$362	$2,749
	TOTAL CONSTRUCTION COST	$2,387	$362	15.2%	$2,749	$2,387	$362	$2,749	$2,387	$362	$2,749
01	LANDS AND DAMAGES	$6	$1	15.0%	$0	$6	$1	$6	$6	$1	$6
30	PLANNING, ENGINEERING AND DESIGN	$221	$22	10.0%	$243	$221	$22	$243	$221	$22	$243
31	CONSTRUCTION MANAGEMENT	$150	$15	10.0%	$165	$150	$15	$165	$150	$15	$165
	TOTAL PROJECT COSTS	$2,763	$400	$1	$3,157	$2,763	$400	$3,164	$2,763	$400	$3,164

* May be authorized under the Continuing Authorities Program

DISTRICT APPROVED:

________________ ACT CHIEF, COST ENGINEERING BRANCH

________________ CHIEF, REAL ESTATE DIVISION

________________ CHIEF, PLANNING DIVISION

________________ CHIEF, ENGINEERING DIVISION

________________ CHIEF, CONSTRUCTION DIVISION

________________ CHIEF, OPERATIONS DIVISION

________________ CHIEF, PROGRAMS MANAGEMENT BRANCH

________________ PROJECT MANAGER

________________ DDE (PM)

DIVISION APPROVED:

CHIEF, COST ENGINEERING ________________

DIRECTOR REALESTATE ________________

CHIEF, PROGRAMS MANAGEMENT ________________

DIRECTOR OF PPMD ________________

APPROVED DATE: ________________

Rhodes Point
Rhodes Point Feasibility Study
Somerset County, Maryland

Designed By: US Army Corps of Engineers
Estimated By: Baltimore District

Prepared By: CENAB-EN-C
Oliver Leimbach

Preparation Date: 12/19/01
Effective Date of Pricing: 10/01/01

Sales Tax: 5.0%

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

		QUANTY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
01	Lands and Damages	1.00	EA	5,510	827	0	6,337	6336.50
09	Channels and Canals	1.00	EA	2,386,812	362,283	0	2,749,095	2749095
30	Planning, Engineering and Design	1.00	EA	221,000	22,100	0	243,100	243100
31	Construction Management	1.00	EA	150,000	15,000	0	165,000	165000
TOTAL	Rhodes Point	1.00	EA	2,763,322	400,210	0	3,163,531	3163531

	QUANTY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
01 Lands and Damages							
01_02 Acquisitions	1.00	EA	1,860	279	0	2,139	2139.00
01_05 Appraisals	1.00	EA	1,500	225	0	1,725	1725.00
01_18 Real Estate Payments	1.00	EA	2,150	323	0	2,473	2472.50
TOTAL Lands and Damages	1.00	EA	5,510	827	0	6,337	6336.50
09 Channels and Canals							
09_01 Channels	1.00	EA	2,386,812	362,283	0	2,749,095	2749095
TOTAL Channels and Canals	1.00	EA	2,386,812	362,283	0	2,749,095	2749095
30 Planning, Engineering and Design							
30_ 5 Contracting division	1.00	EA	10,000	1,000	0	11,000	11000
30_10 Engineering Division	1.00	EA	150,000	15,000	0	165,000	165000
30_15 Operations Division	1.00	EA	11,000	1,100	0	12,100	12100
30_20 Planning Division	1.00	EA	15,000	1,500	0	16,500	16500
30_25 Real Estate Division	1.00	EA	5,000	500	0	5,500	5500.00
30_30 PPMD	1.00	EA	15,000	1,500	0	16,500	16500
30_35 Value Engineering Study	1.00	EA	15,000	1,500	0	16,500	16500
TOTAL Planning, Engineering and Design	1.00	EA	221,000	22,100	0	243,100	243100
31 Construction Management	1.00	EA	150,000	15,000	0	165,000	165000
TOTAL Rhodes Point	1.00	EA	2,763,322	400,210	0	3,163,531	3163531

	QUANTY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
01 Lands and Damages							
01_02 Acquisitions							
01_02.02 By Local Sponsor	1.00	EA	1,410	212	0	1,622	1621.50
01_02.04 Review of Local Sponsor	1.00	EA	450	68	0	518	517.50
TOTAL Acquisitions	1.00	EA	1,860	279	0	2,139	2139.00
01_05 Appraisals							
01_05.03 By Local Sponsor	1.00	EA	1,000	150	0	1,150	1150.00
01_05.05 Review of Local Sponsor	1.00	EA	500	75	0	575	575.00
TOTAL Appraisals	1.00	EA	1,500	225	0	1,725	1725.00
01_18 Real Estate Payments							
01_18.01 Land Payments			2,150	323	0	2,473	
TOTAL Real Estate Payments	1.00	EA	2,150	323	0	2,473	2472.50
TOTAL Lands and Damages	1.00	EA	5,510	827	0	6,337	6336.50
09 Channels and Canals							
09_01 Channels							
09_01.01 Mob, Demob & Preparatory Work	1.00	EA	262,067	39,310	0	301,377	301377
09_01.16 Pipeline Dredging	18470	CY	57,442	8,616	0	66,058	3.58
09_01.20 Disposal Areas	2.00	ACR	20,000	4,000	0	24,000	12000
09_01.30 Bank Stabilize, Dikes & Jetties	1.00	EA	2,047,303	310,357	0	2,357,660	2357660
TOTAL Channels	1.00	EA	2,386,812	362,283	0	2,749,095	2749095
TOTAL Channels and Canals	1.00	EA	2,386,812	362,283	0	2,749,095	2749095
30 Planning, Engineering and Design							
30_ 5 Contracting division	1.00	EA	10,000	1,000	0	11,000	11000
30_10 Engineering Division	1.00	EA	150,000	15,000	0	165,000	165000
30_15 Operations Division	1.00	EA	11,000	1,100	0	12,100	12100
30_20 Planning Division	1.00	EA	15,000	1,500	0	16,500	16500
30_25 Real Estate Division	1.00	EA	5,000	500	0	5,500	5500.00
30_30 PPMD	1.00	EA	15,000	1,500	0	16,500	16500

	QUANTY	UOM	CONTRACT	CONTINGN	ESCALATN	TOTAL COST	UNIT
30_35 Value Engineering Study	1.00	EA	15,000	1,500	0	16,500	16500
TOTAL Planning, Engineering and Design	1.00	EA	221,000	22,100	0	243,100	243100
31 Construction Management	1.00	EA	150,000	15,000	0	165,000	165000
TOTAL Rhodes Point	1.00	EA	2,763,322	400,210	0	3,163,531	3163531

01_02. Acquisitions	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
01_02.02. By Local Sponsor							
USR < > Survey and Legal Descriptions		0.00	0.00	0.00	0.00	500.00	500.00
	1.00 EA	0	0	0	0	500	500
USR < > Title Evidence		0.00	0.00	0.00	0.00	410.00	410.00
	1.00 EA	0	0	0	0	410	410
USR < > Negotiations		0.00	0.00	0.00	0.00	500.00	500.00
	1.00 EA	0	0	0	0	500	500
TOTAL By Local Sponsor		0	0	0	0	1,410	1,410
01_02.04. Review of Local Sponsor							
USR < > Survey and Legal Descriptions		0.00	0.00	0.00	0.00	150.00	150.00
	1.00 EA	0	0	0	0	150	150
USR < > Title Evidence		0.00	0.00	0.00	0.00	150.00	150.00
	1.00 EA	0	0	0	0	150	150
USR < > Negotiations		0.00	0.00	0.00	0.00	150.00	150.00
	1.00 EA	0	0	0	0	150	150
TOTAL Review of Local Sponsor		0	0	0	0	450	450
TOTAL Acquisitions		0	0	0	0	1,860	1,860

01_05. Appraisals	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
01_05.03. By Local Sponsor							
USR < > Appraisals		0.00	0.00	0.00	0.00	1000.00	1000.00
	1.00 EA	0	0	0	0	1,000	1,000
TOTAL By Local Sponsor		0	0	0	0	1,000	1,000
01_05.05. Review of Local Sponsor							
USR < > Appraisals		0.00	0.00	0.00	0.00	500.00	500.00
	1.00 EA	0	0	0	0	500	500
TOTAL Review of Local Sponsor		0	0	0	0	500	500
TOTAL Appraisals		0	0	0	0	1,500	1,500

01_18. Real Estate Payments	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
01_18.01. Land Payments							
01_18.01.10. By Local Sponsor							
USR < > Land Payments		0.00	0.00	0.00	0.00	2000.00	2000.00
	1.00 EA	0	0	0	0	2,000	2,000
TOTAL By Local Sponsor		0	0	0	0	2,000	2,000
01_18.01.20. Review of Local Sponsor							
USR < > Land Payments		0.00	0.00	0.00	0.00	150.00	150.00
	1.00 EA	0	0	0	0	150	150
TOTAL Review of Local Sponsor		0	0	0	0	150	150
TOTAL Land Payments		0	0	0	0	2,150	2,150
TOTAL Real Estate Payments		0	0	0	0	2,150	2,150
TOTAL Lands and Damages		0	0	0	0	5,510	5,510

09_01. Channels		QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
09_01.01. Mob, Demob & Preparatory Work								
USR <	> Mob and Demob of Dredge Plant		0.00	0.00	0.00	0.00	262067	262067.00
		1.00 EA	0	0	0	0	262,067	262,067
	TOTAL Mob, Demob & Preparatory Work		0	0	0	0	262,067	262,067
09_01.16. Pipeline Dredging								
USR AB <	> Pipeline Dredging		0.00	0.00	0.00	0.00	3.11	3.11
		18470 CY	0	0	0	0	57,442	57,442
	TOTAL Pipeline Dredging		0	0	0	0	57,442	57,442
09_01.20. Disposal Areas								
09_01.20. 5. Wetland Planting								
USR AB <	> Wetland Planting		0.00	0.00	0.00	0.00	10000.00	10000.00
		2.00 AC	0	0	0	0	20,000	20,000
	TOTAL Wetland Planting		0	0	0	0	20,000	20,000
	TOTAL Disposal Areas		0	0	0	0	20,000	20,000
09_01.30. Bank Stabilize, Dikes & Jetties								
09_01.30. 5. Jetties								
09_01.30. 5_ 5. Armor Stone (North) (USER)								
L USR AA <	> Light load armor Stone		0.11	3.34	5.82	0.00	0.00	9.15
		5150.00 TON	576	17,180	29,966	0	0	47,147
L USR AA <	> Hauling Armor Stone		0.14	4.15	3.99	25.20	0.00	33.34
		5150.00 TON	718	21,398	20,530	129,780	0	171,708
USR AA <	> Armor Stone Placement		0.11	3.61	3.26	0.00	0.00	6.86
		5150.00 TON	576	18,580	16,771	0	0	35,351
USR AA <	> Move stone on the Jetty to the		0.08	2.85	5.36	0.00	0.00	8.21
	placement equipment.	5150.00 TON	432	14,684	27,585	0	0	42,269
L USR AA <	> Unload Light loaded Barge on to		0.11	3.34	5.82	0.00	0.00	9.15
	structure	5150.00 TON	576	17,180	29,966	0	0	47,147

09_01. Channels		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
	TOTAL Armor Stone (North)			2,879	89,022	124,820	129,780	0	343,621
09_01.30. 5_ 10. Base Stone (North) (USER)									
L USR AA <	> Core Stone Placement			0.06	1.84	1.66	0.00	0.00	3.51
		1123.00	TON	64	2,069	1,868	0	0	3,937
L USR AA <	> Hauling Core Stone			0.14	4.15	3.99	18.90	0.00	27.04
		1123.00	TON	157	4,666	4,477	21,225	0	30,367
L USR AA <	> Light load Barge			0.11	3.41	5.94	0.00	0.00	9.35
		1123.00	TON	128	3,827	6,674	0	0	10,501
USR AA <	> Move stone on the Jetty to the			0.04	1.46	2.74	0.00	0.00	4.19
	placement equipment	1123.00	TON	48	1,635	3,072	0	0	4,707
L USR AA <	> Unload Light loaded Barge on to			0.10	2.84	4.95	0.00	0.00	7.79
	structure	1123.00	TON	107	3,189	5,562	0	0	8,751
	TOTAL Base Stone (North)			504	15,386	21,653	21,225	0	58,263
09_01.30. 5_ 15. Geo-Tech Fabric (North) (USER)									
L USR AA <02535 1016	> Geotextile Fabric			0.01	0.22	0.15	4.03	0.00	4.40
		4910.00	SY	37	1,088	732	19,797	0	21,617
	TOTAL Geo-Tech Fabric (North)			37	1,088	732	19,797	0	21,617
09_01.30. 5_ 20. Concrete Block (North) (USER)									
RSM AA <03326 0200	> Concrete ready mix, regular			0.00	0.00	0.00	67.46	0.00	67.46
	weight, 3500 psi	290.00	CY	0	0	0	19,564	0	19,564
RSM AA <03217 0500	> Reinforcing in place, footings,			15.24	671.09	0.00	538.65	0.00	1209.74
	#4 to #7	11.60	TON	177	7,785	0	6,248	0	14,033
MIL AA <03162 0150	> Forms in place, grade beam, 4			0.08	2.74	0.00	0.53	0.00	3.26
	use, plywood	2900.00	SF	230	7,946	0	1,523	0	9,468
L USR AA <	> Light load Concrete Blocks			0.14	4.11	7.17	0.00	0.00	11.29
		217.99	EA	30	896	1,564	0	0	2,460
L USR AA <	> Hauling Concrete Blocks			0.45	13.41	12.87	17.06	0.00	43.34
		217.99	EA	98	2,924	2,805	3,720	0	9,449
USR AA <	> Concrete Block Placement			0.11	3.55	3.21	0.00	0.00	6.76
		217.99	EA	24	775	699	0	0	1,474

09_01. Channels		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR AA <	> Move blocks on the Jetty to the			0.08	2.81	5.28	0.00	0.00	8.08
	placement equipment.	217.99	EA	18	612	1,150	0	0	1,762
L USR AA <	> Unload Light loaded Barge on to			0.10	2.84	4.95	0.00	0.00	7.79
	structure	217.99	EA	21	619	1,080	0	0	1,699
	TOTAL Concrete Block (North)			598	21,556	7,298	31,054	0	59,909
09_01.30. 5_ 25. Bedding Stone (North) (USER)									
L USR AA <	> Core Stone Placement			0.06	1.84	1.66	0.00	0.00	3.51
		2261.00	TON	129	4,166	3,760	0	0	7,926
L USR AA <	> Hauling Core Stone			0.14	4.15	3.99	11.55	0.00	19.69
		2261.00	TON	315	9,394	9,013	26,115	0	44,522
L USR AA <	> Light load Barge			0.11	3.41	5.94	0.00	0.00	9.35
		2261.00	TON	258	7,704	13,438	0	0	21,142
USR AA <	> Move stone on the Jetty to the			0.04	1.46	2.74	0.00	0.00	4.19
	placement equipment	2261.00	TON	97	3,292	6,185	0	0	9,478
L USR AA <	> Unload Light loaded Barge on to			0.10	2.84	4.95	0.00	0.00	7.79
	structure	2261.00	TON	215	6,420	11,199	0	0	17,619
	TOTAL Bedding Stone (North)			1,015	30,977	43,595	26,115	0	100,687
09_01.30. 5_30 . Armor Stone (South) (USER)									
L USR AA <	> Light load armor Stone			0.11	3.34	5.82	0.00	0.00	9.15
		5389.00	TON	603	17,978	31,357	0	0	49,335
L USR AA <	> Hauling Armor Stone			0.14	4.15	3.99	25.20	0.00	33.34
		5389.00	TON	752	22,391	21,483	135,803	0	179,677
USR AA <	> Armor Stone Placement			0.11	3.61	3.26	0.00	0.00	6.86
		5389.00	TON	603	19,442	17,549	0	0	36,991
USR AA <	> Move stone on the Jetty to the			0.08	2.85	5.36	0.00	0.00	8.21
	placement equipment.	5389.00	TON	452	15,365	28,866	0	0	44,231
L USR AA <	> Unload Light loaded Barge on to			0.11	3.34	5.82	0.00	0.00	9.15
	structure	5389.00	TON	603	17,978	31,357	0	0	49,335
	TOTAL Armor Stone (South)			3,013	93,153	130,612	135,803	0	359,568

09_01. Channels		QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
09_01.30. 5_35 . Base Stone (South) (USER)								
L USR AA <	> Core Stone Placement		0.06	1.84	1.66	0.00	0.00	3.51
		1138.00 TON	65	2,097	1,893	0	0	3,989
L USR AA <	> Hauling Core Stone		0.14	4.15	3.99	18.90	0.00	27.04
		1138.00 TON	159	4,728	4,537	21,508	0	30,773
L USR AA <	> Light load Barge		0.11	3.41	5.94	0.00	0.00	9.35
		1138.00 TON	130	3,878	6,764	0	0	10,641
USR AA <	> Move stone on the Jetty to the placement equipment	1138.00 TON	0.04 49	1.46 1,657	2.74 3,113	0.00 0	0.00 0	4.19 4,770
L USR AA <	> Unload Light loaded Barge on to structure	1138.00 TON	0.10 108	2.84 3,231	4.95 5,636	0.00 0	0.00 0	7.79 8,868
	TOTAL Base Stone (South)		511	15,591	21,942	21,508	0	59,042
09_01.30. 5_40 . Geo-Tech Fabric (South) (USER)								
L USR AA <02535 1016 >	Geotextile Fabric		0.01	0.22	0.15	4.03	0.00	4.40
		5290.00 SY	40	1,172	789	21,329	0	23,290
	TOTAL Geo-Tech Fabric (South)		40	1,172	789	21,329	0	23,290
09_01.30. 5_45 . Concrete Block (South) (USER)								
RSM AA <03326 0200 >	Concrete ready mix, regular weight, 3500 psi	310.00 CY	0.00 0	0.00 0	0.00 0	67.46 20,913	0.00 0	67.46 20,913
RSM AA <03217 0500 >	Reinforcing in place, footings, #4 to #7	12.40 TON	15.24 189	671.09 8,322	0.00 0	538.65 6,679	0.00 0	1209.74 15,001
MIL AA <03162 0150 >	Forms in place, grade beam, 4 use, plywood	3100.00 SF	0.08 246	2.74 8,494	0.00 0	0.53 1,628	0.00 0	3.26 10,121
L USR AA <	> Light load Concrete Blocks		0.14	4.11	7.17	0.00	0.00	11.29
		233.03 EA	32	958	1,672	0	0	2,630
L USR AA <	> Hauling Concrete Blocks		0.45	13.41	12.87	17.06	0.00	43.34
		233.03 EA	105	3,126	2,999	3,976	0	10,101
USR AA <	> Concrete Block Placement		0.11	3.55	3.21	0.00	0.00	6.76
		233.03 EA	26	828	747	0	0	1,575
USR AA <	> Move blocks on the Jetty to the placement equipment.	233.03 EA	0.08 19	2.81 654	5.28 1,229	0.00 0	0.00 0	8.08 1,884

09_01. Channels		QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
L USR AA <	> Unload Light loaded Barge on to structure	233.03 EA	0.10 22	2.84 662	4.95 1,154	0.00 0	0.00 0	7.79 1,816
	TOTAL Concrete Block (South)		639	23,043	7,801	33,196	0	64,041
09_01.30. 5_50 . Bedding Stone (South) (USER)								
L USR AA <	> Core Stone Placement	2432.00 TON	0.06 139	1.84 4,481	1.66 4,045	0.00 0	0.00 0	3.51 8,526
L USR AA <	> Hauling Core Stone	2432.00 TON	0.14 339	4.15 10,105	3.99 9,695	11.55 28,090	0.00 0	19.69 47,889
L USR AA <	> Light load Barge	2432.00 TON	0.11 278	3.41 8,287	5.94 14,454	0.00 0	0.00 0	9.35 22,741
USR AA <	> Move stone on the Jetty to the placement equipment	2432.00 TON	0.04 104	1.46 3,541	2.74 6,653	0.00 0	0.00 0	4.19 10,194
L USR AA <	> Unload Light loaded Barge on to structure	2432.00 TON	0.10 232	2.84 6,906	4.95 12,045	0.00 0	0.00 0	7.79 18,951
	TOTAL Bedding Stone (South)		1,092	33,320	46,893	28,090	0	108,302
	TOTAL Jetties		10,328	324,307	406,135	467,897	0	1,198,339
09_01.30.10. Mob and Demob								
09_01.30.10_ 5. Stone Loading Crew (UOEHT4)								
MIL AA <	> Equip. Operators, Medium	24.04 HR	1.00 24	35.24 847	0.00 0	0.00 0	0.00 0	35.24 847
MIL AA <	> Equip. Operators, Oilers	24.04 HR	1.00 24	29.93 719	0.00 0	0.00 0	0.00 0	29.93 719
MIL AA <	> Laborers, (Semi-Skilled)	48.08 HR	1.00 48	27.04 1,300	0.00 0	0.00 0	0.00 0	27.04 1,300
GEN AA <	> DREDGE BARGE, 100 - 400 TONS (90.7 - 362.9MT)	24.04 HR	0.00 0	0.00 0	14.84 357	0.00 0	0.00 0	14.84 357
GEN AA <	> CRANE, FLOATING, 150TON, 290HP (136MT, 216KW), 250'(76.2M) BOOM	24.04 HR	0.00 0	0.00 0	193.18 4,644	0.00 0	0.00 0	193.18 4,644
	TOTAL Stone Loading Crew		96	2,867	5,000	0	0	7,867

09_01. Channels		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
09_01.30.10_ 10. Stone Placement Crew (CODET)									
MIL AA <	> Equip. Operators, Crane/Shovel			1.00	37.44	0.00	0.00	0.00	37.44
		24.04	HR	24	900	0	0	0	900
MIL AA <	> Laborers, (Semi-Skilled)			1.00	27.04	0.00	0.00	0.00	27.04
		24.04	HR	24	650	0	0	0	650
MIL AA <	> HYD EXCV, CRAWLER, 70,000LBS,			0.00	0.00	58.21	0.00	0.00	58.21
	(31,751KG) 2.00CY, (1.5M3) BKT	24.04	HR	0	0	1,399	0	0	1,399
	TOTAL Stone Placement Crew			48	1,550	1,399	0	0	2,949
09_01.30.10_ 15. Stone moving on structure (CODFG)									
MIL AA <	> Laborers, (Semi-Skilled)			1.00	27.04	0.00	0.00	0.00	27.04
		12.02	HR	12	325	0	0	0	325
MIL AA <	> Equip. Operators, Crane/Shovel			1.00	37.44	0.00	0.00	0.00	37.44
		24.04	HR	24	900	0	0	0	900
MIL AA <	> LOADER, F/E, WHEEL, 7.00CY			0.00	0.00	95.75	0.00	0.00	95.75
	(5.4M3), 4WD	24.04	HR	0	0	2,302	0	0	2,302
	TOTAL Stone moving on structure			36	1,225	2,302	0	0	3,527
09_01.30.10_ 20. Land based equipment transporati (UTDHA)									
MIL AA <	> Laborers, (Semi-Skilled)			1.00	28.04	0.00	0.00	0.00	28.04
		48.08	HR	48	1,348	0	0	0	1,348
MIL AA <	> Laborers, (Semi-Skilled)			1.00	27.04	0.00	0.00	0.00	27.04
		192.31	HR	192	5,201	0	0	0	5,201
MIL AA <	> Truck Drivers, Heavy			1.00	27.99	0.00	0.00	0.00	27.99
		48.08	HR	48	1,346	0	0	0	1,346
GEN AA <	> TRUCK, HWY 55,000 (24,948KG)GVW			0.00	0.00	32.99	0.00	0.00	32.99
	6X4, 3 AXLE, (ADD ACCESSORIES)	48.08	HR	0	0	1,586	0	0	1,586
GEN AA <	> TRAILER, LOWBOY, 75T (68.0MT)			0.00	0.00	9.87	0.00	0.00	9.87
	3 AXLE (ADD TOWING TRUCK)	48.08	HR	0	0	475	0	0	475
	TOTAL Land based equipment transporati			288	7,895	2,061	0	0	9,955
	TOTAL Mob and Demob			469	13,537	10,762	0	0	24,299

09_01. Channels	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
09_01.30.15. Breakwaters							
09_01.30.15_ 5. Armor Stone							
L USR AA < > Light load armor Stone		0.11	3.34	5.82	0.00	0.00	9.15
	4842.00 TON	542	16,153	28,174	0	0	44,327
L USR AA < > Hauling Armor Stone		0.14	4.15	3.99	25.20	0.00	33.34
	4842.00 TON	675	20,118	19,303	122,018	0	161,439
USR AA < > Armor Stone Placement		0.11	3.61	3.26	0.00	0.00	6.86
	4842.00 TON	542	17,468	15,768	0	0	33,236
USR AA < > Move stone on the Jetty to the		0.08	2.85	5.36	0.00	0.00	8.21
placement equipment.	4842.00 TON	406	13,806	25,936	0	0	39,741
L USR AA < > Unload Light loaded Barge on to		0.11	3.34	5.82	0.00	0.00	9.15
structure	4842.00 TON	542	16,153	28,174	0	0	44,327
TOTAL Armor Stone		2,707	83,698	117,355	122,018	0	323,071
09_01.30.15_ 10. Base Stone							
L USR AA < > Core Stone Placement		0.06	1.84	1.66	0.00	0.00	3.51
	811.00 TON	46	1,494	1,349	0	0	2,843
L USR AA < > Hauling Core Stone		0.14	4.15	3.99	18.90	0.00	27.04
	811.00 TON	113	3,370	3,233	15,328	0	21,931
L USR AA < > Light load Barge		0.11	3.41	5.94	0.00	0.00	9.35
	811.00 TON	93	2,763	4,820	0	0	7,583
USR AA < > Move stone on the Jetty to the		0.04	1.46	2.74	0.00	0.00	4.19
placement equipment	811.00 TON	35	1,181	2,219	0	0	3,400
L USR AA < > Unload Light loaded Barge on to		0.10	2.84	4.95	0.00	0.00	7.79
structure	811.00 TON	77	2,303	4,017	0	0	6,320
TOTAL Base Stone		364	11,111	15,637	15,328	0	42,076
09_01.30.15_ 15. Geo-Tech Fabric (USER)							
L USR AA <02535 1016 > Geotextile Fabric		0.01	0.22	0.15	4.03	0.00	4.40
	3330.00 SY	25	738	497	13,427	0	14,661
TOTAL Geo-Tech Fabric		25	738	497	13,427	0	14,661

09_01. Channels	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
TOTAL Breakwaters		3,096	95,547	133,488	150,773	0	379,808
TOTAL Bank Stabilize, Dikes & Jetties		13,893	433,391	550,386	618,670	0	1,602,446
TOTAL Channels		13,893	433,391	550,386	618,670	339,509	1,941,955
TOTAL Channels and Canals		13,893	433,391	550,386	618,670	339,509	1,941,955

30_ 5. Contracting division	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR < > Contracting Division		0.00	10000.00	0.00	0.00	0.00	10000.00
	1.00 EA	0	10,000	0	0	0	10,000
TOTAL Contracting division		0	10,000	0	0	0	10,000

30_10. Engineering Division			QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR	<	> Technical Management		0.00	10000.00	0.00	0.00	0.00	10000.00
			1.00 EA	0	10,000	0	0	0	10,000
USR	<	> Hydrology and Hydraulics		0.00	20000.00	0.00	0.00	0.00	20000.00
			1.00 EA	0	20,000	0	0	0	20,000
USR	<	> Geotechnical Analyses-Drilling &		0.00	20000.00	0.00	0.00	0.00	20000.00
		Testing	1.00 EA	0	20,000	0	0	0	20,000
USR	<	> Dams and Investigations		0.00	15000.00	0.00	0.00	0.00	15000.00
			1.00 EA	0	15,000	0	0	0	15,000
USR	<	> Civil Design		0.00	35000.00	0.00	0.00	0.00	35000.00
			1.00 EA	0	35,000	0	0	0	35,000
USR	<	> Surveys and Mapping		0.00	30000.00	0.00	0.00	0.00	30000.00
			1.00 EA	0	30,000	0	0	0	30,000
USR	<	> Technical Support (Specs)		0.00	10000.00	0.00	0.00	0.00	10000.00
			1.00 EA	0	10,000	0	0	0	10,000
USR	<	> Cost Engineering		0.00	10000.00	0.00	0.00	0.00	10000.00
			1.00 EA	0	10,000	0	0	0	10,000
		TOTAL Engineering Division		0	150,000	0	0	0	150,000

30_15. Operations Division	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR < > Technical Management		0.00	5000.00	0.00	0.00	0.00	5000.00
	1.00 EA	0	5,000	0	0	0	5,000
USR < > BCO Review		0.00	6000.00	0.00	0.00	0.00	6000.00
	1.00 EA	0	6,000	0	0	0	6,000
TOTAL Operations Division		0	11,000	0	0	0	11,000

30_20. Planning Division				QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
	USR	<	> Technical Management		0.00	6000.00	0.00	0.00	0.00	6000.00
				1.00 EA	0	6,000	0	0	0	6,000
	USR	<	> Economics		0.00	4000.00	0.00	0.00	0.00	4000.00
				1.00 EA	0	4,000	0	0	0	4,000
	USR	<	> Environmental		0.00	5000.00	0.00	0.00	0.00	5000.00
				1.00 EA	0	5,000	0	0	0	5,000
			TOTAL Planning Division		0	15,000	0	0	0	15,000

30_25. Real Estate Division	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR < > Real Estate Division		0.00	5000.00	0.00	0.00	0.00	5000.00
	1.00 EA	0	5,000	0	0	0	5,000
TOTAL Real Estate Division		0	5,000	0	0	0	5,000

30_30. PPMD		QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR	< > Programs and Project Management		0.00	15000.00	0.00	0.00	0.00	15000.00
	Division	1.00 EA	0	15,000	0	0	0	15,000
	TOTAL PPMD		0	15,000	0	0	0	15,000

30_35. Value Engineering Study	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR < > VE Study		0.00	15000.00	0.00	0.00	0.00	15000.00
	1.00 EA	0	15,000	0	0	0	15,000
TOTAL Value Engineering Study		0	15,000	0	0	0	15,000
TOTAL Planning, Engineering and Design		0	221,000	0	0	0	221,000

	QUANTY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST
USR < > Construction Management		0.00	150000.00	0.00	0.00	0.00	150000.00
	1.00 EA	0	150,000	0	0	0	150,000
TOTAL Construction Management		0	150,000	0	0	0	150,000
TOTAL Rhodes Point		13,893	804,391	550,386	618,670	345,019	2,318,465

ANNEX C

REAL ESTATE PLAN

ANNEX C
REAL ESTATE PLAN
SMITH ISLAND ENVIRONMENTAL RESTORATION and PROTECTION PROJECT
SHEEP PEN GUT
SOMERSET COUNTY, MARYLAND
FEASIBILITY STUDY

1. PURPOSE:

The purpose of this Real Estate Plan (REP) is to provide a planning level analysis of real estate requirements, in support of the Sheep Pen Gut Smith Island Environmental Restoration and Protection Project. This area was part of a preliminary evaluation of various plans for environmental restoration, navigation improvement, and erosion protection projects for Smith Island, documented in the reconnaissance report, dated May 1997. The study is being conducted under the authority of a resolution of the Committee on Public Works and Transportation of the United States House of Representatives on September 28, 1994, in which the Secretary of the Army was requested to review pertinent reports with 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. The Maryland Department of Natural Resources will be the Non-Federal Sponsor (NFS) for project implementation. The purpose of this project is to install twin jetties to prevent shoaling that is occurring along a section of the main stem of Sheep Pen Gut navigation channel, clean out and realign the channel, and deposit the dredged material and create wetlands along the shoreline. Authorization for the project falls under Section 107 of the Rivers and Harbors Act as amended.

The project area is Smith Island, Maryland, the last inhabited Chesapeake Bay Island, located 12 miles west of Crisfield, Maryland and 95 miles south of Baltimore, Maryland. The island is approximately 8,000 acres in area and is 8 miles long by 4 miles wide. The life of this project is estimated to be approximately 25 years.

2. REAL ESTATE REQUIREMENTS (The minimum estates are as follows.)

The project jetties and dredged material placement area will be constructed on State owned lands below the mean high water line (MHWL). Also one (1) Perpetual Channel Improvement Easement (CIE) on two (2) tracts will need to be acquired, consisting of approximately 1.20 of an acre from John Jacobs. Jr. Trustee for installation of the twin jetty tie-ins. All construction will be done from the water.

THE CHANNEL IMPROVEMENT EASEMENT ESTATE WILL READ AS FOLLOWS:

CHANNEL IMPROVEMENT EASEMENT (Estate No. 8) A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over and across (the land described in Schedule A) (Tract Nos. ______, and _____) for the purposes as authorized by the Act of Congress approved, including the right to clear, cut, fell, remove and dispose of any and all timber, trees, underbrush, buildings, improvements and/or other obstructions therefrom; to excavate, dredge, cut away, and remove any or all of said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

3. DESCRIPTION OF NFS' EXISTING OWNERSHIP: The NFS owns the lands below the MHWL in Fee simple subject to navigational servitude. This estate is adequate for project purposes.

4. RECOMMENDED ESTATES, NON-STANDARD: No non-standard estates will be required for this project.

5. EXISTING FEDERAL PROJECTS: There are Federal navigation projects in the proposed project area including several channels along Twitch Cove on Tangier Sound through Big Thorofare, Ewell (with an anchorage basin), Levering Creek, Swan Island (with twin jetties), Tyler Creek (with an anchorage basin), Shanks Creek (with an anchorage basin), Big Thorofare River to Tylerton, and Rhodes Point to Tylerton through Sheep Pen Gut. These are Federally maintained navigation projects constructed under navigational servitude with no non-Federal sponsor.

6. EXISTING FEDERAL OWNERSHIP: There is no federally owned land within the proposed project area.

7. NAVIGATION SERVITUDE: Navigational servitude does apply to this project since most of the project lands, except the tie-ins, are below the MHWL. The project is being constructed for navigational purposes under Section 107.

8. REAL ESTATE MAPPING: Real Estate mapping showing the project area is attached as Exhibit (A).

9. INDUCED FLOODING: There will be no induced flooding as a result of the construction or the operation and maintenance of the project.

10. BASELINE COST ESTIMATE FOR REAL ESTATE: The cost associated with easement acquisition are nominal and primarily administrative in nature since the lands that will be acquired for said Channel Easement do not adversely impact the economic use of these properties. Therefore only a nominal value is attributable to the affected property; a value estimated to be lower than the administrative cost associated with an acquisition. The acquisition of this easement will not permanently restrict the rights of the property owner from using the property. The Government in its review and coordination of these documents will incur administrative cost. Total costs are estimated

to be $6,337.00. A Real Estate Cost Estimate (MCACES FORMAT) is attached as Exhibit (B).

11. PUBLIC LAW 91-646 RELOCATIONS: There are no PL 91-646 relocations or utility/facility relocations required in connection with this project.

12. MINERAL/TIMBER ACTIVITY: There are no known mineral activities within the vicinity of the project.

13. ASSESSMENT OF NFS' REAL ESTATE ACQUISITION CAPABILITIES: An assessment of the Non-Federal Sponsor's acquisition capabilities was completed for a related project. Attached, as Exhibit C. the NFS is capable of performing the real estate activities required for this project.

14. ZONING CHANGES: There are no zoning ordinances that will result in a taking of real property interest.

15. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE: There are no know potential hazardous, toxic, and radioactive waste (HTRW) sites or other contaminates located in, on, under, or adjacent to the property required for the project.

16 LANDOWNER SENTIMENT: Smith Island Landowners are in support of the project to prevent further erosion of the island.

17. NOTIFICATION OF NFS: The Non-Federal Sponsor was notified in writing about the risk of acquiring lands before execution of the PCA.

18. ACQUISITION SCHEDULE: The Project Cooperation Agreement between the Corps and State of Maryland for project implementation of the Sheep Pen Gut Environmental Restoration and Protection Project is scheduled to be executed in August 2002. Easements will be acquired before start of construction that is anticipated in December 2002.

EXHIBIT B

Real Estate Plan Study Cost Estimate-MCACES Format
Real Estate Acquisition Requirements
SHEEP PEN GUT

		Private			Commercial			Public			Requirement		
		#	$ each	req	#	$ each	req	#	$ each	req	Base	Contingency	Total
	ACQUISITIONS												
0102-------	By Government												
010201---	By Non-Federal Sponsor (NFS)												
010202---	Survey and Legal Descriptions	1	500	500		500	0		500	0	500	75	575
01020201	Title Evidence	1	410	410		600	0		410	0	410	62	472
01020102	Negotiations	1	500	500		2,000	0		1,000	0	500	75	575
01020203	By Government on Behalf of NFS												
010203---	Review of NFS												
010204---	Survey and Legal Descriptions	1	150	150	0	100	0		150	0	150	23	173
01020401	Title Evidence	1	150	150	0	100	0		150	0	150	23	173
01020402	Negotiations	1	150	150	0	100	0		150	0	150	23	173
01020403													
	SUBTOTAL										1,860	279	2,139
	CONDEMNATIONS												
0103-------	By Government												
010301---	By Non-Federal Sponsor (NFS)	0	5,000	0	0	5,000	0	0		0	0	0	0
010302---	By Government on Behalf of NFS												
010303---	Review of NFS	0	1,000	0	0	1,000	0	0		0	0	0	0
010304---													
	SUBTOTAL										0	0	0
	APPRAISALS												
0105-------	By Government												
010501---	By Non-Federal Sponsor (NFS)	1	1,000	1,000			0			0	1,000	150	1,150
010502---	By Government on Behalf of NFS												
010503---	Review of NFS	1	500	500		500	0		500	0	500	75	575
C10504---													
	SUBTOTAL										1,500	225	1,725
	PL 91-646 ASSISTANCE												
0106-------	By Government												
010601---	By Non-Federal Sponsor (NFS)	0		0	0	2,000	0			0	0	0	0
010602---	By Government on Behalf of NFS												
010603---	Review of NFS	0		0	0	200	0	0		0	0	0	0
010604---													
	SUBTOTAL										0	0	0
	TEMPORARY PERMITS LICENSES-RIGHTS-OF-WAY												
0107-------	By Government			0			0			0	0	0	0
010701---	By Non-Federal Sponsor (NFS)			0			0		1,000	0	0	0	0
010702---	By Government on Behalf of NFS			0			0			0	0	0	0
010703---	Review of NFS	0		0	0		0		125	0	0	0	0
010704---	Other			0			0			0	0	0	0
010705---	Damage Claims	0	3,000	0	0	3,000	0			0	0	0	0
010706---													
	SUBTOTAL										0	0	0
	REAL ESTATE PAYMENTS												
0115------													
	Land Payments												
011501---	By Government										0	0	0
01150101	By Non-Federal Sponsor (NFS)	1	2,000	2,000					0	0	2,000	300	2,300
01150102	By Government on Behalf of NFS										0	0	0
01150103	Review of NFS	1	150	150							150	23	173
01150104													
	PL 91-646 Assistance Payments										0	0	0
011502---	By Government										0	0	0
01150201	By Non-Federal Sponsor (NFS)				0	10,000	0				0	0	0
01150202	By Government on Behalf of NFS										0	0	0
01150203	Review of NFS										0	0	0
01150204													
	Damage Payments										0	0	0
011503---	By Government										0	0	0
01150301	By Non-Federal Sponsor (NFS)											0	0
01150302	By Government on Behalf of NFS										0	0	0
01150303	Review of NFS											0	0
01150304													
	SUBTOTAL										2,150	323	2,473
	Account 02 Facility/Utility Relocations (Construction cost only)											0	0
	REAL ESTATE ACQUISITION TOTAL										**$5,510**	**$827**	**$6,337**

ASSESSMENT OF NON-FEDERAL SPONSOR'S
REAL ESTATE ACQUISITION CAPABILITY

Project: Smith Island Environmental Restoration and Protection

Non-Federal Sponsor: State of Maryland Department of Natural Resources

I. Legal Authority:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? Yes

b. Does the sponsor have the power of eminent domain for this project? (Eminent Domain is a right of a government to take private property for public use by virtue of the superior dominion of the sovereign power over all lands within its jurisdiction) Yes

c. Does the sponsor have "quick-take" authority for this project? (Quick-take authority or Declaration of Taking is condemnation proceedings with a concurrent deposit of the estimated compensation in the registry of the court) Yes.

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? No

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? Yes, lands at Swan Island owned by U.S. Fish & Wildlife Service, a Federal entity, cannot be condemned by the non-Federal sponsor.

II. Human Resource Requirements:

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? No

b. If the answer to II.a. is "yes", has a reasonable plan been developed to provide such training?

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? Yes

EXHIBIT C

d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? Yes

e. Can the sponsor obtain contractor support, if required, in a timely fashion? Yes

f. Will the sponsor likely request USACE assistance in acquiring real estate? No

III. Other Project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site? Smith Island is a remote island accessible by boat only. DNR's office is located in Annapolis, MD, within close proximity to the project.

b. Has the sponsor approved the project/real estate schedule/milestones? Yes

IV. Overall Assessment:

a. Has the sponsor performed satisfactorily on other USACE projects? Yes

b. With regard to this project, the sponsor is anticipated to be fully capable.

V. Coordination:

a. Has this assessment been coordinated with the sponsor? Yes

b. Does the sponsor concur with this assessment? Yes

Prepared by:

Helen C. Bunche

HELEN C. BUNCHE
Realty Specialist

Reviewed and approved by:

SUSAN K. LEWIS
Chief, Civil Projects Support Branch
Real Estate Division

ANNEX D

MARYLAND DNR LETTER OF INTENT

Parris N. Glendening
Governor

Kathleen Kennedy Townsend
Lt. Governor

Maryland Department of Natural Resources
Tawes State Office Building
580 Taylor Avenue
Annapolis, Maryland 21401

Sarah J. Taylor-Rogers, Ph.D.
Secretary

Stanley K. Arthur
Deputy Secretary

April 9, 2001

Colonel Charles J. Fiala, Jr.
District Engineer
Baltimore District
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Dear Colonel Fiala:

In accordance with the provision of Section 107 of the River and Harbor Act of July 14, 1960, as amended, which authorizes the federal government to initiate investigations and studies in the interests of navigation, the Maryland Department of Natural Resources hereby makes formal application for a study of Sheep Pen Gut, Rhodes Point, Smith Island, Maryland.

The investigation will be conducted in two phases: the first phase is the reconnaissance study which will be funded by the Corps of Engineers. The MDDNR can provide 50% of the cost of the second phase, the feasibility study, and one-half of our share may consist of in-kind services.

The MDDNR understands that the problem will be assessed through the conduct of a feasibility study. The Federal government will pay 100 percent of the costs of the feasibility study up to the Federal funding limit of $100,000. If the cost exceeds $100,000, the MDDNR can provide 50% of the amount in excess of $100,000. The MDDNR may provide its entire 50 percent share through in-kind services.

The MDDNR can provide the following local cooperation and participation.

1. Provide without cost to the United States all lands, easements, rights-of-way, relocations, including suitable borrow and dredged material placement areas (LERRD), as determined by the Federal government to be necessary for the construction of the project. The value of LERRD will be included in the total project costs and credited towards the sponsor's share of project costs, as defined in the local cooperation agreement.

2. Hold and save the United States free from claims for damages that may result from construction or maintenance of the project, except damages due to the fault or negligence of the United States or its contractors.

3. Accomplish, without cost to the United States, alterations and relocations as required in sewer, water supply, drainage and other utility facilities.

4. Provide, maintain, and operate, without cost to the United States, an adequate, public landing or wharf available to all on equal terms.
5. Provide cash contribution toward construction costs in accordance with cost sharing laws on commercial and recreation navigation.

6. Assume full responsibility for all project costs in excess of the federal cost limitation of $4 million.

7. Establish regulations prohibiting discharge of untreated sewage, garbage and other pollutants in the waters of the harbor. The regulations shall be in accordance with applicable laws and regulations of federal, state, and local authorities responsible for pollution prevention and control.

Sincerely,

Sarah J. Taylor-Rogers

Sarah J. Taylor-Rogers

cc: James W. Dunmyer, Assistant Secretary
✓Daria Van Liew, USACOE
Charles Massey, Somerset County Commissioners
Robert Gaudette, Engineering & Construction
Jordan Loran, Engineering & Construction

ANNEX E

AGENCY AND PUBLIC COORDINATION

D·H·C·D

Maryland Department of Housing and Community Development

Division of Historical and Cultural Programs

100 Community Place
Crownsville, Maryland 21032

410-514-7600
1-800-756-0119
Fax: 410-987-4071
Maryland Relay for the Deaf:
711 or 1-800-735-2258

http://www.dhcd.state.md.us

July 16, 2001

Mrs. Linda Morrison
Chief, Regulatory Branch
Baltimore District, Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21202-1715

RE: MD2001-319-0230 Smith Island Restoration & Protection Project

Dear Mrs. Morrison:

Today, this office met with a representative of the Department of the Army, Baltimore District, Corps of Engineers, in order to examine historic preservation concerns on Smith Island, Maryland. The proposed *Environmental Restoration and Protection Project* in the May 1997 Reconnaissance Report was felt to lack adequate attention to possible cultural resources. Two areas were discussed at today's meeting, the northwest and northeast regions of Smith Island. The northwest portion has been only partially surveyed. In the surveyed area, from Fog Point south for the distance proposed, nine (9) historic period sites have been recorded. Since no grading is planned we request only that the area be covered with a geotextile prior to the installation of the sill and the addition of backfill and/or planting of flora. The area from Fog Point to Fishing Point has not been investigated for archeological properties, although one site has been recorded at Fishing Point. Since the area impacted is within the footprint of the 1942 shoreline, there is no likelihood of either shipwrecks or wharf structures. However, other historic and prehistoric sites are possible. The Corps's representative agreed that a professional archaeological survey would be undertaken in order to determine whether archeological resources exist in the area and based on the results of this survey further coordination will be undertake with the Trust.

The area proposed for a protective structure in the northeast portion, has a low potential for historic sites as it basically follows the 1942 shoreline, and the area was not occupied historically. Therefore potential for maritime resources such as wharves is low. Although there is a possibility of wreck remains, it is unlikely these occur within the area that will be impacted. However, we would ask that in compliance with 36CFR800.11, we be notified in the event that unanticipated cultural remains are encountered during the implementation of this undertaking. Although prehistoric sites may exist in the offshore area, these would be nearly impossible to detect with standard remote sensing equipment and are unlikely to suffer significant adverse effects. Therefore, concurs that work may proceed in this area.

We request that the Corps defer permit issuance for the Fog Point to Fishing Point area only, until a Phase I identification survey of the area is performed at mean low water. This survey should be carried out by a qualified professional archeologist and include areas impacted by the project. The survey needs to be performed in accordance with the "Standards and Guidelines for Archeological Investigations in Maryland" (Shaffer and Cole 1994) and with *Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (1983). Based upon the results of the survey, we will be able to determine whether or not the project will affect any cultural resources and make appropriate recommendations. Further consultation with our office will be necessary to fulfill compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

If you have any questions or require further information, please contact me at 410-514-7662, by fax 410-978-4071, via e-mail: langley@dhcd.state.md.us.

Sincerely,

Stephen R Bilicki

for

Susan B.M. Langley, Ph.D.
200100997

cc: Mr. Robert W. Linder
Ms. Linda C. Janey, J.D.
Mr. Ken Braumgardt
Mr. Robert Rosenbush (Md. Clearinghouse)
Mr. Rick Ayella (MDE)
Ms. Elizabeth J. Cole
Dr. Gary Shaffer
Mr. Stephen Bilicki

Response to Public Comments
Received on Draft Rhodes Point Section 107
Feasibility Report and Integrated Environmental Assessment

Comments on the draft report were received from the U.S. Fish and Wildlife Service, the U.S. Department of the Interior Office of Environmental Policy and Compliance and the Maryland Department of Natural Resources.

U.S. Fish and Wildlife Service- letter dated 27 June 2002

A copy of the U.S. Fish and Wildlife letter is provided in the Agency Coordination annex to the final report.

Comment 1) Aerial *surveys by the Virginia Institute of Marine Science have identified a transient bed of submerged aquatic vegetation (SAV) within the backfill/wetland creation footprint. Depending on the survey year, this SAV bed ranges from undetectable from the air to approximately 4 acres in size. The exact species of SAV at this location has not been determined. An attempt should be made to delineate the extent of this bed and identify which species occur there. Once additional information is obtained, the Corps should consult with the Service, the National Marine Fisheries Service (NMFS) and the Maryland Department of Natural Resource to discuss options for avoiding or minimizing impacts to this habitat.*

Response: The site of the transient SAV bed will be surveyed in conjunction with the Fish and Wildlife Service to ascertain the presence or absence of SAV. After the site survey, the resource agencies will be consulted before designs are finalized.

Comment 2) *At least three species of Federally-listed sea turtles have been documented to forage in the Chesapeake Bay as far north as Smith Island and beyond. These include the Federally endangered Atlantic Ridley ((Lepidochelys kempi) and the threatened loggerhead (Caretta caretta caretta) and the Atlantic green (Chelonia mydas mydas) turtles. We recommend that you contact John Nichols of the National Marine Fisheries Service to discuss potential impacts to these species.*

Response: The District will coordinate with John Nichols to discuss potential impacts to the sea turtle species.

Comment 3) *Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under our jurisdiction are known toe exist in the project impact area. Therefore, no Biological Assessment or further Section 7 Consultation pursuant to the Endangered Species Act of 1973 is required with the Fish and Wildlife Service. Should project plans change or if additional information on listed or proposed species becomes available this determination may be reconsidered.*

Response: If project plans change or if additional information on proposed species becomes available, the District will coordinate with resource agencies to assure compliance with Section 7 of the Endangered Species Act of 1973.

Comment 4) *In summary, we support the project provided the Corps coordinates with the State and Federal natural resource agencies regarding SAV concerns and NMFS concerning the potential for impact to foraging sea turtles.*

Response: Thank you for your support of the project. The District will continue to coordinate with State and Federal resource agencies throughout the design and construction of the project.

<u>National Marine Fisheries Service- letter dated 10 July 2002</u>

Fish and Wildlife Coordination (FWC) Comments:

Comment 1) In *general, we do not oppose use of dredge material for salt marsh establishment. However, salt marsh creation/restoration sites should* ***not*** *result in unwarranted "trade-offs" of aquatic habitats with existing high value, such as SAV. We recommend that an alternative placement site be selected that will not displace SAV habitat. For example, shoreline areas further south along Hog Neck (i.e., at a distance greater than 1,000 feet south of the entrance to Sheep Pen Gut) do not have historical importance to SAV and should be investigated as alternative placement sites.*

Response: We agree with the concept that "trade-offs" between salt marsh creation and SAV habitat is generally to be avoided. But, the historic SAV beds in the proposed placement area have been dormant for several years, and based on a summer 2002U.S. Fish & Wildlife survey, there are currently no existing SAV in the proposed placement area. Nevertheless, an alternative placement site which would avoid historic SAV beds will be investigated during project Plans & Specifications.

Comment 2) *Dredging and spoil placement activities for this proposal should be restricted from April 1 through October 15, of any year, to protect local beds of eelgrass and widgeon grass during the period optimal for their growth and reproduction.*

Response: We concur with the comment and will schedule dredging and spoil placement activities to avoid impacts to SAV beds

Comment 3) *Best management practices (i.e., appropriate containment structures) should also be used during hydraulic pumping of spoil to a placement site to minimize drift to sediments into important adjacent habitats, such as salt marsh and SAV beds.*

Response: Best management practices will be used during pumping of spoil to minimize sediment drift and protect habitats.

Essential Fish Habitat (EFH) Comments:

Comment 4) *We do not concur with your determination that the project will not adversely affect EFH for summer flounder, bluefish, and red drum. SAV to be affected by the dredge material placement plan has been identified as a Habitat of Particular*

Concern (HAPC) for adult and juvenile summer flounder and juvenile red drum. The Magnuson-Stevens Act stipulates that a HAPC is particularly important to the long-term productivity of populations of managed species and is particularly vulnerable to degradation and warrants high standards for protection and restoration. Consequently, certain activities, such as discharge of dredge material, should not be located within a HAPC.

Response: The EFH determination was based on the existing conditions and most probable future conditions in the project area. SAV beds have been dormant for almost 10 years and the erosive shoreline in the project area is not considered favorable for SAV propagation. Based on the assumption that SAV beds are not present in the project area and are not expected to propagate in the future, it was assumed that the EFH for the red drum and summer flounder would not be adversely impacted. In addition, it is possible that the protection against shoreline erosion provided by breakwater structures could increase the probability of SAV propagation in the project area.

Comment 5) *Additionally, although not a HAPC for bluefish, SAV beds are frequently targeted by bluefish for foraging activities. Consequently, displacement of SAV within the dredge material placement site will also adversely affect this species.*

Response: See response to comment 4) above.

Comment 6) *Pursuant to Section 305(b)(4)(A) of the Magnuson-Stevens Act, we recommend that you adopt the following EFH conservation recommendations, which coincide with our recommendations discussed above in our FWC Act comments.*

Response:

U.S. Department of Interior- letter dated 16 July 2002

The Department of Interior comments are exactly the same as those provided by the U.S. Fish & Wildlife Service. See previous section for comments and responses. A copy of the Department of Interior letter is provided in the Agency Coordination annex to the final report.

Maryland Department of Natural Resources (DNR) - letter dated 30 July 2002

A copy of the Maryland DNR letter is provided in the Agency Coordination annex to the final report.

Comment 5) *Our Wildlife and Heritage Service reports that there is a colonial waterbird nesting site within ¼ mile of the project site. Both alternatives 2A and 2B are near enough to disturb nesting birds. It is recommended that no work should be conducted during the colonial waterbird breeding season of March 1 through August 15 of any year.*

Response: Alternatives 2A and 2B were considered during the plan formulation process. Neither of the alternatives was selected as the recommended project. If, for any reason, these alternatives are reconsidered, construction during the colonial waterbird breeding season will be avoided. As the project gets closer to construction, coordination will continue with resource agencies, including DNR. Concerns regarding environmental construction windows may be raised during this process.

Klosterman, Dennis G NAB02

From: John Nichols [John.Nichols@noaa.gov]
Sent: Tuesday, October 01, 2002 10:58 AM
To: Klosterman Dennis G NAB02
Subject: Re: Sea Turtles Coordination

Dennis:
In addition to the three species of sea turtles listed in your message, the endangered leatherback may also occur in the project area. The leatherback and green sea turtles should be considered as rare transients in the Smith Island area. The loggerhead is the most likely species to be encountered in the Smith Island area. The Ridley turtle may also be encountered, although they are more common in Virginia waters in the lower Bay.

The Rhodes Point project, if constructed using either mechanical or hydraulic dredging, should have no effect on any species of sea turtle. Sea turtles are most vulnerable to hopper dredges, which, if used for this project, would necessitate further Section 7 consultation. Addionally, placement of dredge material as beach nourishment or for beneficial creation of tidal marsh will have no effects on turtles, since they are not known to nest in the Smith Island area.

If you need a formal written response from our Gloucester office (PR staff), this may require several weeks to a month because of heavy work loads that the Regional office is experiencing.

"Klosterman, Dennis G NAB02" wrote:

> John:
>
> The Corps of Engineers Planning Division is preparing a final feasibility report for the Rhodes Point Section 107 navigation project at Smith Island. One of the comments we received during public and agency review of the draft report from Dan Murphy at the Fish & Wildlife Service suggested coordinating with you to discuss potential impacts to three species of Federally-listed sea turtles. The following text within the quotation marks comes directly from the FWS comment we received:

"At least three species of Federally-listed sea turtles have been documented to forage in the Chesapeake Bay as far north as Smith Island and beyond. The include the Federally-endangered Atlantic Ridley (*Lepidochelys kempi)* and the threatedned loggerhead *(Caretta caretta caretta)* and Atlantic green *(Chelonia mydas mydas)* turtles. We recommend that you contact John Nichols of the National marine Fisheries Service (NMFS) at 410-226-5771 to discuss potential impacts to these species."

I called your number a couple of times this afternoon and didn't get a voice messaging service so I decided to send an email. I will be out of the office until October 14, but I would ask you to coordinate as needed in the meantime with Dan Murphy and Chris Spaur of our office. Chris has the action to certify our Quality Control Review Report and he needs assurance that coordination with you on this issue has been done. Thanks for your assisstance.

Denny Klosterman
410-962-3215

Parris N. Glendening
Governor

Kathleen Kennedy-Townsend
Lt. Governor

Maryland Department of Natural Resources
ENVIRONMENTAL REVIEW

Tawes State Office Building
Annapolis, Maryland 21401

J. Charles Fox
Secretary

Karen M. White
Deputy Secretary

July 30, 2002

Mr. Dennis Klosterman
U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715

Attn: CENAB-PL (Rhodes Point)

Dear Mr. Klosterman:

Thank you for the opportunity to review and comment on the Rhodes Point, Smith Island, Maryland, Section 107 Draft Feasibility Report and Integrated Environmental Assessment. The Environmental Review Unit of the Department of Natural Resources has coordinated a review of the subject draft report and offer the following comments for your consideration:

> Our Wildlife and Heritage Service reports that there is a colonial waterbird nesting site within 1/4 mile of the project site. Both alternatives 2A and 2B are near enough to disturb nesting birds. It is recommended that no work should be conducted during the colonial waterbird breeding season of March 1 through August 15 of any year.

If you should have any questions concerning the above comment you may contact Larry Hughes of my staff at 410-260-8335.

Sincerely,

Ray C. Dintaman, Jr.

Ray Dintaman, Director

cc: Jordan Loran - LWCS, DNR
Lori Byrne - WHS, DNR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401

Action PL
CF CP
PAC

June 27, 2002

Colonel Charles J. Fiala, Jr., PE
District Engineer
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Attn: Dennis Klosterman

Re: *Rhodes Point, Smith Island, Maryland, Section 107 Feasibility Report and Integrated Environmental Assessment*

Dear Colonel Fiala:

This responds to the April 9, 2002, letter to the U.S. Fish and Wildlife Service (Service) from Dennis Klosterman requesting review of the above referenced project. The following comments are submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 884, as amended; 16 U.S.C. 661 *et seq.*) and Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

The document describes a project that is expected to improve navigation in the western approach to Sheep Pen Gut on Smith Island near Rhodes Point, Maryland. The project components include: realigning the existing channel; construction of twin rubble mound jetties, 1300 feet and 1500 feet long, along the north and south sides of the realigned channel; construction of four off-shore segmented rock breakwaters along Hog Neck, just south of Sheep Pen Gut and connecting to existing breakwaters constructed of geomembrane; backfilling with dredged material behind the breakwaters and planting the 2-acre backfill area with wetland plants. This project could potentially impact 1 acre of wetland habitat due to construction-related activities. Any destruction to wetland habitats will be corrected following construction.

Aerial surveys by the Virginia Institute of Marine Science have identified a transient bed of submerged aquatic vegetation (SAV) within the backfill/wetland creation footprint. Depending on the survey year, this SAV bed ranges from undetectable from the air to approximately 4 acres in size. The exact species of SAV at this location has not been determined. An attempt should be made to delineate the extent of this bed and identify which species occur there. Once additional information is obtained, the Corps should consult with the Service, the National

Marine Fisheries Service (NMFS), and the Maryland Department of Natural Resources to discuss options for avoiding or minimizing impacts to this habitat.

At least three species of Federally-listed sea turtles have been documented to forage in the Chesapeake Bay as far north as Smith Island and beyond. These include the Federally-endangered Atlantic Ridley (*Lepidochelys kempi*) and the threatened loggerhead (*Caretta caretta caretta*) and Atlantic green (*Chelonia mydas mydas*) turtles. We recommend that you contact John Nichols of the National Marine Fisheries Service (NMFS) at (410) 226-5771 to discuss potential impacts to these species. Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under our jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further Section 7 Consultation pursuant to the Endangered Species Act of 1973 is required with the Fish and Wildlife Service. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

In summary, we support the project provided the Corps coordinates with the State and Federal natural resource agencies regarding SAV concerns and NMFS concerning the potential for impacts to foraging sea turtles. If you have any questions, please contact Dan Murphy at (410) 573-4521.

Sincerely,

for John P. Wolflin
Supervisor

cc: John Nichols, NMFS, Oxford, MD

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Custom House, Room 244
200 Chestnut Street
Philadelphia, Pennsylvania 19106-2904

IN REPLY REFER TO

July 16, 2002

ER 02/517

Mr. Wesley F. Coleman
Chief, Civil Project Development Branch
U.S. Army Corps of Engineers, Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715

Re: Section 107 Feasibility Report and Integrated Environmental Assessment, Rhodes Point, Smith Island, Maryland

Dear Mr. Coleman:

The Department of the Interior (Department) has reviewed the U. S. Army Corps of Engineers/ Baltimore District's (Corps) March 2002 Draft Section 107 Feasibility Report and Integrated Environmental Assessment (DFR/EA) for Rhodes Point, Smith Island, Maryland. Please give careful consideration to these comments in completing the final document.

The DFR/EA describes a navigation improvement project in the western approach to Sheep Pen Gut on Smith Island near Rhodes Point, Maryland. The project components include: realigning the existing channel; construction of twin rubble mound jetties, 1300 feet and 1500 feet long, along the north and south sides of the realigned channel; construction of four off-shore segmented rock breakwaters along Hog Neck, just south of Sheep Pen Gut and connecting to existing breakwaters constructed of geomembrane; backfilling with dredged material behind the breakwaters and planting the 2-acre backfill area with wetland plants. The proposed project could potentially impact 1 acre of wetland habitat due to construction-related activities. Any destruction to wetland habitats would be corrected following construction.

Aerial surveys by the Virginia Institute of Marine Science have identified a transient bed of submerged aquatic vegetation (SAV) within the backfill/wetland creation footprint. Depending on the survey year, this SAV bed ranges from undetectable to approximately 4 acres in size. The exact species of SAV at this location has not been determined. An attempt should be made to delineate the extent of this bed and identify which species occur there. Once additional information is obtained, the Corps should consult with the U.S. Fish and Wildlife Service (Service), the National Marine Fisheries Service (NMFS), and the Maryland Department of Natural Resources (MDNR) to discuss options for avoiding or minimizing impacts to this habitat.

At least three species of Federally-listed sea turtles have been documented to forage in the Chesapeake Bay as far north as Smith Island and beyond. These include the Federally-endangered Atlantic Ridley (*Lepidochelys kempi*) and the threatened loggerhead (*Caretta caretta caretta*) and Atlantic green (*Chelonia mydas mydas*) turtles. We recommend that you contact John Nichols of the NMFS at (410) 226-5771 to discuss potential impacts to these species.

Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species under Service jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further Section 7 Consultation pursuant to the Endangered Species Act of 1973 is required with the Service. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

In summary, the Department is supportive of the project provided the Corps coordinates further with the Service, NMFS and MDNR regarding SAV concerns, and with NMFS concerning the potential for impacts to foraging sea turtles. If you have any questions, please contact Dan Murphy, U. S. Fish and Wildlife Service, Chesapeake Bay Field Office, 177 Admiral Cocharane Drive, Annapolis, Maryland 21401 at (410) 573-4521.

Sincerely,

Michael T. Chezik

Michael T. Chezik
Regional Environmental Officer

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

JUL 10 2002

Robert W. Lindner
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715

Attn: Steven Kopecky

Dear Mr. Lindner:

We have reviewed the Section 107 Feasibility Report and Integrated Environmental Assessment and your essential fish habitat assessment, submitted in accordance with the Magnuson-Stevens Fishery Conservation and Management Act, for the proposed improvements to the Rhodes Point Federal Navigation Project, Somerset County, Maryland. The selected alternative involves construction of twin jetties at the entrance to the Rhodes Point channel (i.e., Sheep Pen Gut), and realignment of the federal navigation channel between the twin jetties. Additionally, salt marsh will be constructed along Hog Neck immediately south of the entrance to Sheep Pen Gut by: 1) constructing four offshore stone breakwaters; 2) hydraulically pumping dredge material from realigned federal channel into shoreline shallows along Hog Neck, landward of the constructed breakwaters; and 3) planting the consolidated dredge material with salt marsh vegetation. We offer the following comments and recommendations.

Fish & Wildlife Coordination (FWC) Act Comments
We do not object to realigning the federal channel between twin jetties. Such a realignment will reduce the maintenance dredging frequency associated with this project, thereby reducing disturbance to the local aquatic system. However, we are concerned with the proposed dredge material disposal plan, which will displace submerged aquatic vegetation (SAV).

Based on Virginia Institute of Marine Science aerial surveys for SAV during the 1991-2000 growing seasons, shallow subtidal waters within and adjacent to the entrance to Sheep Pen Gut are historically important to eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*). Grass beds formerly situated across the mouth of Sheep Pen Gut have not been present since 1993. However, we are particularly concerned about shoreline areas lying to the south of the gut (i.e., Hog Neck) and within 1000 meters of the gut entrance where SAV has been documented as recently as 1999, and which likely contain viable SAV propagules in the sediments. Consequently, the proposed dredge material placement site, which lies within this area, may have supported SAV growth during the 2001 and 2002 seasons, and has a high probability of supporting SAV during subsequent growing seasons.

Eelgrass and widgeon grass beds of the middle Chesapeake Bay region are highly important spawning, nursery, and forage habitat for estuarine finfish and crustaceans. Heck and Thoman (1984) determined that eelgrass beds supported significantly higher densities of blue crab (*Callinectes sapidus*), particularly juvenile females, than other estuarine habitats sampled. Orth and Heck (1980) also determined that grass meadows serve as shelter and forage ground for numerous finfish species, and were frequently targeted by highly motile predators, such as weakfish (*Cynoscion regalis*), bluefish (*Pomatomus saltatrix*), and striped bass (*Morone saxatilis*), because of higher concentration of prey species. The latter species support lucrative commercial fisheries in the Smith Island vicinity, with thousands of pounds of each species being landed annually by local waterman (Maryland Department of Natural Resources, reported commercial fishery landings for Tangier Sound, 1992-1995).

In general, we do not oppose use of dredge material for salt marsh establishment. However, salt marsh creation/restoration sites should **not** result in unwarranted "trade-offs" of aquatic habitats with existing high value, such as SAV. Use of the proposed placement site will displace approximately two acres of subtidal bottom with historical importance to SAV. We recommend that an alternative placement site be selected that will not displace SAV habitat. For example, shoreline areas further south along Hog Neck (i.e., at a distance greater than 1,000 feet south of the entrance to Sheep Pen Gut) do not have historical importance to SAV and should be investigated as alternative placement sites.

Additionally, dredging and spoil placement activities for this proposal should be restricted from April 1 through October 15, of any year, to protect local beds of eelgrass and widgeon grass during the period optimal for their growth and reproduction. Best management practices (i.e., appropriate containment structures) should also be used during hydraulic pumping of spoil to a placement site to minimize drift of sediments into important adjacent habitats, such as salt marsh and SAV beds.

Essential Fish Habitat

As indicated in your EFH assessment, the project area lies within designated EFH for juvenile and adult summer flounder (*Paralichthys dentatus*), juvenile and adult bluefish, juvenile and adult windowpane flounder (*Scopthalmus aquosus*), and all life stages of red drum (*Sciaenops occelatus*), cobia (*Rachycentron canadum*), Spanish mackerel (*Scomberomorus maculatus*), and king mackerel (*Scomberomorus cavalla*). Of these species, summer flounder, bluefish, and red drum commonly occur in the Smith Island vicinity and are abundant enough to support local commercial fisheries on an annual basis. Furthermore, juvenile and adult summer flounder, juvenile bluefish, and juvenile red drum frequently forage in shoreline shallows similar to those comprising the proposed dredge material placement site.

We do not concur with your determination that the project will not adversely affect EFH for summer flounder, bluefish, and red drum. SAV to be affected by the dredge material placement plan has been identified as a Habitat of Particular Concern (HAPC) for adult and juvenile summer flounder and juvenile red drum. The Magnuson-Stevens Act stipulates that a HAPC is particularly important to the long-term productivity of populations of managed species and is particularly vulnerable to degradation and warrants higher standards for protection and restoration. Consequently, certain activities, such as discharge of dredge material, should not be located within a HAPC.

Additionally, although not a HAPC for bluefish, SAV beds are frequently targeted by bluefish for foraging activities. Consequently, displacement of SAV within the dredge material placement site will also adversely affect this species.

Pursuant to Section 305(b)(4)(A) of the Magnuson-Stevens Act, we recommend that you adopt the following EFH conservation recommendations, which coincide with our recommendations discussed above in our FWC Act comments.

1. An alternative site should be used for placement of dredge material and for salt marsh and breakwater construction.

2. Dredging and open-water dredge material placement should be restricted from April 1 through October 15, of any year, to protect SAV.

3. Best management practices (appropriate containment structures) should be used with hydraulic placement of dredge material in order to minimize drift of sediments to adjacent habitats.

Section 305(b)(4)(B) of the Magnuson-Stevens Act requires you to provide the National Marine Fisheries Service (NMFS) with a detailed written response to these EFH conservation recommendations, including a description of measures adopted for avoiding and/or mitigating the impact of the project on EFH. In the case of a response that is inconsistent with NMFS' recommendations, you must explain the reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the proposed action and the measures needed to avoid, minimize, and mitigate such effects [50 CFR 600.920(k)].

If there are any questions concerning these comments, you may call John S. Nichols at our Oxford, Maryland, Habitat Office at (410) 226-5771.

Sincerely,

Peter Colosi

Peter Colosi
Assistant Administrator
for Habitat Conservation

cc: Dan Murphy, FWS, Annapolis
Ralph Spagnolo, EPA, Region III, Philadelphia
Roland Limpert, MD DNR, Environmental Review
HDC; Oxford, Sandy Hook

rhodespt - 022

LITERATURE CITED

Heck, Kenneth L. Jr., and T. Thoman. 1984. The nursery role of seagrass meadows in the upper and lower reaches of the Chesapeake Bay. Estuaries, Vol. 7(1): 70-92.

Orth, Robert J., and K. Heck. 1980. Structural components of eelgrass (*Zostera marina*) meadows in the lower Chesapeake Bay - Fishes. Estuaries, Vol. 3(4): 278-288.

Klosterman, Dennis G NAB02

From: Kopecky, Steven NAB02
Sent: Monday, February 25, 2002 10:38 AM
To: 'Dan_Murphy@fws.gov'
Cc: Klosterman, Dennis G NAB02
Subject: Fish And Wildlife Coordination

Dan,

I am writing to let you know that we are about to release the Rhodes Point Navigational Improvement Feasibility Report, and we would like to have any information or comments about the project area that you may have. The area is located due west of Rhodes Point, Smith Island, where the channel enters the open bay. You will also have an official chance for public review in March of 2002, but any info you have would be welcome.

The Rhodes Point Project will include the construction of two twin jetties, off-shore of the Rhodes Point Channel. In addition, the channel will be realigned to go directly into deep water. Finally, the material dredged will be used to create two acres of marsh, south of the jetty and one acre north of the jetty. The marsh will be protected by stone breakwaters. The project is designed to make the Rhodes Point Channel functional and help prevent additional erosion along Hog Neck. The project is not expected to have any significant environmental impacts, rather to have a beneficial impact through erosion reduction and marsh creation.

This project was originally part of the Smith Island Feasibility Study and has been separated for implementation under a different authority.

If you have questions, please give me a call.

Steven Kopecky
Geographer
US Army Corps of Engineers
Baltimore District
(410) 962-3413

Klosterman, Dennis G NAB02

From: Kopecky, Steven NAB02
Sent: Monday, February 25, 2002 10:43 AM
To: 'eghigiarelli@mde.state.md.us'
Cc: Klosterman, Dennis G NAB02
Subject: FW: Maryland Department of Enviroinment Coordination

Elder,

I am writing to let you know that we are about to release the Rhodes Point Navigational Improvement Feasibility Report. and we would like to have any information or comments about the project area that you may have. The area is located due west of Rhodes Point, Smith Island, where the channel enters the open bay. You will also have an official chance for public review in March of 2002, but any info you have would be welcome. We will need a costal zone consistency statement and a water quality certification.

The Rhodes Point Project will include the construction of two twin jetties, off-shore of the Rhodes Point Channel. In addition, the channel will be realigned to go directly into deep water. Finally, the material dredged will be used to create two acres of marsh, south of the jetty and one acre north of the jetty. The marsh will be protected by stone breakwaters. The project is designed to make the Rhodes Point Channel functional and help prevent additional erosion along Hog Neck. The project is not expected to have any significant environmental impacts, rather to have a beneficial impact through erosion reduction and marsh creation.

This project was originally part of the Smith Island Feasibility Study and has been separated for implementation under a different authority.

If you have questions, please give me a call.

Steven Kopecky
Geographer
US Army Corps of Engineers
Baltimore District
(410) 962-3413

Klosterman, Dennis G NAB02

From: Kopecky, Steven NAB02
Sent: Monday, February 25, 2002 10:48 AM
To: Klosterman, Dennis G NAB02
Subject: FW: National Marine Fisheries Coordination

John,

I am writing to let you know that we are about to release the Rhodes Point Navigational Improvement Feasibility Report. and we would like to have any information or comments about the project area that you may have. The area is located due west of Rhodes Point, Smith Island, where the channel enters the open bay. You will also have an official chance for public review in March of 2002, but any info you have would be welcome.

The Rhodes Point Project will include the construction of two twin jetties, off-shore of the Rhodes Point Channel. In addition, the channel will be realigned to go directly into deep water. Finally, the material dredged will be used to create two acres of marsh, south of the jetty and one acre north of the jetty. The marsh will be protected by stone breakwaters. The project is designed to make the Rhodes Point Channel functional and help prevent additional erosion along Hog Neck. The project is not expected to have any significant environmental impacts, rather to have a beneficial impact through erosion reduction and marsh creation. Although we will be filling some shallow water areas to create marsh, we do not expect to have any significant impacts on Essential Fish Habitat, as these are areas of soft, recently eroded substrate.

This project was originally part of the Smith Island Feasibility Study and has been separated for implementation under a different authority.

If you have questions, please give me a call.

Steven Kopecky
Geographer
US Army Corps of Engineers
Baltimore District
(410) 962-3413

US Army Corps of Engineers
Baltimore District

29 October 1998

Public Notice

Smith Island, Maryland, Environmental Restoration and Protection Feasibility Study

All Interested Parties: The U.S. Army Corps of Engineers, Baltimore District, is preparing a Feasibility Study for the Environmental Restoration and Protection of Smith Island, Maryland. As part of the study, the Baltimore District will complete an Environmental Assessment (EA), in compliance with the National Environmental Policy Act (NEPA). See attached study area map.

A reconnaissance study was completed in May 1997. The report identified problem areas at each of the three towns on the island and in the Martin Wildlife Refuge. The identified needs are (1) shoreline stabilization and protection at the mouth of Sheep Pen Gut, near Rhodes Point; (2) erosion and storm damage protection at Tylerton; (3) repairs/breach closures in the peninsula between Big Thorofare and the Chesapeake Bay to protect shallow water and SAV habitat; and (4) protection of and re-creation of shallow water habitat in the coves at the north side of the island in the Martin Wildlife Refuge. The report included several alternative plans to improve problem areas, including the use of stone revetments, geotextile tubes, jetties, breakwaters, and other construction methods. A recommended plan will be developed during the feasibility phase.

The decision to implement the recommended plan will be based on an evaluation of the probable impact of the proposed activities on the public interest. The decision will reflect the national concern for both protection and utilization of important resources. The benefits that reasonably may be expected to accrue from the proposed project will be balanced against its reasonably foreseeable detriments. All factors that may be relevant to the proposed actions, including the cumulative effects thereof, will be considered. Among these factors are economics, general environmental concerns, wetlands, cultural values, flood hazards, fish and wildlife values, land use, recreation, aesthetics, water quality, safety, and the general needs and welfare of the people. The Smith Island EA is scheduled to be released for public review in November 2000. The feasibility report is scheduled to be finalized in March 2001.

FOR FURTHER INFORMATION CONTACT: Questions about the Feasibility Study or requests for copies of the reconnaissance report on CD-ROM may be addressed to Mr. Daniel Bierly, Study Team Leader, Baltimore District, U.S. Army Corps of Engineers, ATTN: CENAB-PL-P, PO BOX 1715, Baltimore, Maryland 21203-1715, telephone 410-962-6139 or 1-800-295-1610; or by fax 410-962-4698 or by electronic mail to cenab-pl-p@usace.army.mil. The reconnaissance report is also available on the Baltimore District's Internet website as an Adobe Acrobat file at www.nab.usace.army.mil/environmental/smith island/smith.htm.

This notice is being sent to organizations and individuals known to have an interest in the proposed restoration. Please bring this notice to the attention of any other individuals with an interest in this matter. The feasibility phase of the project will include public involvement activities such as public meetings and newsletters. Copies of the 1997 Reconnaissance Report are available for review at the following locations:

(a) Ewell Public School, Ewell, Maryland
(b) Martin Wildlife Refuge Offices, Ewell, Maryland
(c) Rhodes Point Community Center (MAC Center), Rhodes Point, Maryland
(d) Tylerton Methodist Church, Tylerton, Maryland
(e) Corbin Memorial Library, 4 East Main St., Crisfield, Maryland
(f) Somerset County Library, 11767 Beechwood St., Princess Anne, Maryland
(d) Eastern Shore Public Library, 23610 Front St., Accomac, Virginia
(e) Enoch Pratt Free Library, 400 Cathedral St., Baltimore, Maryland

Harold L. Nelson
Acting Chief, Planning Division

Encl

US Army Corps of Engineers
Baltimore District

MDE

Smith Island
Environmental Restoration and Protection Study

June 1999 **NEWSLETTER** *Issue No. 1*

Public Information Meeting

Members of the study team working on the Smith Island Environmental Restoration and Protection Study will meet with Island residents on July 14th to present information about current study activities, progress on technical investigations, and the project schedule. Study team members represent the U.S. Army Corps of Engineers, the Maryland Department of the Environment (MDE), and the Maryland Department of Natural Resources (DNR). It has been some time since team members have met with the community at large and we are looking forward to discussing recent project developments. The meeting will be from 6:00 to 8:00pm on July 14, 1999, at the Rhodes Point Community Center.

In addition to the evening presentation, members of the study team will stop at Ruke's for lunch prior to the Rhodes Point meeting (on the 14th) and will visit the Drum Point Market on the morning of the 15th. Team members will be happy to meet with anyone who is interested and answer questions or just talk about the project at both those locations.

Project Status

The project is on schedule. Work is progressing on each of the four project components: erosion protection at Tylerton and Sheep Pen Gut (Rhodes Point), closing shoreline gaps and creating wetlands along the northwest shoreline, and recreating the coves at the north end of the Island. With the support of Senators Mikulski and Sarbanes and Congressman Gilchrest, the erosion protection plan for Tylerton has been "spun off" from the main project to the Corps' Section 510 program for the design and construction of projects in the Chesapeake Bay. After preparation of plans and specifications during the coming months and with funding support from the State, Tylerton will be the first project component to be constructed, with work beginning as soon as summer 2000. Separate funding for the construction of erosion protection at Rhodes Point has not yet been received; however, it is still being pursued by the study team. Completion of other portions of the study, including erosion protection and wetland creation along the northwest shoreline and the coves at the north end of the island, will continue on the normal Corps study schedule.

Activities

A number of technical teams have visited the island during the last 10 months to investigate factors such as wildlife habitat, the economic importance of the Sheep Pen Gut inlet, and the locations, amounts, and types of sediments in the surrounding waters. You may have seen the teams at various locations around the island or they may have requested information from you. We appreciate the assistance you have provided. Studies in support of each of the project components are continuing; however, the focus in the coming months will be on completing the technical studies needed for the Tylerton erosion protection project and further defining the exact solutions to be recommended at the other sites.

Next Step

In addition to the July 14 meeting, Island residents may see study team members – from the Corps, MDE, DNR, or the University of Maryland - on or around the Island during the summer and fall of 1999. Members of the study team will be conducting research on sea grasses (SAV), drilling test borings in proposed construction areas to determine the strength of foundation soils, and gathering information for a biological assessment, which will document the impacts of the projects on the environment. Dr. Evamaria Koch, of the University of Maryland's Horn Point Environmental Laboratory, is one of the team members you may meet on the Island or in area waters. Dr. Koch is an expert on sea grasses and, with her students, has compiled maps of sea grass beds in the area. Some of Dr. Koch's findings will be presented at the public meeting.

Remember the Public Information Meeting in Rhodes Point on July 14th

US Army Corps
of Engineers
Baltimore District

MDE

Smith Island
Environmental Restoration and Protection Study

July 1999 — ***AGENCY NEWSLETTER*** — *Issue No. 1*

GENERAL STUDY INFORMATION

The U.S. Army Corps of Engineers, Baltimore District, in cooperation with the Maryland Department of the Environment (MDE), the Maryland Department of Natural Resources (DNR), and Somerset County, initiated the Smith Island Environmental Restoration and Protection Study in June 1998. The purpose of the cost-shared study is to determine the feasibility of improving navigation, flood damage reduction, and erosion control, as well as restoring the environment and protecting wetlands in the area of Smith Island, Maryland. This newsletter is part of a series of public involvement activities designed to provide information about the study to interested citizens, agencies, and other stakeholders, and to request information from the public.

STUDY BACKGROUND

Smith Island is Maryland's last inhabited Chesapeake Bay island. It is located 12 miles west of Crisfield, Maryland and 95 miles south of Baltimore on the Maryland-Virginia state line. The Island is populated by a unique culture of watermen descended from the Island's original settlers of 350 years ago. Though noted for its natural beauty, the study area has numerous water resources problems that are interconnected, with erosion as a common factor. The eroding shorelines of the Island endanger the populated areas, cause shoaling in the navigation channels, decrease protection from wave energy, and cause sedimentation that smothers seagrasses, or submerged aquatic vegetation (SAV). The feasibility study is focused on the problem areas identified in a reconnaissance study that was completed in 1997. The reconnaissance study identified problems and needs at each of the three towns on the Island - Ewell, Rhodes Point, and Tylerton, and in the Martin Wildlife Refuge, at the north end of the Island. The identified problems and needs include the following:

- Navigational improvements and shoreline stabilization at the mouth of Sheep Pen Gut, near Rhodes Point
- Erosion and environmental protection and storm damage reduction at Tylerton
- Repairs and breach closures in the area of Swan Island, between Big Thorofare and the Chesapeake Bay, to protect shallow water and SAV habitat
- Protection and environmental restoration of shallow water habitat in the coves along the north shore of the Martin Wildlife Refuge

The reconnaissance report included several alternative plans to improve problem areas, including the use of stone revetments, geotextile tubes, jetties, breakwaters, and other construction methods. A recommended plan for solving these problems will be developed during the feasibility study.

CORPS' STUDY PROCESS

U.S. Army Corps of Engineers projects are developed through a two-phase planning process: reconnaissance and feasibility. The two types of study have different purposes and also differ in the levels of detail and the types of investigations that are done. A reconnaissance study is conducted to identify and investigate water resources problems and to make a preliminary determination whether there is a potential plan the Corps can implement to solve the problems. A feasibility study is conducted to investigate the problems in more detail and recommend specific solutions to the problems.

The Reconnaissance Study

A reconnaissance study is conducted using existing information and must accomplish a number of tasks. The study (1) identifies water resources problems, needs, opportunities, and potential solutions, (2) determines whether more detailed investigations are warranted as part of a feasibility study, and (3) assesses the level of interest and support of a non-Federal cost-sharing partner(s) in potential solutions and in the feasibility study. Following completion of the Smith Island Reconnaissance Report in May 1997, the Maryland Department of the Environment (MDE), the Maryland Department of Natural Resources (DNR), and Somerset County were identified as the non-Federal sponsors for the feasibility study.

The Feasibility Study

The feasibility study is the second phase in the Corps' planning process and may incorporate field investigations, computer modeling, or other analyses. The feasibility process involves identifying specific problems and opportunities, inventorying resources or information (collecting data), formulating alternatives to solve the problems, evaluating these alternatives, and finally, recommending the best solution to the problem(s).

If the feasibility study concludes that an alternative plan is economically justified and environmentally acceptable, has Federal interest, and identifies a non-Federal sponsor that is willing to share the construction costs, the Corps will recommend that Congress authorize its construction. The Smith Island Feasibility Study was initiated in June 1998 and the draft report is scheduled for completion in October 2000.

The Smith Island Feasibility Study team includes biologists, ecologists, economists, civil engineers, geotechnical engineers, hydraulic engineers, landscape architects, geographical information specialists, real estate specialists, and cultural and archeological experts. The team consists of representatives from the Corps, U.S. Fish and Wildlife Service, MDE, DNR, and Somerset County.

FEASIBILITY STUDY STATUS

The feasibility study is on schedule and work is progressing on each of the project components. (See map on page 5.) The Tylerton erosion protection plan will be the first component of the project to be constructed on the Island. With the support of Maryland Senators Barbara Mikulski and Paul Sarbanes and Congressman Wayne Gilchrest, the Tylerton component of the project was "spun off" and will be constructed under a program to design and build projects that benefit the Chesapeake Bay (the Corps' Section 510 Program). After preparation of plans and specifications during the coming months, it is anticipated that construction at Tylerton could start as soon as summer 2000.

Funding for the construction of erosion protection at Sheep Pen Gut (Rhodes Point) has not been received through the Corps' Small Navigation Program (Section 107); however, the study team is continuing to pursue funding sources separate from the feasibility study as a whole. Completion of other portions of the study, including erosion protection and wetland creation along the northwest shoreline and the coves in the Martin Wildlife Refuge at the north end of the Island, will continue on the normal Corps study schedule.

PROJECT ACTIVITIES

Investigations on wildlife habitat, economics, hydrology, and sediment have been conducted in recent months. Study team members are also studying seagrasses (SAV) in the area and gathering information for a biological assessment, which will document the environmental impacts of the projects. Technical investigations in support of all the project components are continuing; however, efforts in the next few months will be focused on completing technical studies needed for the Tylerton erosion protection project.

PUBLIC INVOLVEMENT

Extensive public involvement is being conducted as part of the Smith Island study. Public involvement is especially important on the Island because of the unusually close relationship between Island residents and the environment. It is also important because ideas received through public involvement result in better projects and because public involvement is required by the National Environmental Policy Act (NEPA).

According to NEPA, the public must be informed about and involved in projects that use Federal money, are built on Federal lands, or require Federal permits. A number of public meetings have been held throughout the reconnaissance and feasibility studies to exchange information about citizens' ideas and concerns and to discuss the study process and status. The next public meeting will be held on July 14, 1999, at Rhodes Point, on Smith Island. The purpose of the meeting is to inform Island residents about the study progress. Additional meetings will be held as the study continues.

FURTHER INFORMATION

If you would like additional information, or if you know anyone who would be interested in receiving information on this feasibility study, or if you wish to be removed from our mailing list, please fill out the last page and send to the following address:

Smith Island Feasibility Study
ATTN: Daniel M. Bierly (CENAB-PL)
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, MD 21203-1715

Smith Island Environmental Restoration and Protection Project

____ Please add my name to the study mailing list
____ Please remove my name from the mailing list

Name: ______________________________

Address: ______________________________

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Phone No.

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Comments?______________________________

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Was this newsletter helpful?______________

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How could we make this newsletter better?

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Comments, please...

Your questions or comments are welcome.
You can reach us by writing to our Baltimore office at the address below.
Additional ways to contact us are to:

- Call us at **(410) 962-6139** or toll-free at **(800) 295-1610**
- Fax us at **(410) 962-4698**
- E-mail us at **daniel.m.bierly@usace.army.mil**

You may also visit the Baltimore District Internet site at **http://www.nab.usace.army.mil**. This newsletter and additional information on this and other District activities can be found at this site.

Do we have your correct name and address? If not, please fill out the attached mail-in form, return it with your old mailing label, and we will correct our records.

Smith Island Feasibility Study
ATTN: Daniel M. Bierly (CENAB-PL)
U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715

MEMORANDUM FOR THE RECORD

Smith Island Environmental Restoration and Protection, Maryland

Team Meeting

28 March 2000

Attendees:

Cornelia Pasche Wikar	MdDNR	Oktay Ertugrul	MDE
Jordan Loran	MdDNR	Robert Pudmericky	MDE
John Gill	USFWS	John Morton	USFWS – Blackwater
Daria Blumenauer	PPMD	C.J. Winand	Design Mgt
Larry Mathena	Civil Design	Dave Capka	Geotech
Oliver Leimbach	Cost Engr	Greg Bass	H&H
Renee Otto	DA Intern	Carol Anderson-Austra	Planning
Mark Mendelsohn	Planning	Helen Bunche	Real Estate
Steve Kopecky	Planning	Denny Klosterman	Economics
Dan Bierly	Planning		

1. The meeting commenced at 10:00 a.m. in Room 6500 of the Baltimore District Office. The purpose of the meeting was to present project alternatives considered to date by the Corps study team, identified benefits of the projects, and roughly estimated costs in order to guide and focus the remaining study efforts leading to completion of the draft feasibility report. This meeting will be followed by the P-7 milestone meeting with the Corps division headquarters. The goal of the meeting was to determine for each project area the preferred alternative based on the professional judgment of the team. See the attached agenda.

2. After opening remarks, and introductions by the attendees, Dan Bierly briefly explained the near-term steps in the study process. These include meeting with Mark Colosimo, the District policy advisor for environmental projects, finalizing the EPW methodology for valuing habitat, and preparing for the P-7 meeting with North Atlantic Division (NAD). Next Daria Blumenauer briefly went over the schedule and funding situation for the study. Due to the work performed on the Tylerton project, the study is somewhat behind on expenditures, but with the renewed focus on the study, there should not be a problem catching up with the schedule. As for milestones, the final report is due in March 2001. That is, the Division Engineer's notice, not the actual completion of the final report itself including incorporating comments from the public review, which will occur earlier. Prior to that the District will hold a Alternative Formulation Briefing with Headquarters USACE (Washington), then the draft report will go out for public review in late summer, and finally the final report document will be prepared and forwarded to HQ in early 2001. With that in mind, Daria said that the designs should be completed by the end of May.

Economics, NEPA, real estate, and the other disciplines will need to work off of this date to wrap up their analyses.

3. The Smith Island project was been broken into 6 parts. The first is the Tylerton project, which has been broken off into Section 510 and is scheduled for construction in September. The next part considered is the Rhodes Point – Sheep Pen Gut area. This area is experiencing two problems. First, the Federal channel in the area shoals in very short order after dredging and is useable only during high tide by the watermen. Second, the mouth of the Gut is highly erosive, and allows ever increasing wave energy to affect Rhodes Point. Greg Bass reported that the contractor is still working on this, but he has some preliminary information and will be able to make some conclusions soon. The idea of realigning the channel so that is takes a more direct route to deep water was well received by the group. Of more contention is the possibility of moving the channel south so that it intersects Hog Neck below the geotextile tubes. This is contentious due to the SAV beds in the area and the possibility of having to cut marsh if the gut is not large enough. It was recommended that local sentiment be assessed before plugging on with this idea. Denny Klosterman discussed his work on the benefits side of the equation. He said that the watermen are experiencing approximately $213,000 per year in increased costs. If our project can save 80% of this, then we could "afford" a project of approximately $2.5 million. If the project saves 60%, then we can "afford" a project of about $1.9 million. This needs to be kept in mind as we contemplate alternatives. During the P-7 meeting, the team will recommend that this project be broken off into a Section 107 effort.

4. The remainder of the meeting revolved around the Martin Wildlife Refuge and the proposed improvements there. The first to be considered was the western shoreline. That area is defined as going from the northern jetty northward to Fog Point. The projects considered include protection of this shoreline to a point that corresponds with the northernmost reach of Big Thorofare, and then the rest of the shoreline along the refuge up to Fog Point. Consideration was given to breakwaters along the reaches, a solid stone sill placed 30 feet off-shore with no backfill, and a sill placed 30 or 100 feet off-shore with backfill to create marsh. The borrow source for any backfill would likely be the off-shore site near the western coast of the refuge due to the high expense of using other areas. High transportation costs or high cost of double or triple handling were cited as reasons for the cost. The stone sill options are quite a bit more expensive than the breakwater alternatives, but it was thought that perhaps the design was too conservative, and the structure too massive. Further, a stone sill may not allow enough flushing in the area, and would certainly preclude some wildlife from being able to use the created marsh. Also of concern is whether or not breakwaters would be affective at ceasing erosion much less trapping sediment. This area is considered of extreme importance, yet no one alternative seems to suit the problems. For that reason, the group decided that Engineering Division, with the help of the rest of the team, should design a project that mixes the various project alternatives to come up with a solution that has some of the benefits of each option while minimizing the negative aspects. The team generally agreed that any

combination of the methods discussed would be satisfactory to the group. The most important thing is to ensure the long-term stability of the landmass. The group also agreed that the protection should extend to Fog Point.

5. At Fog Point, the alternative plans included structures, either segmented breakwaters or a solid sill, that would extend from the west and/or eastern shoreline potentially with some material placement behind the structure to create wetlands. Any structure placed to the east will be more expensive due to water depths. For this reason it was recommended that breakwaters be used to the east. Jordan Loran wondered if any structure should be placed to the east jutting into the water. He wondered if we may be better served by protecting the point of land on the east side of the cove using a revetment. It was agreed that this should be analyzed as a beneficial yet inexpensive option that could also benefit Back Cove. On the western side, the team is leaning toward a solid structure with backfill behind it to create marsh, as long as the price is not too steep.

6. Along with the western shoreline area, Back Cove is considered the most important area for protection. The cove is highly functioning but is in severe danger. The "upper peninsula" that protects the area has been breached in many areas and its effectiveness as a barrier is being compromised. John Gill said that whatever we have to do to save this landmass should be pursued, and the one selected should be the least cost. For this reason, the Corps will consider a revetment-like structure right against the shoreline that would have the greatest certainty of providing protection at the lowest cost. If we can extend the protection out into the water with marsh creation behind it, that would be nice, but protection of the peninsula is essential. To the southern end of the Cove, the team agreed that the landmass between Back Cove and Terrapin Sand Cove should be protected, but due to the cost, breakwaters may be the best way to do it.

7. At Terrapin Sand Cove there is a well-established SAV bed that is being threatened by sand bar migration that is "pinching" the habitat as the bar moves toward the mainland. The alternative that would place a structure along the sand bar from the mainland to the remnant island to keep the bar from migrating further was recommended as a good project. It would be nice to extend the protection beyond the remnant island, but this is unlikely due to the cost.

8. Finally, Dan Bierly tried to focus the group toward providing an assessment of which projects are the most important to the team. That is, which projects, based on professional judgment, appear to offer the most cost-effective restoration opportunities. It was unanimous that the western shoreline and the upper peninsula of Back Cove should have top priority among the environmental restoration projects. As for the others, opinion was mixed. John Gill believes that the sand bar at Terrapin Cove is important. Jordan Loran and Dan Bierly felt that the eastern point at Fog Point Cove has merit. As for the other projects, the analysis will have to be conducted to direct the team. Also, the USFWS representatives will contact Mike

Harrison at Martin Wildlife Refuge to get his opinion on how the others should be ranked. As mentioned before, this is for guidance only. All alternatives will go through a rigorous analysis of evaluation that weighs habitat quantity and quality versus constructability, price, and other competing factors.

9. In the near future, team members will meet with Mark Colosimo to check our analysis methodology. Internal meetings will be held to direct the detailed designs that Engineering will work on. Janet Norman of USFWS will be contacted so that the EPW work can be concluded. The P-7 meeting with NAD will be held, which includes completing read-ahead material by next week. Coordination with NMFS will continue since it is almost certain that backfill material will need to come from offshore near the west coast of the Refuge. Additional geotechnical drilling will be required. Finally, in the May timeframe, the team will need to report back to the locals on the likely recommendation of the report, hopefully to include a determination of the direction of the Rhodes Point project.

10. The meeting adjourned at approximately 12:45 pm.

Dan Bierly
Study Manager

Post Notes:

Subsequent to this meeting, the EN team met with the H&H contractor, OCTI. The team passed along the recommendations of the meeting and the contractor will run these scenarios and Sheep Pen Gut through the model. We should have input by early May from this analysis.

After further discussion, there will be no further consideration given to relocating the Sheep Pen Gut navigation channel south of the geotextile tubes.

If the goal at Terrapin Sand is to stabilize the shoal that is migrating toward the mainland, then the structure may need to extend south of the existing island not from the island north to the mainland.

The team must consider construction schedules and staging that allows for test sections and flexible, phased construction.

US Army Corps of Engineers
Baltimore District

MDE

Smith Island
Environmental Restoration and Protection Study

July 2000 *NEWSLETTER* *Issue No. 4*

What's Happening - Smith Island Feasibility Study

The study team is making progress on the Smith Island Feasibility Study and the Tylerton Shoreline Protection project. The feasibility study covers improvements to Sheep Pen Gut, the northwest shoreline of Smith Island, and the coves along the northern shoreline of the Martin Refuge. Team members working on the feasibility study are having discussions with engineering experts, other agencies, and the folks who will have to make final decisions about the projects. Some of the questions being resolved are related to the costs of various alternative plans and getting the best value.

Tylerton Project

Everyone must know that a wonderful signing ceremony was held on April 24 at the Chesapeake Bay Foundation House on Tylerton. Those signing an agreement to share the costs of the Tylerton project included Senator Paul Sarbanes, Assistant Secretary of the Army Joseph Westphal, and DNR Secretary Sarah Taylor-Rogers. The Reverend Ashley Maxwell and Baltimore District Engineer Bruce Berwick also signed as witnesses. Blustery breezes calmed and the sun was shining as Tylerton residents and visitors gathered to hear messages of support from speakers who clearly appreciate the island. Following the ceremony, the United Methodist Women's Association and the Tylerton Community Center hosted a beautiful lunch in the church basement.

During the last few months contractors and team members have visited Tylerton. Some of the tasks being accomplished include determining what real estate needs to be acquired, how to move or work around the power lines that run close to the shore, and how to prepare (clean up) the bulkhead area for the new construction.

Wastewater and Trash Management

In addition to the feasibility study and the Tylerton project, a Corps contractor is developing plans for new wastewater treatment facilities on the island. The contractor has visited existing facilities at Ewell/Rhodes Point and Tylerton and is planning two new systems designed for island conditions. Features of the new facilities include wetland ponds for secondary treatment of wastewater and salt resistant fiberglass tanks at Tylerton.

The Maryland Rural Community Assistance Project is working on a proposal for a solid waste management plan for Smith Island. Community Development Specialist Joyce DeLaurentis visited the incinerator at North End and is eager to work with island residents in developing a comprehensive plan for the entire island. The plan may incorporate a number of solid waste management techniques, from recycling and re-use to composting, burning, and hauling.

Martin Wildlife Refuge Shore Protection and Coves

A combination of a low stone sill and a bulkhead is being looked at for erosion protection along the western shore of the refuge and the coves. The project would provide extra protection in the most threatened areas and still allow bird and fish access to the marsh. Concept designs and cost analysis to determine the best protection for the money should be completed in the next few months.

Community Meeting - 6:30 PM, Tuesday, August 15, 2000 – Rhodes Point Community Center

Rhodes Point
Alternative plans for the construction of jetties to protect Sheep Pen Gut are still in development. The study team is analyzing information from ocean engineering specialists, cost engineers, and local watermen, among others. The goal is to get the most protection with the funds available.

DNR Wetland Restoration
Work on the wetland restoration project along Shell Road in Ewell will start this August. After the project area is surveyed, the project details will be designed and dredged material will be placed at the site. The dredged material will come from maintenance dredging scheduled for Big Thoroughfare in 2001. When the site is ready for planting, DNR project managers hope that interested island residents will participate and get a hands-on introduction to wetland restoration.

Community Meeting
Study team members will meet with island residents at the Rhodes Point Community Center on Tuesday evening, August 15. Several contractors working on the Tylerton shore protection project, replacement of the wastewater treatment plants, and a comprehensive solid waste management plan for the island, will also be there. The study team will present information on the Corps' feasibility and Tylerton studies and ask for ideas and comments about the construction of jetties at Rhodes Point.

Tylerton Visit and Clean Up
On Wednesday, August 16, several team members will meet at Tylerton with County representatives and members of the community trash committee to identify and tag any waste materials that might be in the way of construction of the new bulkhead.

Other Actions
We always welcome your calls and questions. The Smith Island projects are complex and we hope you'll write or call if you have concerns. Since we're not on the island, we need for you to let us know if there are issues you want to discuss. We're all trying to find solutions - help us do a good job for you.

U.S. Army Corps of Engineers
Baltimore District
CENAB-PL (Smith Island)
P.O.Box 1715
Baltimore, Maryland 21203-1715

Smith Island Projects - Community Meeting

Rhodes Point Community Center, August 15, 2000

TENTATIVE AGENDA

Time: 6:30 - 8:30 PM

Meeting Purpose: To provide information on the Smith Island projects currently under development. Meeting will cover the status of the Tylerton erosion protection project, alternatives for Rhodes Point, feasibility level plans for the Martin Refuge, and wastewater and solid waste management plans.

Meeting Concept: Informal and highly interactive presentations/discussions by project managers, followed by a general question and discussion period.

Product: Input of local residents on all projects, specifically on the Rhodes Point alternatives.

6:15 - 6:30	Meet and greet/sign in
6:30 – 6:40	Welcome; introductions – CA-A
6:40 - 6:50	Project status - Daria
6:50 – 7:00	Tylerton Project – Larry and Daria
7:00 – 7:10	Martin Refuge – Steve Shore Protection and Cove Restoration
7:10 – 7:30	Rhodes Point Alternatives – Larry and Daria
7:30 – 7:40	Wastewater Treatment Plants – Bruce Laswell and CJ
7:40 – 7:50	Solid Waste Management - Joyce DeLaurentis
7:50 – 8:00	Questions/discussion - Daria and team
8:00 – 8:05	Summary and next actions - Daria
8:05	Thanks for coming – CA-A

Display Boards: Original problem identification map; aerial photos; alternatives for Rhodes Point, the west shoreline and coves of the refuge; concepts/photos/cross sections

Personnel: Daria Van Liew, Larry Mathena; Steve Kopecky, CJ Winand, Carol Anderson-Austra (Corps); Bruce Laswell (ATS), Joyce DeLaurentis (Md. Rural Community Dev.), Rachel Smyk-Newton and Zoe Johnson (DNR); Mike Harrison and Blackwater rep. (FWS); Robert Street, (Somerset County).

Supplies: Markers, pens, sign-in sheets, candies/baskets, comment cards, handouts, welcome signs, index cards, business cards, name tags, tape, early reports, poster paper.

Prior to Meeting: Arrange chairs, set up displays, organize welcome table with sign-in sheets, handouts, comment cards, candies.

Smith Island Environmental Restoration and Protection Study

Community Meeting

Rhodes Point Community Center, August 15, 2000

Welcome! The purpose of tonight's meeting is to provide information on projects the Corps is involved with on Smith Island. The study team will also introduce several new participants who are working on the Tylerton shore protection project, improvements to the wastewater treatment plants, and on a solid waste management plan. Thank you for joining us this evening.

This meeting is one of a series of meetings that began several years ago and will continue until the projects are complete. Many of you have participated in earlier meetings and know that the process of getting projects constructed is fairly complex. Of the four projects in the 1998 reconnaissance study, the one at Tylerton is ready to begin construction; a second, at Rhodes Point, is in the planning stages; and the remaining two projects are expected to be constructed in the Refuge within the next several years.

As with our other meetings, we are looking for your ideas, concerns, and suggestions about any and all information presented. If you prefer you can write your thoughts on index cards and hand them to one of the study team members or send in one of the comment cards on the sign-in table, or just call or write a note.

Comments may be made at any time during the planning process and all will be incorporated into the project plans and addressed in the feasibility report. You are invited to submit comments at this meeting or at any time by calling Dan Bierly at 410-962-6139 or 1-800-295-1610, or by speaking with any of the team members, by sending fax messages to 410-962-4698, or by regular or electronic mail at the following addresses:

U.S. Army Corps of Engineers
Attn: CENAB-PL-PC (Smith Island)
P.O. Box 1715
Baltimore, Maryland 21203-1715

Internet address: daniel.m.bierly@usace.army.mil

MEETING AGENDA

6:30	Welcome and Introductions – Carol Anderson-Austra
6:40	Status of Projects – Daria Van Liew
6:50	Tylerton Project and Schedule – Larry Mathena and Daria
7:00	Martin Refuge Alternatives – Steve Kopecky Northwest Shore Protection and Cove Restoration
7:10	Rhodes Point Alternatives – Larry and Daria
7:30	Wastewater Treatment Plants – Bruce Laswell and CJ Winand
7:40	Solid Waste Management Plan – Joyce DeLaurentis
7:50	Questions/Discussion – Daria and Team Members
8:00	Summary and next actions – Daria
8:05	Thanks for coming – Carol

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

PLANNING AID REPORT

Prepared For:

Department of the Army
Baltimore District, U.S. Army Corps of Engineers
P.O. Box 1715
Baltimore, Maryland 21203-1715

Prepared By:

Laura R. Mitchell and John W. Gill
Fish and Wildlife Biologists

Under Supervision Of:

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Supervisor

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
March, 1997

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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:

- Protect SAV and potential SAV habitat from physical disruption.
- 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).
- 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).
- 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).
- 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.

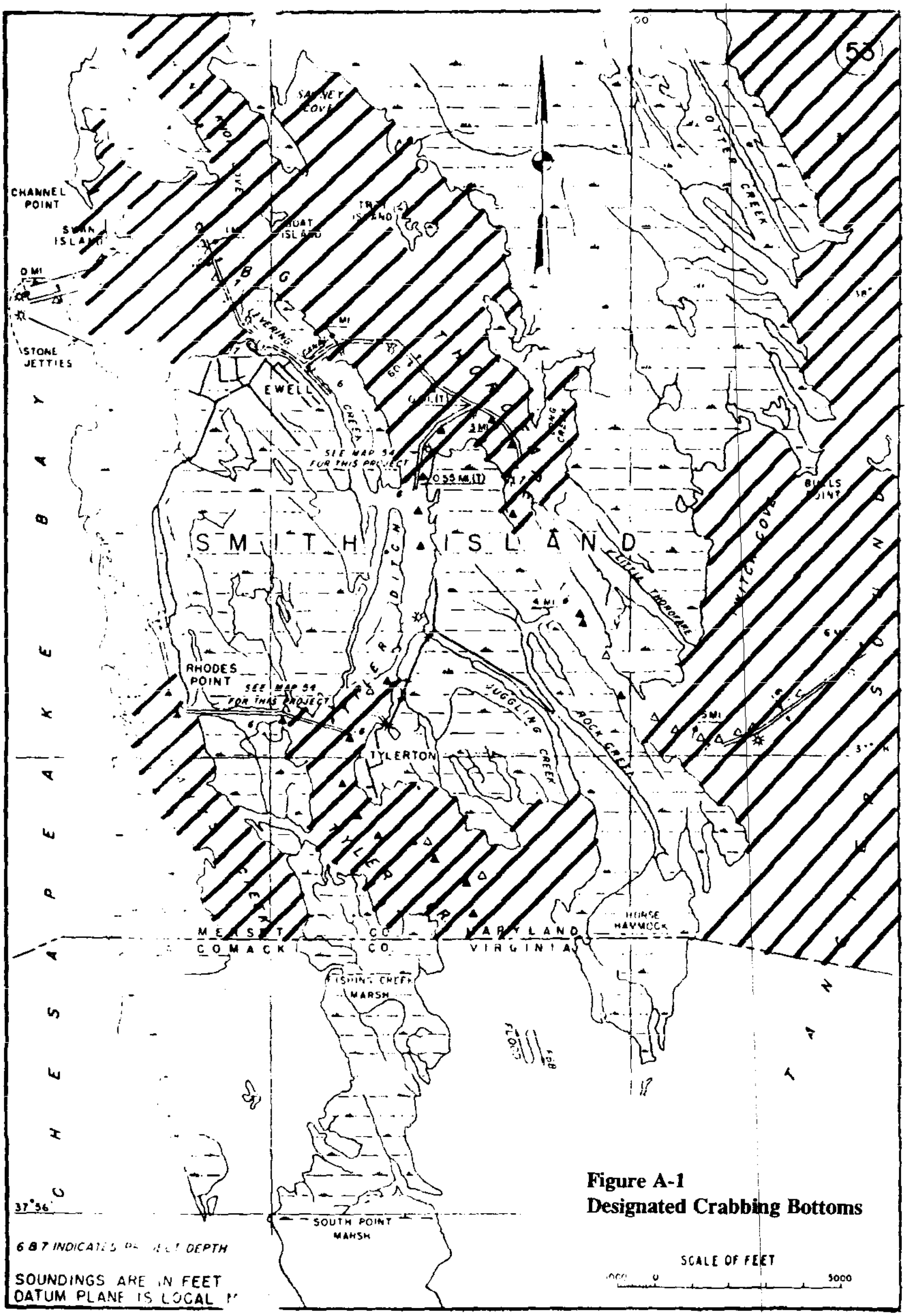

Figure A-1
Designated Crabbing Bottoms

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

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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

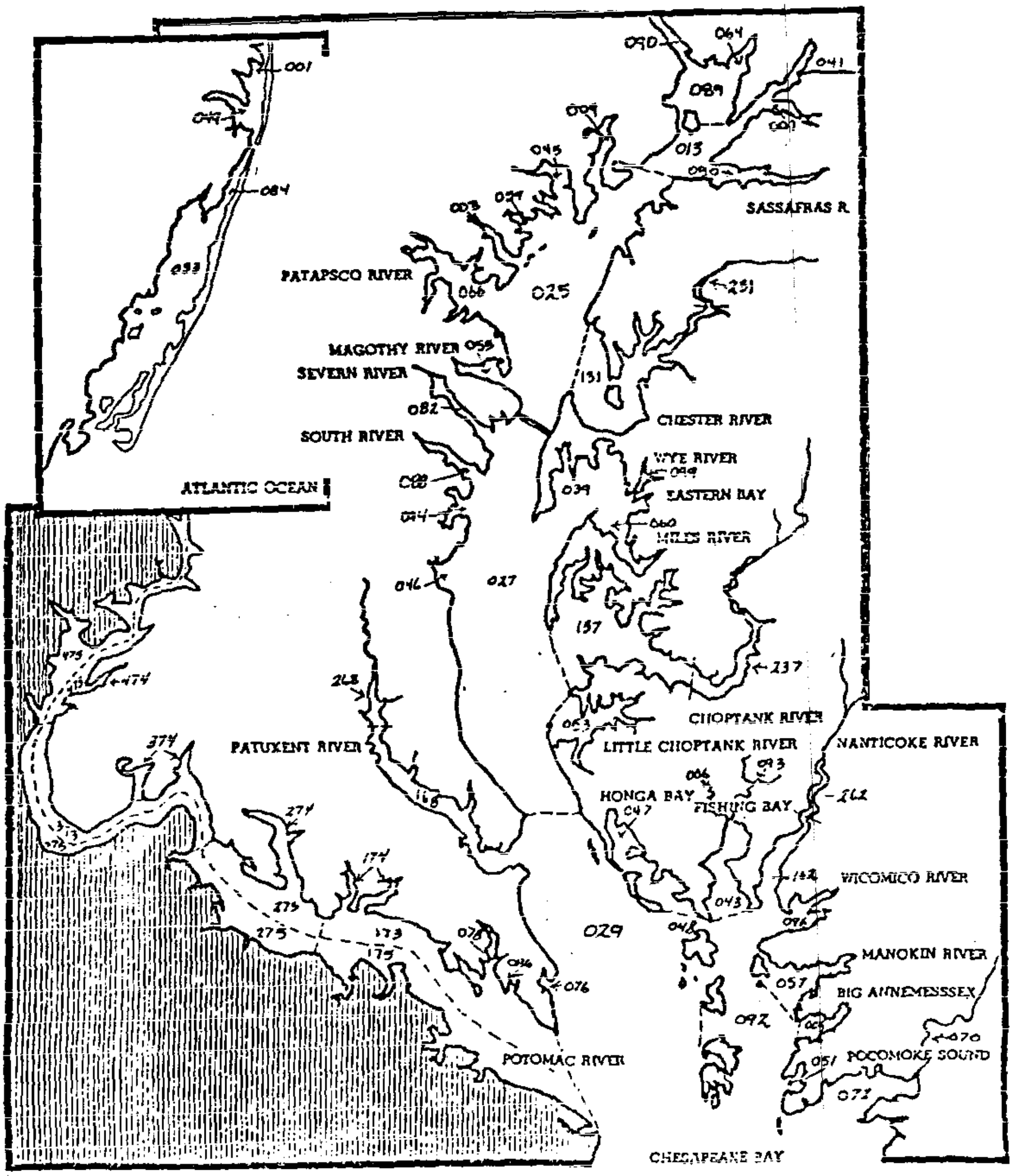
NOAACODE=092 SPECNAME=WHITE PERCH

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

[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.

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[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.**

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ANNEX F

404(b)(1) EVALUATION

CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION
RHODES POINT NAVIGATION IMPROVEMENT PROJECT
SOMERSET COUNTY, MARYLAND

I. Project Description

a. Location

Rhodes Point is located on Smith Island, which is located in the Chesapeake Bay west of the town of Crisfield and Tangier Sound, in Somerset County, Maryland at approximately 37° 58' 00" degrees latitude and 76° 02' 00" degrees longitude. Rhodes Point is only accessible by boat and is at least a 45-minute ride to Chrisfied, MD. The area is shown on the U.S. Geological Survey Kedges Strait 7.5' quadrangle topographic map.

b. General Description

The U.S. Army Corps of Engineers, Baltimore District (the Corps) currently maintains a navigation channel from Rhodes Point northwest for about ½ mile before entering the Bay, where it then stretches southwest to deep water in the open Chesapeake Bay. This channel is subject to continuous sedimentation resulting in the formations of shoals. The area of the channel immediately offshore quickly fills in, and becomes nearly unusable within 3-6 months after maintenance dredging.

The proposed project would construct twin jetties and realign the channel, taking it directly into deep water. The north jetty would be 1,300 ft long and the south jetty would be 1,500 ft. long. The jetties will be placed approximately 200 ft. apart to leave room for the channel traffic and any future scour. In addition, a series of offshore breakwaters will be constructed south of the jetties to provide shoreline protection. The area is severely eroding, which threatens extensive interior marshes. The breakwaters will be approximately 100-ft offshore, and will be 250 ft long with 125-ft. gaps, to allow for water and wildlife access.

The proposed action involves hydraulically dredging a 1,500 ft. long realigned channel to the authorized depth of 6 feet, plus two-foot of allowable overdepth. The dredging of the new channel will create 18,500 cubic yards of material. This material will be placed behind the breakwaters to create 2 acres of marsh, until it is tied into the existing marsh surface. The material will be stabilized with *Spartina alterniflora* and *Spartina patens*.

c. Purpose

The purpose of the proposed action is to increase the effectiveness of the authorized channel and make Rhodes Point more accessible to the Chesapeake Bay for commercial fishing. The channel is in effect unusable, even after regular maintenance. This action will increase the channel's effectiveness and reduce the maintenance interval.

A secondary purpose of the proposed action is to stabilize nearly 1,500 ft of shoreline and create an additional 2 acres of marsh. Stabilizing the marsh will provide valuable fish and wildlife habitat and help protect nearby SAV beds, which have been damaged from the sediments eroded from the nearly marshes.

d. General Description of Discharge Material

(1) *Characteristics of Fill Material* - Approximately 18,500 cubic yards of medium to fine sand and silt material will be dredged from the realigned channel. The jetties and breakwaters will be constructed of placed stone.

(2) *Source of Fill materials*
The stone will be barged in from offshore quarries and the fill material for the marshes will be dredged from the channel realignment.

e. Description of the Proposed Discharge Site

The discharge site will be on the western shoreline of Smith Island. These sites are actively eroding, contributing to severe marsh erosion and have the potential to cause damage to nearby SAV beds. The jetties will be located north and south of the realigned channel, and extend approximately 1,500 ft. into the Bay. The proposed breakwater system would be located in shallow waters, approximately 100 feet channelward of the existing shoreline. The 2-acre marsh creation site will be located landward of the breakwaters, from 100 ft to the island marsh. The filled area is eroded marsh and has low potential for SAV habitat, due to the fine sediments accumulated from the eroded marsh. The fillet site north of the jetty is also eroded marsh, shallow water with fine sediments, and no SAV colonization.

f. Description of Placement Method

Stone will be placed for both the jetties and the breakwaters. The jetties will be continuous stone structures, placed by cranes from barges in the water. The breakwaters will be constructed by cranes located on offshore barges. The jetty tie-outs will be constructed from the land. Approximately 18,500 cubic yards of dredged material will be obtained from the realigned channel. This material will be placed using hydraulic pipeline dredging to fill behind the breakwaters. This area will be graded and planted to tie into the existing marsh and create a functional shoreline protection for the existing island resources. After deposition, the dredged material will be planted with *Spartina alterniflora* and *Spartina patens*.

Best-management practices will be used for construction and dredging activity. These include time of year restrictions, proper construction sequencing, and the use of all appropriate sediment and erosion control techniques.

g. Alterations Considered

Fill will be placed to avoid sensitive areas of the Bay bottom, including oyster bars, SAV beds, or known spawning areas. The dredged material will be used for beneficial purposes, habitat creation and shoreline protection.

II. Factual Determinations

a. Physical and Substrate Determinations

(1) Substrate elevation and slope – The elevation of Smith Island averages one to two feet above mean high water. Topographic changes are very gentle to essentially flat, and large expanses of shallow water (less than two feet deep) surround the island in all directions. The proposed navigation channel will be dredged to and maintained at a depth of 6 feet plus overdredge.

(2) Sediment Type – The sediment found immediately offshore is predominately sand. The material from the interior of the channel is comprised of an approximately 50-50 mixture of fine sand and silt.

(3) Dredged/Fill Material Movement – The jetties are designed to limit sedimentation within the channel bottom, allowing for continued boat access. At the placement sites, equilibrium is expected to develop behind the breakwaters, creating crescent shaped peninsulas commonly observed behind breakwaters. The material will tie into existing marsh and create additional marsh habitat. The jetties are expected to allow for accumulation north of the jetty structure, which will create additional sandy beach for terrapin breading. Because the placement sites will be planted, the material is expected to stabilize within a full season after construction. Wave and tidal action, the predominate causes of erosion, are expected to be reduced by the proposed project and no significant material movement is expected.

(4) Other Effects – Wave energy is expected to be reduced, reducing erosion on the island behind the breakwaters and in lee of the jetties.

(5) Actions Taken to Minimize Impacts – The construction sequence will be coordinated with the environmental agencies to minimize the movement of material. Construction of the breakwaters prior to channel dredging will minimize the movement of material placed behind the breakwater structures.

b. Water Circulation, Fluctuation, and Salinity Determinations

(1) *Water*

(a) Salinity - No change expected.
(b) Chemistry - No change expected.
(c) Clarity - Minor and temporary reduction expected during placement due to turbidity. No long-term impact expected.

(d) Color - Minor and temporary change expected during construction due to minor increase in turbidity. No long-term impact expected.
(e) Odor - No change expected.
(f) Taste - Not applicable.
(g) Dissolved Gas Levels – Changes in dissolved gas levels and content are expected to occur at the placement sites as a result of the transition from a shallow water habitat to a tidal marsh wetland. No negative impacts are expected.
(h) Nutrients – Minor, short-term releases of nutrients can be expected. The material to be dredged is predominantly fine sand and silt with a low fines/organic component and nutrient releases are expected to be minimal.
(i) Eutrophication - Not expected to occur.
(j) Temperature - No change expected.

(2) *Current Patterns and Circulation*
(a) Current Patterns and Flow – Minimal effects are expected.
(b) Velocity – Some increase in velocity can be expected within the jetties, which may help keep the channel open to its authorized depth. However, these are not expected to be significant. In addition, slowing of velocity is expected to occur at the placement sites as a result of the construction of shoreline stabilizing tidal marsh wetlands.
(c) Stratification – No change in stratification is expected to occur with the project. The substrate is similar in composition to the dredged material, and no negative impacts are expected.
(d) Hydrologic Regime – The hydrologic regime at the placement site will change from a shallow water system to a tidal marsh wetland system.

(3) *Normal Water Level Fluctuations* – A change in water depth will occur within the placement site as a result of the placement of one to two feet of dredged material allowing the conversion of a shallow water area into tidal marsh wetlands. No change in water levels will occur.
(4) *Salinity Gradients* - No change expected.
(5) *Actions Taken to Minimize Impacts* – Not Applicable.

c. Suspended Particulate/Turbidity Determinations

(1) *Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Placement Site* - Minor, localized, and short-term impacts are expected to occur in the area of the placement sites. Coarse grain-size material will rapidly settle out of suspension. Finer grained material may take 24 to 36 hours before settling. Turbidity levels are expected to rapidly return to background levels once placement is completed.

(2) *Effects (degree and duration) on Chemical and Physical Properties of the Water Column*
(a) Light Penetration - Minor, temporary, and localized reduction in light penetration is expected to occur within the contained areas during placement.
(b) Dissolved Oxygen - Minor, temporary, and localized reduction in dissolved oxygen due to turbidity may occur during construction.

(c) Toxic Metals and Organics - No toxic metals or organics are expected to be released into the water column.
(d) Pathogens - No pathogens are expected to be released into the water column.
(e) Aesthetics – Minor and temporary impacts may occur during placement of the material due to clouding of water and the presence of manmade equipment.
(f) Temperature - No change expected.

(3) *Actions Taken to Minimize Impacts* – If seasonal restrictions to protect water quality are identified, they will be observed. All work will conform to the requirements of the State Water Quality Certification.

d. Contaminant Determinations

No evidence exists to suggest the presence of contaminants in the vicinity of the proposed dredging or placement site.

e. Aquatic Ecosystem and Organism Determinations

(1) *Effects on Plankton* - Impacts from the discharge of fill materials which will result in increased turbidity during construction are anticipated to be minor and temporary. No detrimental long-term impacts are expected.

(2) *Effects on Benthos* – Placement of the jetty and breakwater structures will result in the conversion of bare fine sand substrate to rock and salt marsh. The proposed placement site supports two habitat types. Riprap habitat with rock crevices will develop along the stone jetties and breakwaters. Non-mobile benthic organisms will be destroyed at the time of construction. Mobile benthos will relocate at the time of construction. The salt marsh created by the project will produce resultant long-term benefits to the benthic community by providing foodweb support.

(3) *Effects on Nekton* - Nekton are expected to be temporarily disturbed during placement but to return after project completion. Long-term benefits to nekton are expected to result from the construction of a tidal marsh.

(4) *Effects on Aquatic Food Web* - The food web at the placement site will experience permanent changes from a shallow water-based to a tidal marsh wetland based food web. This will provide foodweb support and will compensate for recent salt marsh losses due to erosion.

(5) *Effects on Special Aquatic Sites*

(a) Sanctuaries and Refuges - This project will have no effect. Martin National Wildlife Refuge, is located nearly 1.5 miles to the north.
(b) Wetlands - The project will create approximately 2 acres of tidal marsh wetlands. This is expected to provide habitat for fish and wildlife.
(c) Tidal flats - Not applicable.
(d) Vegetated Shallows - SAV has been found off the western shoreline. Impacts to SAV have not been determined. Coordination with resource agencies will determine

whether former SAV beds should be avoided. By reducing erosion, there may be an increase in light attenuation, leading to beneficial effects on local SAV beds.

(6) Threatened and Endangered Species - No effects to rare, threatened or endangered species are expected as a result of this project.

(7) Other Wildlife - It is expected that shorebirds, terrapins, and other mobile species will temporarily relocate during construction.

(8) Actions to Minimize Impact - The existence of high-value SAV is of primary concern within the project area. Coordination with resource agencies during public review of this report will determine whether additional measures to minimize impacts are needed.

f. Proposed Disposal Site Determinations

(1) *Mixing Zone Determination* - Not applicable.
(2) *Determination of Compliance with Applicable Water Quality Standards* - Construction activities will be conducted in accordance with all applicable State water quality standards.
(3) *Potential Effects on Human Use Characteristic*

(a) Municipal and Private Water Supply - Not applicable.
(b) Recreational and Commercial Fisheries - Construction may temporarily impede navigation activity. The creation of tidal marsh wetlands will provide habitat for juvenile game species as well as for baitfish and crabs.
(c) Water Related Recreation - Construction may temporarily impede recreational boat use. The impacts are expected to be minor and temporary.
(d) Aesthetics - A temporary and minor reduction in aesthetic value within the area of construction is expected to occur during placement of the riprap and dredged material. Long-term improvements are expected through the increase in marshland.
(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves – No adverse effects are expected.

g. Determination of Cumulative Effects on the Aquatic Ecosystem – This project will effectively maintain a realigned navigation channel, while reducing erosion and creating additional wetlands along the western shoreline of Smith Island. Minor losses of shallow water habitat will occur. Protection from erosion will reduce the sediment discharge within the project area. Thus, cumulative adverse effects on the aquatic ecosystem are expected to be minor and beneficial impacts are expected for the local area.

h. Determinations of Secondary Effects on the Aquatic Ecosystem - Indirect effects resulting from the project have been discussed previously in this analysis under each category. No significant detrimental secondary effects are anticipated.

III. Finding of Compliance

a. <u>Adaptation of the Section 404(b)(1) Guidelines to This Evaluation</u> - No adaptations of the Guidelines were made relative to this Evaluation.

b. <u>Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem</u>. - The project is by its nature water-dependent and will require activity within the aquatic realm.

c. <u>Compliance With Applicable State Water Quality Standards</u>. - The proposed placement of fill material will comply with Maryland State Water Quality Standards.

d. <u>Compliance With Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act</u>. - The proposed fill material is not anticipated to violate the Toxic Effluent Standard of Section 307 of the Clean Water Act.

e. <u>Compliance With Endangered Species Act of 1973</u> – The project is in full compliance with the endangered species act.

f. <u>Compliance With Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972</u> - No Marine Sanctuaries, as designated in the Marine Protection, Research, and Sanctuaries Act of 1972, are located within the study area.

g. <u>Evaluation of Extent of Degradation of Waters of the United States</u> - The proposed placement of fill material will not result in significant adverse impacts on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and wildlife will not be significantly adversely affected. Significant adverse impacts on aquatic ecosystem diversity, productivity and stability, and recreation, aesthetics and economic values will not occur as a result of the project.

h. <u>Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem</u> – Appropriate steps to minimize potential impacts of the placement of fill material in aquatic systems will be followed. On the basis of the guidelines, the proposed placement site are specified as complying with the inclusion of appropriate and practical conditions to minimize contamination or adverse effects to the aquatic ecosystem.

ANNEX G

ESSENTIAL FISH HABITAT ASSESSMENT

ESSENTIAL FISH HABITAT ASSESSMENT

RHODES POINT SECTION 107 SMALL NAVIGATION PROJECT

Proposed Action: Construction of Twin Jetties with a Realigned Navigation Channel and Offshore Breakwaters with Placement of Dredged Material and Wetlands Creation At Sheep Pen Gut near Rhodes Point, Smith Island, Maryland

February 2002

Prepared By the Baltimore District U.S. Army Corps of Engineers

PROJECT BACKGROUND

The Baltimore District, U.S. Army Corps of Engineers proposes a Section 107 small navigation project at Sheep Pen Gut near Rhodes Point on Smith Island, Maryland. The project consists of the construction of twin jetties, one to either side of a realigned navigation channel. The jetty on the northern side of the channel will be 1,500 feet long, and the jetty on the southern side of the channel will be 1,300 feet long. The jetties will follow the path of the realigned navigation channel to deep water in the Bay. The jetties will be placed a minimum of 200 feet apart to provide adequate room for the channel and possible enlargement of the channel due to natural scour. The realigned channel will be 1,500 feet long, requiring approximately 18,500 cubic yards of dredging.

The project also features the construction of four offshore-segmented breakwaters. The breakwaters will be 250 feet long with 125-foot gaps, and will be placed approximately 100 feet from the shoreline. The breakwaters were sized and placed to take advantage of the existing shoreline irregularities. The breakwaters will provide a dredged material placement site and 1,500 feet of shoreline stabilization. Material dredged from the realigned navigation channel will be placed behind the breakwaters. Wetland plantings behind the breakwaters will restore approximately 2 acres of marshland along the shoreline.

ESSENTIAL FISH HABITAT (EFH) DESIGNATION

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act strengthened the ability of National Marine Fisheries Service (NMFS) to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. These habitats are termed "essential fish habitat (EFH)" and are defined in the Code of Federal Regulations (CFR) 50, part 600, to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity".

In 1998, the Magnuson-Stevenson Fishery Conservation and Management Act regulations required that EFH areas are identified for each fishery management plan and that all Federal agencies consult with NMFS on all Federal actions that might adversely affect EFH. Under the Magnuson-Stevenson Fishery Conservation and Management Act each Federal agency must identify the fish species of concern and prepare an analysis of the effects of the proposed action. The agency must also give its views regarding the effects of the proposed action and propose mitigation if applicable.

The NMFS has indicated that the EFH analysis and determination may be incorporated as part of the National Environmental Policy Act (NEPA) process or as a separate document such as this EFH assessment. The EFH areas have been designated by the Fishery Management Councils and were published in March 1999 by NOAA/NMFS as the "Guide to Essential Fish Habitat in the Northeastern United States, Volume V: Maryland and Virginia".

After consultation with NMFS, it was determined that the area of Sheep Pen Gut near Rhodes Point on Smith Island in Somerset County, Maryland, which is under consideration for a Section 107 small navigation project, lies within the general area that may provide EFH for some of the species managed by NMFS. Species of concern are: Summer Flounder *(Paralicthys dentatus)*, Windowpane Flounder *(Scopthalmus aquosus)*, Bluefish *(Pomatonus saltatrix)*, Cobia *(Rachycentron Canadum)*, Red Drum *(Sciaenops ocellatus)*, King Mackerel *(Scomberomorus cavalla)*, and Spanish Mackerel *(Scomberomorus maculatus)*. The District obtained this information from the EFH website (www.nero.nmfs.gov) maintained by NMFS.

Furthermore, the District coordinated with the NMFS Region X Oxford, Maryland field office to further refine the EFH assessment for this action. The biologists at the Oxford field office offered the following advise for tailoring the EFH website information to the Rhodes Point Section 107 small navigation project assessment:

NMFS recommended that the EFH assessment focus on the Summer Flounder (juveniles and adults) and the bluefish (particularly the juvenile life stage). According to NMFS, Summer Flounder are rare in the waters of the Chesapeake Bay near Smith Island, but juvenile bluefish are common.

Also, NMFS recommended that the rest of the species of concern, except for the Windowpane Flounder, be recognized in the assessment as occurring in the Bay but very rarely in the northern Bay. They usually are more common in the southern part of the Bay, off the western shore of Virginia, and are more oriented to an oceanic environment and salinity range.

For the Windowpane Flounder, NMFS recommended that we minimize the discussion since this species may not even occur in the Chesapeake Bay and is more commonly found in the Northeastern EFH region and is managed by the Northeastern Fisheries Management Council.

PURPOSE & NEED OF THE PROPOSED ACTION

The proposed project will be constructed by the Baltimore District, U.S. Army Corps of Engineers under the general authority of Section 107 of the River and Harbor Act of 1960. The purpose of the proposed project is to provide a safe, direct navigation channel for access to deep water for 30 commercial watermen who use the Sheep Pen Gut channel. A secondary project purpose is to provide shoreline protection on the western shoreline south of Sheep Pen Gut. The need for this project is to eliminate the rapid shoal formation in the existing Federal channel at Sheep Pen Gut. This action will provide improved access to Chesapeake Bay fishing waters.

SPECIES OF CONCERN

1. Summer Flounder (Paralicthys dentatus)
2. Windowpane Flounder (Scopthalmus aquosus)
3. Bluefish (Pomatomus saltatrix)
4. Cobia (Rachycentron canadum)
5. Red Drum (Sciaenops)
6. King Mackerel (Scomberomorus cavalla)
7. Spanish Mackerel (Scomberomorus maculatus)

Summer Flounder (Paralicthys dentatus)

Summer Flounder is a large flatfish common to Maryland waters. Its migration pattern is similar to many other migrating fish species, which enter the bay in the spring and summer and leave with the onset of winter. Its eyes and color are on the left-hand side of its body.

The Summer Flounder prefers sandy substrate and is frequently seen near sandy shores, partly buried in the sand. Summer Flounder can live to be 20 years of age. Juveniles prefer shallower waters. No impacts to spawning or Summer Flounder eggs are projected because spawning occurs during the Atlantic Ocean offshore migration. The eggs are not found in the Chesapeake Bay, and do not occur in the project area. Larvae begin to migrate into the Bay in October.

It is believed that the Summer Flounder is a winter spawner and probably seeks deep water. Since the Summer Flounder is not usually found in the project area during the winter there is no reason to believe that the area is used for spawning. This species is rarely found north of the Virginia border.

Eggs: 1) North of Cape Hatteras, EFH for eggs is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90% of the all the ranked ten-minute squares for the area where Summer Flounder eggs are collected in the MARMAP survey. 2) South of Cape Hatteras, EFH is the waters over the Continental Shelf (from the coast out to the limits of the EEZ), from Cape Hatteras, North Carolina to Cape Canaveral, Florida, to depths of 360 ft. In general, Summer Flounder eggs are found between October and May, being most abundant between Cape Cod and Cape Hatteras, with the heaviest concentrations within 9 miles of shore off New Jersey and New York. Eggs are most commonly collected at depths of 30 to 360 ft.

Larvae: 1) North of Cape Hatteras, EFH for larvae is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90% of all the ranked ten-minute squares for the area where Summer Flounder larvae are collected in the MARMAP survey. 2) South of Cape Hatteras, EFH is the nearshore waters of the Continental Shelf (from the coast out to the limits of the EEZ), from Cape Hatteras, North Carolina to Cape Canaveral Florida, in near shore waters (out to 50 miles from shore). 3) Inshore, EFH is all the estuaries where Summer Flounder were identified as being present (rare, common, abundant, or highly abundant) in the ELMR database, in the "mixing" (defined in ELMR as 0.5 to 25.0 ppt) and "seawater" (defined in ELMR as greater than 25 ppt) salinity zones.

In general, Summer Flounder larvae are most abundant near shore (12-50 miles from shore) at depths between 30 to 230 ft. They are most frequently found in the northern part of the Mid-Atlantic Bight from September to February, and in the southern part from November to May. The larvae enter the Bay from October through May and move into the shallows (Murdy 1997).

Juveniles: Juvenile Summer Flounder are generally distributed inshore and in estuarine areas throughout their range during the spring, summer, and fall. During colder months they move into deeper waters and can be found offshore with adults.

1) North of Cape Hatteras, EFH is the demersal waters over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90% of all the ranked ten-minute squares for the area where juvenile Summer Flounder are collected in the NEFSC trawl survey. 2) South of Cape Hatteras, EFH is the waters over the Continental Shelf (from the coast out to the limits of the EEZ) to depths of 500 ft, from Cape Hatteras, North Carolina to Cape Canaveral, Florida. 3) Inshore, EFH is all of the estuaries where Summer Flounder were identified as being present (rare, common, abundant, or highly abundant) in the ELMR database for the "mixing" and "seawater" salinity zones. In general, juveniles use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 37 °F and salinities from 10 to 30 ppt range. Juvenile Summer Flounder utilize shallow water and eelgrass beds (Murdy 1997).

Adults: 1) North of Cape Hatteras, EFH for adults is the demersal waters over the Continental Shelf (from the coast out to the limits of the EEZ), from the Gulf of Maine to Cape Hatteras, North Carolina, in the highest 90% of all the ranked ten-minute squares for the area where adult Summer Flounder are collected in the NEFSC trawl survey. 2) South of Cape Hatteras, EFH is the waters over the Continental Shelf (from the coast out to the limits of the EEZ) to depths of 500 ft, from Cape Hatteras, North Carolina to Cape Canaveral, Florida. 3) Inshore, EFH is the estuaries where Summer Flounder were identified as being common, abundant, or highly abundant in the ELMR database for the "mixing" and "seawater" salinity zones. Generally Summer Flounder inhabit shallow coastal and estuarine waters during warmer months and move offshore on the outer Continental Shelf at depths of 500 ft in colder months. Adults utilize deep channels, ridges, sandbars, and shallow water with sandy bottoms. After the age of 3, adults predominantly remain in ocean waters (Murdy 1997).

Summer Flounder are found from Nova Scotia to Florida along the continental shelf and estuarine waters. Their center of abundance is in the mid-Atlantic Bight area. The stock is considered overexploited and at a medium level of historical abundance. Temporal and spatial distribution have been correlated with temperature and salinity. Generally adults and older juveniles are found in the winter in the middle and outer continental shelf areas. Adult Flounder are found in inshore shallow coastal and estuarine areas during the summer.

Spawning: Summer Flounder are ocean spawners. Spawning occurs during the offshore ocean migration from late summer to mid-winter (Murdy 1997). Adults spawn while moving offshore in autumn and early winter; spawning activity peaks in October in the Atlantic Ocean north of the Chesapeake Bay.

Prey: Summer Flounder feed mainly on small fish, squids, shrimp, and crabs. The Summer Flounder prefers sandy substrate and is frequently seen near sandy shores, partly buried in the sand. Color adaptation is developed to a very high degree.

Impact on Summer flounder: No impacts are expected to adults or juveniles during the proposed activities. No impacts to spawning or Summer Flounder eggs will occur since spawning occurs during the offshore Atlantic Ocean migration. The eggs sink to the bottom, cling together, and do not relocate outside the spawning grounds. Larvae begin to migrate into the Bay in October, usually overwintering and growing in the southern portion of the Bay. Summer Flounder juveniles and adults are rarely found in the Bay near Smith Island. Even if they are present in the construction area the impact to the species or the Summer Flounder fishery will be very minor and temporary. If the hydraulic dredging (at most) impacts a few individuals, the population will rebound within the next season.

Windowpane Flounder *(Scophthalmus aquosus)*

Windowpane Flounder is another small to medium flatfish common to Chesapeake Bay waters near the proposed project area. Its migration pattern is similar to many other migrating fish species, which enter the Bay in the spring and summer and leave with the onset of winter. The Windowpane Flounder is a food fish in the Bay, though most are too small to be commercially valuable, and is caught from March until November.

Windowpane Flounder are distributed from the Gulf of St. Lawrence to Florida. The stock is considered overexploited with a low biomass level. Spawning occurs from April through December in the Mid-Atlantic Bight area, with peaks in May and October. Relative to the rare occurrences of Summer Flounder in the Bay waters surrounding Smith Island, the Windowpane Flounder is even less frequently sighted. ((NFMS-Oxford) Nichols and Goodger, pers. comm, 2000)

Eggs: Windowpane Flounder eggs are found in surface waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally the following conditions exist where Windowpane Flounder eggs are found: sea surface temperatures less than 20C and water depths less than 70 meters. Windowpane Flounder eggs are often observed from February to November with peaks in May and October in the middle Atlantic and July - August on Georges Bank.

Larvae: Pelagic waters around the perimeter of the Gulf of Maine, on Georges Bank, southern New England, and the middle Atlantic south to Cape Hatteras. Generally, the following conditions exist where Windowpane Flounder larvae are found: sea surface temperatures less than 20C and water depths less than 70 meters. Windowpane Flounder larvae are often observed from February to November with peaks in May and October in the middle Atlantic and July through August on Georges Bank.

Juveniles: Bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to Cape Hatteras are used by juveniles Windowpane Flounder. Generally, the following conditions exist where Windowpane Flounder juveniles are found: water temperatures below 25C, depths from 1 – 100 meters, and salinities between 5.5 – 36ppt.

Adults: Bottom habitats with a substrate of mud or fine-grained sand around the perimeter of the Gulf of Maine, on Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border are used by adult Windowpane Flounder. Generally, the following conditions exist where Windowpane Flounder adults are found: water temperatures below 26.8C, depths from 1-75 meters, and salinities between 5.5 – 36ppt.

Prey: Windowpane Flounder feed mainly on fish, shrimp, crabs, and benthic worms.

Spawning Adults: Bottom habitats with a substrate of mud or fine-grained sand in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to the Virginia-North Carolina border are used for spawning. Generally, the following conditions exist where Windowpane Flounder adults are found: water temperatures below 21C, depths from 1 - 75 meters, and salinities between 5.5 – 36ppt. Windowpane Flounder are most often observed spawning from February to December with a peak in May in the middle Atlantic.

The Windowpane Flounder is not usually found in the project area during the winter, so there is no reason to believe that this area is used for spawning. The Windowpane Flounder prefers sandy substrate and is frequently seen near shores, partly buried in the sand.

Impact on Windowpane Flounder: No impacts are expected to adults or juveniles during the proposed activities. No impacts to spawning or Windowpane Flounder eggs will occur since spawning occurs during the offshore Atlantic Ocean migration. The eggs sink to the bottom, cling together, and do not relocate outside the spawning grounds. Larvae begin to migrate into the Bay in October, usually overwintering and growing in the southern portion of the Bay. Relative to the rare occurrences of Summer Flounder in Smith Island waters, the Windowpane Flounder is an even more rare visitor. ((NFMS-Oxford) Nichols and Goodger, pers. comm. 2000). Even if they are present in the project area, the impact to the species or the Windowpane Flounder fishery will be very minor and temporary. If the hydraulic dredging (at most) impacts a few individuals, the population will rebound within the next season.

Bluefish *(Pomatomus saltatrix)*

Bluefish is a pelagic, schooling species that supports a large recreational and commercial fishery along the Atlantic Coast. It is generally found from Nova Scotia to Brazil, including the Gulf of Mexico. It also occurs on continental shelves, in estuaries of temperate and tropical waters, and around much of the world except the eastern Pacific. Bluefish reach sexual maturity at age 2, can live more than 12 years, and are usually found high in the water column. Maximum adult size is 1.1 m (3.6 ft). There is much variability in bluefish abundance from year to year. In some years, large numbers of bluefish penetrate far up the Bay; in other years, bluefish schools are sparse, with larger bluefish concentrating in Virginia waters. In the Chesapeake Bay, most of the catch is through the use of gill nets or pound nets (Murdy 1997).

Bluefish are highly migratory, pelagic fish that are found along the entire Atlantic coast. Bluefish stock is considered overexploited and is currently at levels considered below sustainable yield. Southern fish spawn from April to May and Mid-Atlantic Bight (MAB) fish spawn from June through August. Temperature and salinity are the principal factors influencing spawning. Juvenile fish feed on polychaetes, crustaceans, and fish. Adult bluefish feed on a wide variety of pelagic and demersal fish and invertebrates. Bluefish are food for sharks, swordfish, tuna, and wahoo.

Eggs: 1) North of Cape Hatteras, EFH for eggs is pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ) at mid-shelf depths, from Montauk Point, NY south to Cape Hatteras in the highest 90% of the area where bluefish eggs were collected in the MARMAP surveys. 2) South of Cape Hatteras, EFH is 100% of the pelagic waters over the Continental Shelf (from the coast out to the eastern wall of the Gulf Stream) through Key West, Florida at mid-shelf depths. Bluefish eggs are generally not collected in estuarine waters and thus there is no EFH designation inshore for eggs. Generally, bluefish eggs are collected between April through August in temperatures greater than 64 °F (18 °C) and normal shelf salinities (>31 ppt).

Larvae: 1) North of Cape Hatteras, EFH for larvae is pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ) most commonly above 49 ft (15 m), from Montauk Point, New York south to Cape Hatteras, in the highest 90% of the area where bluefish larvae were collected during the MARMAP surveys. 2) South of Cape Hatteras, EFH is 100% of the pelagic waters greater than 45 feet over the Continental Shelf (from the coast out to the eastern wall of the Gulf Stream) through Key West, Florida. 3) EFH also includes the "slope sea" and Gulf Stream between latitudes 29° 00 N and 40° 00 N. Bluefish larvae are not generally collected inshore so there is not EFH designation inshore for larvae. Generally, bluefish larvae are collected April through September in temperatures greater than 64 °F (18 °C) in normal shelf salinities (>30 ppt).

Bluefish are ocean spawners; although recently hatched larvae have been collected within the mouth of the Chesapeake Bay. Eggs and early larvae should not be found as far up the Bay as the Potomac River (Lippson 1974). Late larvae and juveniles migrate into the Bay and into the Potomac on occasion (Murdy 1997).

Juveniles: 1) North of Cape Hatteras, EFH for juveniles is pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ) from Nantucket Island, Massachusetts south to Cape Hatteras, in the highest 90% of the area where juvenile bluefish are collected in the NEFSC trawl survey. 2) South of Cape Hatteras, EFH is 100% of the pelagic waters over the Continental Shelf (from the coast out to the eastern wall of the Gulf Stream) through Key West, Florida. 3) EFH also includes the "slope sea" and Gulf Stream between latitudes 29° 00 N and 40° 00 N. 4) Inshore, EFH is all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida.

Generally juvenile bluefish occur in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from May through October, and South Atlantic estuaries March through December, within the "mixing" and "seawater" zones (Nelson *et al.* 1991, Jury *et al.* 1994, Stone *et al.* 1994). Distribution of juveniles by temperature, salinity, and depth over the continental shelf is undescribed (Fahay 1998). Early juveniles [25-50 mm (1.0-2.0 in.) total length] enter the lower Bay and its tributaries in later summer and fall. Young-of-the-year also moves into the Bay in late summer and fall, tending to concentrate in shoal waters. In contrast to adults, the young have a wide range of salinity tolerance and penetrate much farther up the Bay and its tributaries, where they can be found in waters of very low salinity (Murdy1997).

Adults: 1) North of Cape Hatteras, EFH is the pelagic waters found over the Continental Shelf (from the coast out to the limits of the EEZ), from Cape Cod Bay, Massachusetts south to Cape Hatteras, in the highest 90% of the area where adult bluefish were collected in the NEFSC trawl survey. 2) South of Cape Hatteras, EFH is 100% of the pelagic waters over the Continental Shelf (from the coast out to the eastern wall of the Gulf Stream) through Key West, Florida. 3) Inshore, EFH is all major estuaries between Penobscot Bay, Maine and St. Johns River, Florida. Adult bluefish are found in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from April through October, and in South Atlantic estuaries from May through January in the "mixing" and "seawater" zones (Nelson *et al.* 1991, Jury *et al.* 1994, and Stone *et al.* 1994). Bluefish adults are highly migratory and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish are generally found in normal shelf salinities (> 25 ppt).

Bluefish travel in schools, especially in deeper water. The bluefish is most prevalent just off the Atlantic coast during the summer. Most bluefish weigh from 2 to 15 pounds. Bluefish, especially juveniles, follow herring, menhaden, and other small fish into the middle and upper Chesapeake Bay. The waters of the Eastern Shore of Maryland are especially important to the juveniles. There may be late summer populations of bluefish near Smith Island, although they are unlikely to be near shore. Bluefish are rare in the area during winter months (USACE, 2000).

Adult bluefish overwinter off the southeastern coast of Florida and begin a northward migration in the spring. Bluefish typically enter the Bay in March and April, and are common in the Chesapeake Bay waters from spring through autumn. Bluefish are abundant in the lower Bay and common most years in the upper Bay, though they are not normally found north of Baltimore. In early autumn, bluefish begin to migrate out of the Bay and move south along the coast. Large adult bluefish are not usually found north of Annapolis (Murdy 1997).

Spawning Adults: Temperature and salinity are the principal factors influencing spawning. Optimal temperature and salinity are 11.3°C (78°F) and 31 ppt. Spawning does not occur in the project area. Spring spawning occurs during the coastal ocean migration from Florida to southern North Carolina, and summer spawning occurs further offshore in the mid-Atlantic. In the Maryland and Virginia area, peak spawning occurs in July in the Atlantic Ocean over the outer continental shelf (Murdy 1997).

Southern fish spawn from April to May, and Mid-Atlantic Bight (MAB) fish spawn from June through August. As a result of the two spawning periods, two distinct size groups are encountered annually. After the spring spawn in the ocean, some bluefish move shoreward; the smaller fish generally enter the Chesapeake Bay while the larger fish head farther north.

Prey: Bluefish are sight feeders throughout the water column and are voracious predators. Smaller individuals feed on a variety of fishes and invertebrates, and large bluefish feed almost exclusively on fish, particularly menhaden (*Brevoortia tyrannus*), Bay anchovies (*Anchoa mitchelli*), and Atlantic silversides (*Menida menida*). Juveniles feed on polychaetes, crustaceans, and small fish. The young of species such as Bay anchovy, menhaden, and Atlantic silversides are found predominantly in depths less than 25 m (82.5 ft). Spawning of menhaden occurs near the mouth of the bay or offshore. Bay anchovies broadcast spawn in warmer months. Silversides can begin spawning as early as March in the estuary, but prefer shallow areas. The increase in productivity and stratified reef habitat should provide additional forage for the bluefish.

Impact on Bluefish: No impacts to spawning, egg, or larvae habitat of the bluefish are projected because spawning does not occur in the Chesapeake Bay and the eggs and larvae do not occur in the area. Juveniles prefer shallow waters. Adults are not typically bottom feeders and are strong swimmers. No significant impacts are expected to adults or juveniles during the proposed construction or dredged material placement activities. The relatively small scope of the proposed project when compared to the entire habitat range of the bay will limit the potential for juveniles and adult being adversely affected by the proposed action.

Spawning of menhaden occurs near the mouth of the bay or offshore. Spawning of other prey species of fish and the life cycles of other prey items are mainly during the warmer months and the populations of prey items should be more than adequate in the project area with or without the project.

Cobia (*Rachycentron canadum*)

Cobia is a larger fish (up to 100 lbs.) that can often be found around bottom structures such as pilings and wrecks.

Essential fish habitat for coastal migratory pelagic species includes sandy shoals off of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including *Sargassum*. Other habitat includes coastal inlets. For Cobia, essential fish habitat includes high salinity bays, estuaries, and seagrass habitat. In addition, the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse coastal migratory pelagic larvae. For Cobia, essential fish habitat occurs in the South Atlantic and Mid-Atlantic Bights.

Eggs: Spawning occurs from mid-June to mid-August near the Bay mouth or just offshore, where Cobia form aggregations (Murdy, 1997). The eggs are buoyant in the water column.

Larvae: Larvae are found in the coastal Atlantic Ocean.

Juveniles: The Chesapeake Bay serves as a nursery ground for Cobia.

Adult: Adults frequent the Chesapeake Bay beginning in late May and migrate out of the Bay and south by mid-October (Murdy, 1997).

Spawning Adult: Spawning occurs from mid-June to mid-August near the Bay mouth or just offshore, where Cobia form aggregations (Murdy, 1997).

Prey: The bulk of their diet is crabs and shrimp, with fish and squid being a small component (Murdy, 1997).

Impact on Cobia: Since the species mainly only occurs in the southern part of the Bay, the potential that the project components would impact the species, in any life stage, is very rare.

Red Drum (*Sciaenops ocellatus*)

Red Drum is one of the larger members of the Sciaenid fish, weighing up to 83 lbs. They are bottom-feeding fish, with the young preferring grassy (SAV) or mud bottoms.

Essential fish habitat includes all of the following habitats to a depth of fifty meters offshore: tidal freshwater; estuarine emergent vegetated wetlands (flooded saltmarshes, brackish marsh, tidal creeks); estuarine scrub/shrub (mangrove fringe); submerged rooted vascular plants (sea grasses); oyster reefs and shell banks; unconsolidated bottom (soft sediments); ocean high salinity surf zones; and artificial reefs. The area covered includes Virginia through the Florida Keys.

Seagrass beds or submerged aquatic vegetation (SAV) prevalent in the Chesapeake Bay and the sounds and bays of North Carolina and Florida are also critical areas for Red Drum, particularly for 1 and 2 year old fish (>750 mm or 29.5 in FL). Seagrass beds, shallow areas of estuarine rivers and mainland shorelines, are where many Red Drums reside during the summer.

Eggs: In a study in Mobile bay (Marley, 1983), Red Drum eggs were carried into bays by high salinity tidal currents. Such transport of eggs is unlikely during periods of high freshwater inflow.

Larvae: Larvae can be found along the Atlantic Coast from Virginia through the Florida Keys, in depth of less than 50 meters, low salinity and 2-33 C in temperature.

Juveniles: Juveniles also can be found along the Atlantic Coast from Virginia through the Florida Keys. Juveniles are throughout Chesapeake Bay from September to November.

Spawning Adult: Red Drum spawn in late summer and fall. During this period they migrate out of estuaries and lagoons and move into deeper water near the mouths of bays and inlets where they spawn. Spawning also takes place on the Gulf side of the Barrier Island and Mississippi Sound (Perret et al.1980). Most Red Drum in the Gulf of Mexico spawn from mid-August to December. On the West Coast of Florida, spawning begins in September and peak in October (Yokel 1966). Along the Atlantic Coast, spawning occurs on the nearshore coastal waters from late summer through fall, with the young of the year appearing in the Bay from August through September. This species is found as far north in the Bay as the Patuxent River (Murdy, 1997).

Prey: These fish, as adults, feed on small fish, blue crabs, shrimp, and various benthic organisms.

Impact on Red Drum: The project is located so far north in the Bay that there is a very rare chance of impacting any life form of this species or its prey items. The project will not impact the red drum population.

King Mackerel (*Scomberomorus cavalla*)

King Mackerel weight up to 90-lbs. King Mackerel range from the Gulf of Maine to South America but regularly occur off the coast of Virginia and North Carolina and not usually found in the Chesapeake Bay. King Mackerel is primarily open water schooling fish. Essential fish habitat for coastal migratory pelagic species includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf Stream shoreward, including *Sargassum*. In addition, all coastal inlets, and all state-designated nursery habitats of particular importance to coastal migratory pelagic are EFH. For King Mackerel essential fish habitat occurs in the South Atlantic and Mid-Atlantic Bights. It is a coastal pelagic species and generally not found beyond the continental shelf. King Mackerel migrate seasonally with changes in temperature. During the summer they are found in the northern part of their range and in the winter they are found in South Florida.

Eggs: Spawning occurs over the middle and outer portions of the Atlantic continental shelf from July through September.

Larvae: Found in Atlantic Ocean.

Juveniles: Found in Atlantic Ocean.

Adult: King Mackerel adults are mainly found in large schools of similar sized fish migrating along the Atlantic coast. They are occasional visitors to the Bay and are rare in the upper Bay (Murdy, 1997).

Prey: King Mackerel feed mainly on small fish, shrimp and squid.

Impact on King Mackerel: Since no life stages of this species has ever been reported in the project area, or the Upper Bay, no impacts to this species are expected. No impacts to its prey items are anticipated from either component of the project.

Spanish Mackerel (*Scomberomorus maculatus*)

Spanish Mackerel is small fish that can weight up to 20-lbs. Spanish Mackerel range from the Gulf of Maine to the Yucatan Peninsula and are most abundant from the mouth of the Chesapeake Bay region to south Florida. They seasonally migrate along the Atlantic coast to the Gulf of Mexico.

The Maryland DNR provided data from a pound net in the vicinity of Reedville VA, across the bay from Smith Island. Spanish Mackerel was caught in the Reedville net from the last week in May through the middle of September. Although Spanish Mackerel primarily occurred in the lower Chesapeake Bay, there were regular occurrences and occasionally high numbers of mackerel caught at Reedville.

Spanish Mackerel prefer polyhaline regions (18-30ppt) but can also be found in the saltier portions of mesohaline (5-18ppt) waters. Spanish Mackerel occurs in the Bay when water temperatures near the Bay mouth exceed about 17°C and become abundant at about 20°C. (Chittenden Jr., M.E, L.R. Barbieri, and C.M. Jones. 1993 and Spatial and temporal occurrence of Spanish Mackerel in Chesapeake Bay. Fishery Bulletin 91:151-158.)

Eggs: Spanish Mackerel spawn off the western shore of Virginia in the Chesapeake Bay from late spring through late summer (Murdy, 1997).

Larvae: Larvae occur in the water column in inland waters, mainly in the lower bay, of higher salinity.

Juvenile: Juvenile Spanish Mackerel can be found in estuaries and in near shore waters, mainly in the lower Bay.

Spawning Adult: Spanish Mackerel has a protracted spawning period and larvae have been found from April through September in the Atlantic Ocean.

Prey: Spanish Mackerel is a major predator on small schooling fish such as herring, anchovies, and menhaden.

Impact on Spanish Mackerel: The project will not impact the Spanish Mackerel population or its prey species.