DRAFT DETAILED PROJECT REPORT

TANGIER ISLAND JETTY
ACCOMACK COUNTY, VIRGINIA
CONTINUING AUTHORITITIES PROGRAM
SECTION 107
NAVIGATION STUDY

U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

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EXECUTIVE SUMMARY

The study examines the feasibility and environmental effects of implementing measures to protect the navigation channel and harbor located on Tangier Island in Accomack County, Virginia. The feasibility study described in this report was conducted under authority of Section 107 of the River and Harbor Act of 1960 [Public Law (PL) 86-645], as amended, and is part of the U.S. Army Corps of Engineers (USACE) Continuing Authorities Program (CAP). Projects implemented under Section 107 of the CAP are formulated for small commercial navigation in accordance with current policies and procedures.

Tangier Island is located in the Chesapeake Bay approximately 65 miles north of Norfolk, Virginia and lies entirely within the political boundaries of Accomack County on Virginia's Eastern Shore. The section of the island that provided shelter to the navigation channel and harbor has eroded considerably in recent years. This erosion has resulted in a longer fetch, stronger currents and more wave energy, which has resulted in damage to structures within the harbor and infrastructure related to the fishing industry.

The proposed project is located on the shore and in near-shore waters of Tangier Sound, adjacent to Tangier and the Uppards Islands. The Uppards, a large, now uninhabited island of the Tangier Island complex, consists entirely of estuarine wetlands. Tangier Island that still has uplands and is the location of a small inhabited town, also called Tangier, the last island town in Virginia waters of the Chesapeake Bay

The navigation channel and associated harbor is the primary site where the majority of the island’s watermen keep and launch their vessels, as well as where recreational boaters and visitors to the island dock their vessels, which includes postal, medical, and general supply services to the island in addition to tourists. Additionally, an extensive network of facilities dedicated to the soft-shell crab industry line a portion of the channel and harbor area. These facilities provide for substantial income to the islands’ watermen, who make the bulk of their income from the blue crab fishery.

The proposed project involves constructing a stone jetty. The structure will be constructed at the southwestern tip of Uppards Island, extending south into the water approximately 494 feet from its point of origin into the navigation channel. The proposed project would protect the western portion of the navigation channel, the harbor for the town of Tangier, and its associated seafood industry infrastructure. This infrastructure includes crab shedding operations and seafood facilities, docking and moorage facilities, and the working boats of Tangier watermen.

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TANGIER ISLAND JETTY, ACCOMACK COUNTY, VIRGINIA SECTION 107, NAVIGATION STUDY, DRAFT DETAILED PROJECT REPORT

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1. INTRODUCTION

1.1 Authority

The feasibility study described in this report was conducted under authority of Section 107 of the River and Harbor Act of 1960 [Public Law (PL) 86-645], as amended, and is part of the U.S. Army Corps of Engineers (USACE) Continuing Authorities Program (CAP). Projects implemented under Section 107 of the CAP are formulated for small commercial navigation in accordance with current policies and procedures.

The project was initially authorized in 1994 as part of the USACE CAP Section 107 and a reconnaissance report was completed and approved in March 1995. The 1995 reconnaissance report developed a solution to the direct wave attack problems. However with a benefit to cost ratio (BCR) of 0.5, the proposed jetty plan was not economically feasible in accordance with USACE policy for National Economic Development (NED) analyses. Notwithstanding the BCR, Congress determined that the project design and construction was justified in the Water Resources Development Act (WRDA) of 1996 (PL 104-303), stating, "Congress finds that in view of the historic preservation benefits resulting from the project authorized by this section, the overall benefits of the project exceed the costs of the project". The WRDA 2007 House Report H.R. 1495-4, Section 3162 amended Section 577(a) of the WRDA 1996 and authorized design and construction costs at $3.6M.

In 2009, initial funding was received to develop a Project Management Plan (PMP) and to prepare, negotiate and execute a Project Partnership Agreement (PPA) to begin the Design and Implementation (DI) Phase. Upon further review of the study, Headquarters U.S. Army Corps of Engineers (HQUSACE) felt that additional investigation would be required before NAO move into the DI Phase.

HQUSACE provided additional implementation guidance in a 31 MAR 2011 memorandum, requesting that the Norfolk District complete a Section 107 Fact sheet to be submitted for review by the North Atlantic Division (NAD) and the Office of the Assistant Secretary of the Army for Civil Works (ASA(CW)). The guidance also recommended that the Norfolk District complete a Detailed Feasibility Study in the event the ASA(CW) concurs with the Section 107 fact sheet. In December of 2011, Norfolk District submitted a Section 107 fact sheet to NAD and requested approval. In a 25 June 2012 memorandum, the ASA(CW) concurred with the Section 107 fact sheet. NAD approved the fact sheet in a memorandum dated 26 SEP 2012. ASA(CW) and NAD concurrence allowed NAO to proceed with negotiating and executing a Feasibility Cost Sharing Agreement (FCSA) with the Commonwealth of Virginia on 29 September 2012 and the start of a Detailed Feasibility Study.

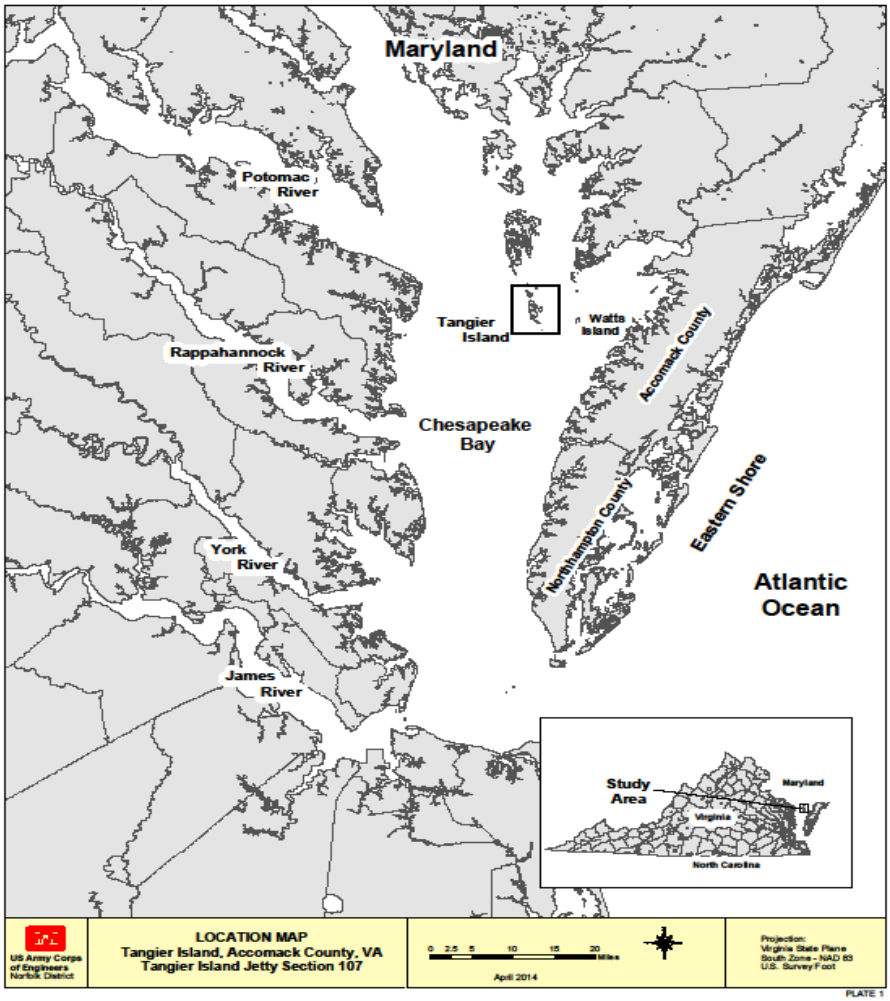
In 2014, the USACE Engineer Research and Development Center began a study of the

investigating the use of jetties in North Channel. The study used numerical and wave modeling to create a series of five jetty designs that would reduce wave energy from entering Tangier Harbor. An economic analysis was completed on the series of designs and one alternative provided a BCR of greater than 1.0. This alternative met all requirements to proceed as a CAP Section 107 Project. The economic analysis will be discussed in greater length later in this report.

1.2 Project Area

Tangier Island complex is located in the Chesapeake Bay approximately 65 miles north of Norfolk, Virginia and lies entirely within the political boundaries of Accomack County on Virginia's Eastern Shore. An area on the western side of the island, which provides shelter to the navigation channel and harbor, has eroded considerably in recent years. The loss of land has resulted in a longer fetch, stronger currents and more wave energy experienced in the navigation channel and harbor. This study examines the feasibility and environmental effects of implementing measures to protect the navigation channel and harbor located on Tangier Island. The vicinity map of the proposed project is shown in Figure 1.

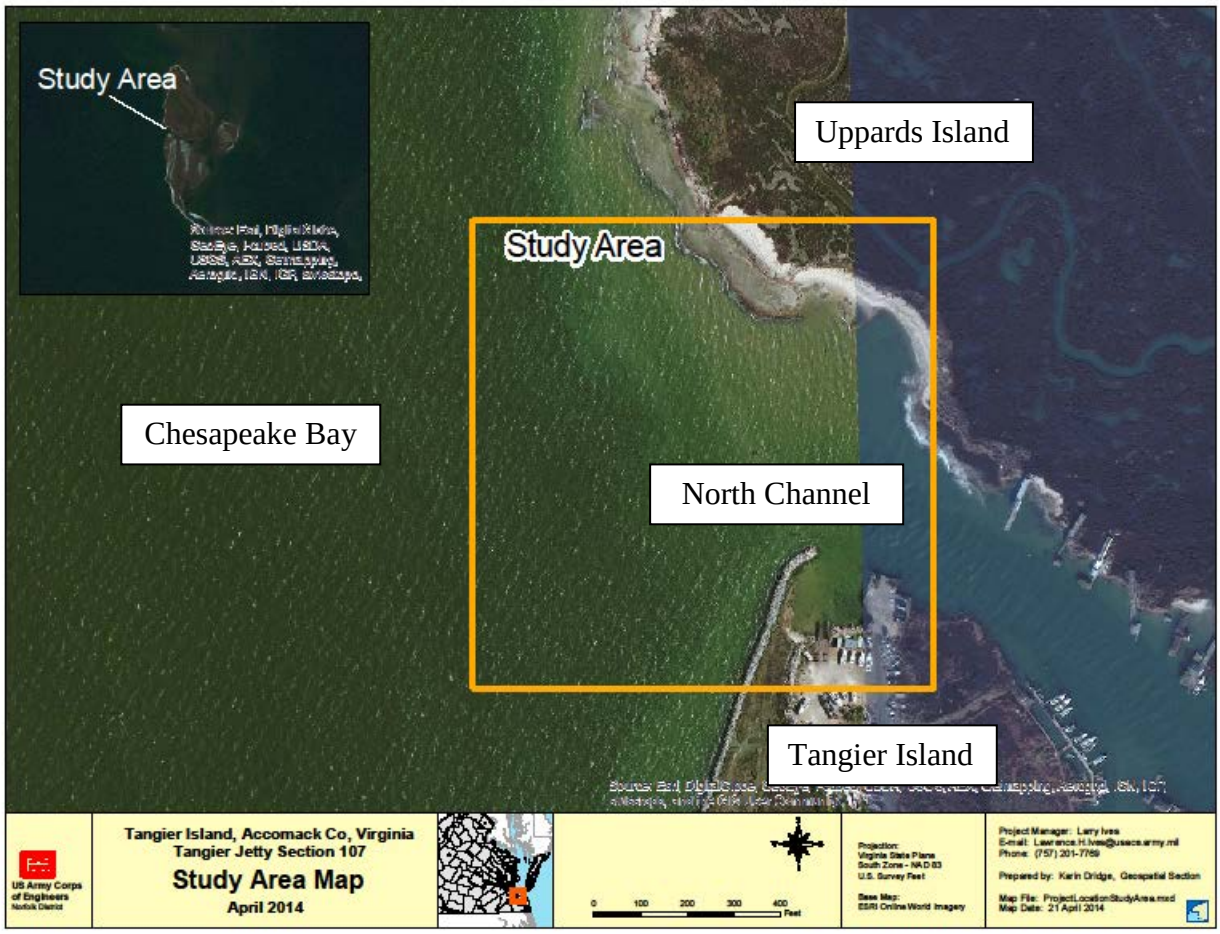
Figure 1: VICINITY MAP OF THE TANGIER ISLAND JETTYACCOMACK COUNTY, VIRGINIA, SECTION 107, NAVIGATION STUDY



The project area is located in the 2nd Congressional District, which has the following congressional delegation.

Senator Tim Kaine (D)
Senator Mark Warner (D)
Representative Scott Rigell (R)

Figure 2: THE PROJECT AREA OF THE TANGIER ISLAND JETTYACCOMACK COUNTY, VIRGINIA, SECTION 107, NAVIGATION STUDY



1.3 Project Scope

This detailed project report (DPR) describes the study and the coordination which was conducted in order to determine whether the Federal Government should participate in implementation of navigation measures on the western shore of the Tangier Island complex. The study considered a wide range of alternatives and the environmental consequences of those alternatives, but focused mainly on actions that would provide efficient and effective management of hazards to navigation in the channel and damages to infrastructure that occur in the channel and harbor. Navigation is a high priority mission for the USACE, and risks to navigation due to erosion of the western shore of the navigation channel of Tangier Island generated sufficient National Economic Development (NED) benefits to allow the USACE to recommend project implementation.

Engineer Regulation 1105-2-100, "*Planning Guidance Notebook*" of USACE defines the contents of a DPR for CAP Section 107 requirements. Engineer Regulation 200-2-2, "*Procedures*

for Implementing NEPA", directs the compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code 4321 *et seq*). An Environmental Assessment (EA) was written for this project and can be found in Appendix C. The conclusions from the EA are included in Section 8.0 of this report.

1.4 Study Participants and Coordination

The Norfolk District, USACE, was primarily responsible for conducting the study of the North channel Tangier Island. The non-Federal sponsor (the Commonwealth of Virginia) and the town of Tangier participated in all phases of the study process. Data presented in this report was obtained from previous studies conducted by ERDC, the Virginia Institute of Marine Science (VIMS) and the University of Maryland. Information was also provided by many individuals and agencies, including the Commonwealth of Virginia, the United States Fish and Wildlife Service (USFWS), the Virginia Historic Preservation Officer, and many members of the public, who contributed information and constructive criticism to improve the quality of this study. This Draft Detailed Project Report and attached EA will be made available to the interested public and appropriate Federal, state, and local agencies.

1.5 National Objective

The Federal objective of water and related land resources project planning is to contribute to NED consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Water and related land resources project plans are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. Contributions to NED increase the net value of the national output of goods and services as expressed in monetary units. NED contributions are the direct net benefits that accrue in the project area and in the rest of the Nation and apply to those goods and services that are marketed, as well as those that may not be marketed.

1.6 Related Studies and Reports

Since 1970, Tangier Island and its erosion problem has been the subject of several studies. From 1970 to 1973, the USACE studied protection for the shoreline adjacent to the southern quarter of the airport runway, which, at that time, was about 600 feet shorter than it is today. A June 1973 DPR recommended the construction of a riprap revetment with sand fill to be placed along the severely eroded area at the south end of the runway. No further action on this study was taken because later that year, the Virginia Division of Aeronautics decided to include shoreline protection measures with their runway extension plans. These plans were implemented in 1976.

In 1975, the Commonwealth of Virginia established an interagency task force to consider the possible solutions to the erosion problem along Tangier Island's western shore. The February

1976 report of the task force recommended construction of a continuous seawall along 8,200 feet of exposed shoreline at a cost of $2,500,000. The project was not recommended because the costs of this shoreline protection project outweighed the economic benefits under USACE planning guidelines. The task force reconvened in 1978 to review the shoreline situation at Tangier Island and the construction of a seawall was again recommended and documented in a report dated December 1978.

In 1979, the Commonwealth of Virginia, in an effort to expedite passage of special Congressional legislation, contracted with the USACE to provide a design, plans and specifications, and a cost estimate for a seawall at Tangier Island. This contract work was completed in June 1980, but the wall was not constructed.

An appraisal report entitled "Shoreline Erosion, Tangier Island, Accomack County Virginia" was completed in May 1986 by the Norfolk District at the request of the Office of the Chief of Engineers in a letter dated 16 October 1985. It investigated erosion along the western shore of the island, south of the North Channel, and concluded that there was a significant erosion problem currently affecting the island's airport runway. It further stated that in the future, the on-going erosion would affect the sewage treatment plant and a number of private homes. The recommended solution to this problem was determined to be an 8,200-foot-long stone riprap seawall. The BCR was well below 1.0; therefore, the report recommended no Federal action.

Section 501(e) of the Water Resources Development Act of 1986 authorized the design and construction of the seawall. It stated that, "Such project shall be carried out on an emergency basis, in view of the national, historic, and cultural value of the island and in order to protect the Federal investment in public facilities." Consequently, the project was redesigned and construction was completed in April 1990.

In June 1982, a report entitled "Evaluation of Long-Term Dredged Material Disposal, Tangier Island, Virginia" was completed for the Norfolk District by J. Woodville Holton, Jr. of Waterway Surveys and Engineering, Ltd and Cyril Galvin, Coastal Engineer. This report investigated placement options for the material dredged during the maintenance of the two navigation channels. One of the options considered was nearshore placement of the dredged material along the west shore of the island. This would create a sacrificial buffer and mitigate erosion of the shoreline, while still supplying a sediment source to the accreting spit at the southern terminus of the island. It was recommended that this option be further evaluated from an engineering standpoint and construction criteria for plans and specification development.

A follow-up report was completed for the Norfolk District by the same firms from the 1982 event in 1983, entitled "Engineering Evaluation of Dredged Material Placement along the West Shore of Tangier Island, Virginia". It used detailed field engineering investigations and actual wind data to conclude that the option under study promised to be a feasible long-term solution to

the placement problem. It also set forth detailed procedures for placement of maintenance dredged material should this area be used in the future.

Initiated in 2001, a final report completed in December of 2012 under the Section 206 CAP authority presented solutions to reduce shoreline erosion and to stabilize the western and northern portions of the Uppards. That report, which incuded and EA was approved by memorandum from the North Atlantic Division dated 21 February 2013. The final report documented the revisions to the 2004 recommended plan, based on the changed conditions in the study area. The updated plan consisted of eight breakwaters placed intermittently to follow the eroding shoreline. Almost 1,300 acres of estuarine wetland, submerged aquatic vegetation (SAV), sheltered shallow water, beach, riparian zone, and dune habitat could be restored and/or protected by the recommended project. The non-Federal sponsor, the town of Tangier, was unable to fund their share of the design and construction costs and no further Federal action was taken at that time.

U.S. Army Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory (CHL) completed a study of Tangier Island. The results of the study were published in March 2015 in a report entitled "*Modeling Study for Tangier Island Jetties, Tangier Island, Virginia*" (ERDC/CRL TR 14-8. ERDC) used numerical wave and flow modeling to evaluate the impact of five jetty designs on a shallow draft navigation channel on Tangier Island. "The primary goal of the study was to develop a quantitative estimate of waves and wave reduction in the canal for a relative comparison of alternatives investigated and for the preliminary structural design calculations". The spectral wave model, CMS-Wave, was used to estimate waves in Chesapeake Bay and propagate waves into the entrance channel and boat canal. The study was used to choose the Tentatively Selected Plan.

1.7 Existing Water Projects

Three USACE water resource projects are located on or adjacent to Tangier Island (Figure 3). Two of those projects, the seawall and a channel project, are located near the proposed project area. A seawall project consists of a continuous 5,700 feet long, shoreline revetment. The project, constructed along the southwestern side of Tangier Island, was built in 1990 to protect the small airport and the western side of the island. The second project, the Tangier Channel to the Chesapeake Bay (or North Channel), was authorized under the River and Harbors Act of 1960. The project provides a channel that runs from the turning basin at the Town of Tangier, northwesterly through Tangier Creek to the Chesapeake Bay. The channel has a depth of 7 feet at mean low water (MLW), a width of 60 feet wide, and a total length of approximately 3,820 feet. The turning basin is 400 feet square, with a depth of 7 feet deep MLW. The third USACE project, the Tangier Channel to Tangier Sound was authorized under the River and Harbors Act of 1919. The channel, which is more than 6000 feet in length, is maintained at a depth of 8 feet deep at MLW. The channel projects provide both commercial and recreational boating access to the harbor facilities at Tangier Island.

Figure 3: EXISTING USACE PROJECTS ON TANGIER ISLAND

2. PLANNING CRITERIA

2.1 Problems, Opportunities and Project Purpose

2.1.1 Problems. The western shore of the Tangier Island complex has experienced severe erosion (> 3 feet/yr), which has resulted in the conversion of land to shallow open water habitat. This loss of land mass has, in recent years, exposed the opening of the western navigation channel to the long fetch across the Chesapeake Bay. The erosion has resulted in a number of problems for the citizens of Tangier Island. Navigation through the channel has become more difficult due to shoaling of sediment that has eroded from the shoreline of Uppards Island. This

shoaling not only can make navigation more difficult, it will also increase the amount of dredging needed to maintain the channel.

The erosion of the western shore has also exposed seafood processing infrastructure, including facilities, piers, mooring slips, and fishing vessels located in the harbor area, to more powerful wave energy during storm events. The orientation of the western navigation channel with respect to the Chesapeake Bay makes it vulnerable to storms from the northwest, west and southwest. Every year, business owners report structural damage to their property as a result of wave energy. The people of Tangier depend primarily upon seafood harvesting and processing for their income, so any losses to this capability is especially detrimental. Given that erosion will continue without intervention, it is expected that the navigation channel and harbor will continue to experience higher levels of wave energy and storm-related damages.

2.1.2 Opportunities. Opportunities are instances in which the implementation of a plan has the potential to positively address an issue or impact a resource without being formulated specifically for that resource or issue. Two opportunities were identified during the Tangier Island Jetties Navigation Study.

Erosion experienced on Tangier Island within the project area has resulted in the loss of important terrestrial habitat, specifically estuarine wetlands and open beach. The Uppards, a large, uninhabited island on the northern portion of the Tangier Island complex, consists entirely of estuarine wetlands. Protecting the project area from the impacts of erosion could reduce future losses of open beach and estuarine wetlands located on that island.

Submerged Aquatic Vegetation (SAV) within Tangier Island, the Uppards and Goose Islands has declined significantly, though local populations appear relatively stable in recent years (post early 2000s) with die-backs occurring (with thus far a subsequent recovery) during summers where water temperatures exceed the preferred temperature range for SAV, particularly eelgrass (Figure 7). Eroded sediments are deposited on the leeward side of the Uppards and Goose Islands, where they have covered existing SAV beds and have buried SAV seed too deeply for successful germination. SAV provides significant environmental benefits, including functioning as a blue crab nursery and habitat for adults. The main source of revenue to the citizens of Tangier Island is harvesting blue crabs. This project could provide benefits to SAV beds located within the project area if the impacts of erosion are controlled.

2.1.3 Project Purpose. The purpose of this study is to evaluate the problems at the navigation channel located on the western shore of Tangier Island and to identify the most cost-effective plan for navigation improvements. The study also considered solutions that would reduce or eliminate erosion of the shoreline and sediment inflow to the existing Federal navigation channel. The findings are based on an evaluation of the most cost-effective plan and a determination of the potential solutions' compliance with current policies and within CAP

Section 107 project funding limits.

2.2 Project Constraints

Planning constraints are any policy, technical, environmental, economic, local, regional, social, and institutional considerations that act to restrict or otherwise impact the planning process. Typical general constraints include state-of-the-art limitations, time, money, uncertainty of the future, policy, and the inaccuracies inherent in design procedures on which alternative plans are based. In this case the project should not negatively affect Federally threatened and endangered species and their critical habitats. In addition, conversion of one Essential Fish Habitat (EFH) type to another should be done without adversely impacting various fish species. More specifically to the proposed project, any measures implemented should not negatively impact navigation or the commercial fishing industry that occur in and around Tangier Island.

2.3 Study Objectives

Based on the identified navigation problems, needs, and concerns, a number of general and specific planning objectives have been established to assist in the development and evaluation of alternative plans. In general, the primary Federal objective is to contribute to NED consistent with protecting the Nation's environment. The general and specific planning objectives for this study take an integrated systematic approach to the solution of the navigation problems at the Tangier Island North Channel and associated facilities.

2.3.1 General Objectives.

- Meet the specified needs and concerns of the general public;
- Respond to expressed public desires and preferences;
- Be flexible to accommodate changing economic, social, and environmental patterns and changing technologies;
- Integrate with, and be complementary to, other related programs in the study area;
- Be implementable with respect to the financial and institutional capabilities, as well as public support; and
- Non-structural as well as structural alternatives must be examined.

2.3.2 Study Objectives.

- Reduce damage to commercial fishing and recreational boats;
- Reduce operating costs for existing and prospective commercial fishing boat operators and owners;
- Reduce necessity for commercial fishing and recreational boat owners to relocate boats during storm events;
- Reduce damage to adjacent shore structures including but not limited to seafood processing facilities;

- Preserve and enhance the Federal, state, and local investments in existing navigation improvements;
- In accordance with the limits of institutional participation, all plan components must meet NED objectives; and
- Preserve and maintain the environmental and historic character of the study area, including directly related plans formulated for implementation by the USACE.

2.4 Criteria

2.4.1 <u>National Evaluation Criteria.</u> Federal Principles and Guidelines establish four criteria for evaluation of water resources projects. Those criteria and their definitions are listed below.

2.4.2.1 *Acceptability.* Acceptability is defined as "the viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for particular solutions or political expediency."

2.4.2.2 *Completeness.* Completeness is defined as "the extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. It does not necessarily mean that alternative actions need to be large in scope or scale."

2.4.2.3 *Effectiveness.* Effectiveness is defined as "the extent to which an alternative alleviates the specified problems and achieves the specified opportunities."

2.4.2.4 Efficiency. Efficiency is defined as "the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at the least cost"

2.4.2 <u>Study Specific Evaluation Criteria.</u> The purpose of this section of the report is to provide the pertinent technical, economic, environmental, social, and institutional criteria utilized in the formulation process. The following specific formulation and evaluation criteria have been identified for this study.

2.4.2.1 *Technical* Criteria.

- The plan selected should be consistent with local, regional, and state goals for water resources development;
- Plans must represent sound, safe, and acceptable engineering solutions;
- Plans must comply with USACE regulations and policies;
- Plans must be realistic and reflect state-of-the-art measures and analysis techniques;
- The plan should be technically feasible to implement and complete within itself and should not require additional future improvements; and
- The optimization scale of project development should be identified by analyzing NED and engineering feasibility.

2.4.2.2 ***Economic Criteria.***

- Identification of the most cost-effective plan for implementation, tangible and intangible benefits must equal or exceed project economic costs;
- Each separable unit of improvement must provide benefits at least equal to its costs;
- The scope of the proposed development must be scaled to provide maximum net benefits. However, departure from a project that provides economic optimum is possible in cases where the departure is justifiable and substantiated; and
- There must be no more economical means, evaluated on a comparable basis, of accomplishing the same purpose that would be precluded from development if the Federal plan was under taken. This limitation applies only to those alternatives that would be physically displaced or economically precluded from development if the project were undertaken.

2.4.2.3 ***Environmental Criteria.***

- Plans cannot have an unreasonably negative impact on environmental resources;
- NEPA documentation must be fully coordinated;
- Water quality standards must be maintained during construction activities in accordance with water quality certification requirements;
- Plans should avoid the destruction or disruption of manmade and natural resources, aesthetic and cultural values; and
- Mitigation of unavoidable adverse environmental effects must be an appropriate part of all plans.

2.4.2.4 ***Social Criteria.***

- Consideration should be given to public health, safety, and social well-being, including possible loss of life;
- Plans should minimize the displacement of people, businesses, and livelihood of residents in the project area;
- Plans should minimize the disruption of normal and anticipated local and regional growth and effects on local community patterns;
- Preserve, and where practical, enhance the social, cultural, educational, aesthetic, and historic values of the study area; and
- Plans should avoid the destruction or disruption of community cohesion and the availability of public facilities and services.

2.4.2.*5* *Institutional Criteria.*

- Plans must be consistent with existing Federal, state, and local laws and regulations;

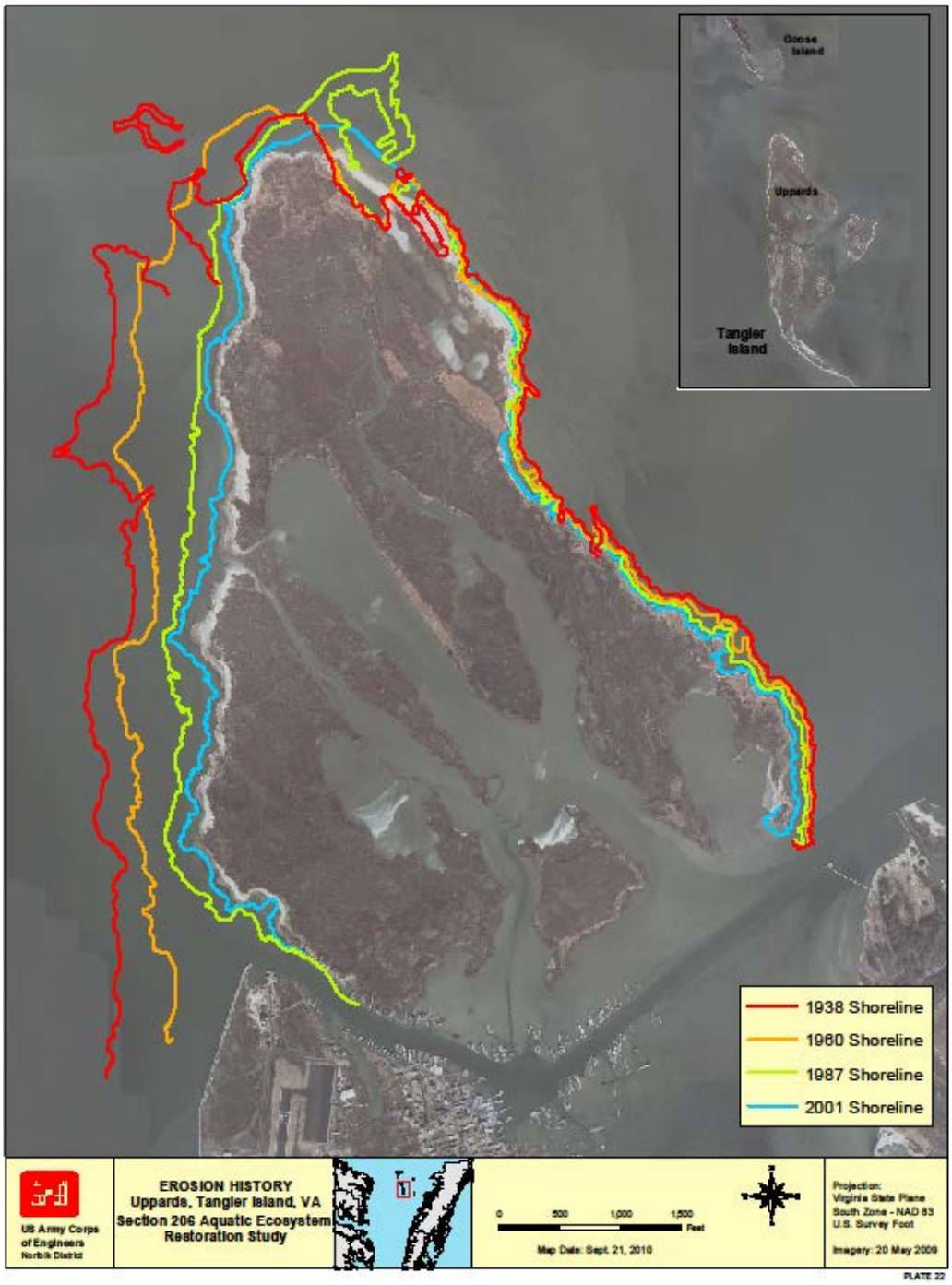
- Plans must be locally supported to the extent that local interests provide a letter of intent stating that they understand their responsibilities and obligations as set forth in the WRDA of 1986, as amended; and
- Prior to the construction phase, the non-Federal sponsor would enter into a written Project Partnership Agreement (PPA) to provide all items of local cooperation satisfactory to the Secretary of the Army, as mandated by Section 22 of PL 91-611, as amended.

3. BASELINE CONDITIONS/AFFECTED ENVIRONMENT

Tangier is a complex of five separate islands, including Tangier, Goose, Fox, Watts and the Uppards Island. Watts Island, which lies approximately 4.5 miles to the southeast of Tangier, is the southernmost island of this chain. These islands represent the remnants of a peninsula that extended from the Maryland Eastern Shore down into Virginia waters. This landform has been almost entirely lost as a result of sea level changes that occurred since the end of the last Ice Age. The remaining islands have continued to erode, subside, and decline in area as sea level continues to rise. As an example of this issue, Figure 4 depicts land loss due to erosion. Significant land losses have occurred along the western half of the island complex over the past 130 years. Erosion has also been observed on the eastern shore of the island, but these impacts were not as severe as those on the western side.

The largest island that still has uplands, Tangier Island, is approximately 5 miles long and 1-1/2 miles wide. It is composed primarily of low marshland and tidal flats, with the exception of three sand ridges, where the town of Tangier is located. The Town of Tangier is the last island town in Virginia waters of the Chesapeake Bay. The other islands that make up the complex consist entirely of estuarine wetlands and shoreline.

Figure 4: LAND LOSS DUE TO EROSION OF UPPARDS ISLAND



The tidal wetlands along the Island's coastline produce an abundance of commercially important shellfish, including blue crabs, oysters and clams while also providing habitat for a variety of finfish species. And for centuries, the inhabitants of Tangier Island have been a community of watermen, who have relied on the harvest of seafood from the waters surrounding Tangier. Accomack County has one of the largest percentages of employees in the fishing

industry compared to other localities in the Commonwealth of Virginia.

The commercial fishing vessels currently based on Tangier Island range between 25 and 45 feet in length, with drafts between 2 and 6 feet. There are many boat slips in the Federally-maintained harbor, most of which are in constant use. The majority of the boats that use the harbor are commercial fishing boats.

Numerous mooring docks and commercial facilities are located along both the north and south shorelines of the North Channel. Commercial development in this area consists primarily of wholesale seafood processing businesses and is essential infrastructure that supports the island's fishing fleet.

Currently, blue crabs are the predominant fisheries resource caught locally, off-loaded, and sold from the docks on Tangier. Crabs are held in floating and fixed enclosures until they shed their shells, and are then sold as soft-shelled crabs. Each of the shedding and processing facilities works between 75 and 110 floats, which, when full, hold up to 800 blue crabs each.

Physiography, Relief, and Drainage

The Chesapeake Bay occupies a drowned river valley excavated by the Susquehanna River and its tributaries during the late Pleistocene. Melting glacial ice caused an increase in sea level approximately 10,000 years ago, and this resulted in the formation of the Chesapeake Bay. The water depth within Chesapeake Bay is relatively shallow and rarely exceeds 40 feet deep, averaging about 20 feet in depth. Salinity varies considerably within the Chesapeake Bay, decreasing with distance from the Atlantic Ocean. The salinity of waters in the study area varies from between 14 to 20 parts per thousand, depending on season and precipitation.

Tangier Island and the string of islands to the north have diminished in size, extent, and relief over the years as a direct result of sea level rise and erosion forces. Uppards and Goose Islands were once inhabited from 1778 through the early 20th century (Cultural Resources, Inc., 2003). The inhabitable portions of these islands were abandoned due to sea level rise, which rendered the ridges that homes were built on too low to provide adequate protection from tidal action and storm surges. Before 1900, there were seven ridges that were high enough to support permanent human habitation. By 1930, there were six, and today there are only three. If sea level rise continues at present rates, the Town of Tangier is likely to become uninhabitable in the relatively near future. Present rates of sea level rise in the Chesapeake Bay are about three quarters of a foot (0.75') every 50 years and this rate is accelerating.

Geology and Soils

Soils on Tangier, Uppards, and Goose Islands consist mostly of Chincoteague Silt Loam and Magotha Fine Sandy Loam, both categorized as not being highly suitable for farming or highly erodible; however, constant flooding and wave action are eroding the islands at an alarming rate. During the period from 1938 to 2001, the western shoreline of the Uppards has

eroded at a rate of 16 feet/year and erosion rates since then appear to be similar. An erosion rate of 3 feet/year is considered severe. Where beaches have been created along the shores of Tangier, Uppards and Goose Islands, the soils consist primarily of medium grain sand.

Subsurface Stability

Tangier and Uppards Islands are eroding and subsiding as sea level rises. The present shorelines of these islands consist of low eroding marshes that are very irregular. The irregularity is due to a series of headlands and embayments that have developed as the islands erode. The embayments show evidnce of erosion of the subsurface of the islands themselves, and the subsurface sediments are often exposed in the embayments. These subsurface sediments are primarily ancient peats deposited by many centuries of marsh vegetation growth cycles. Peat boulders, which have been ripped out of the subsurface of the islands, can be observed along the western shore of any of the islands. Evidence of former islands can be observed in the underlying sediments present in what is now a channel between Uppards and Goose Islands as layers of compacted substrates, primarily peat that is still in some cases identifiable as former *Spartina sp.* vegetation as well as historical documents, including navigation charts, of the local area dating back to the mid 1800's.

Water Quality

The water quality in the study area is generally considered good. However, salinity, nutrient levels, dissolved oxygen (DO), and total suspended solids (TSS) can at times vary enough to cause negative impacts to marine life, especially the benthos, typically during major storm events. Phosphorous input is generally derived from agricultural practices, which are considered non-point sources of pollution and can be difficult to control. Levels of phosphorous tend to peak in the summer. Total nitrogen levels tend to be rather high in the study area, especially in the summer. The agricultural practices on the Eastern Shore, in particular fertilizer application and waste from livestock, cause the nitrogen levels found in the study area. However, these levels are very close to the SAV habitat criteria of 0.15 milligrams per liter (mg/l). Phosphate concentration was measured in the study area and found to be 0.002 mg/l, well below the SAV habitat criteria acceptable maximum of 0.02 mg/l established by the CBP (Koch, 2003). DO levels are typically high enough to avoid hypoxia. TSS varies greatly with season and year. During a monitoring study within the study area to determine the fitness of the site for SAV (Koch, 2003), TSS was reported as approximately 50 mg/l.

Wetlands

The Uppards, according to the USFWS National Wetlands Inventory survey (1995), consists entirely of different types of wetlands. As of this report, the Uppards contains approximately 320 acres of wetlands. Tangier Island itself also holds extensive wetland acreage, approximately 375 acres, which does not include the airfield or three inhabited ridges. All are estuarine intertidal, and many are classed as unconsolidated shore, with most of the remainder

classed as emergent. Much of the total acreage consists of *Spartina patens* or *Spartina alterniflora* marshlands with saltgrass, *Distichlis spicata,* often associated with the *S. patens.* Higher areas have wetland vegetation common to slightly higher elevations, such as *Baccharis halmifolia,* the saltbush, and *Iva frutescens,* the marsh elder.

Submerged Aquatic Vegetation

The latest year for which published data is available (2014) shows approximately 300 acres of SAV growing in the lee of the Uppards in a number of different locations, or beds.

These SAV beds have varied considerably in extent over time, along with the depth at which it can grow. Historic maps from the 1800's indicate SAV once grew at the 12-15 foot contour, much deeper than today. Currently, it is found in waters of up to 5 feet in depth m.l.w. The SAV in the study area consists of a mixture of widgeon grass, *Ruppia maritima,* and eelgrass, *Zostera marina*. Widgeongrass is one of the dominant species of SAV in higher salinity waters of the Chesapeake Bay, along with eelgrass, and they are often found together or in close proximity to each other. Widgeongrass is most often found growing in shallower waters, with eelgrass in deeper water than the widgeongrass when found in the same area.

Commercial Benthos

Blue crabs are the primary commercial fishery in the area today. Watermen from Saxis Island, Tangier Island, Smith Island, and other areas rely primarily on the blue crab harvest. From 1996-1998 the Chesapeake Bay-wide commercial harvest averaged 70 million pounds of live crab. A significant recreational fishery also exists, and estimates for the catch per year range widely from 11 to 40 million pounds. In recent years, catch data has indicated the fishery may be overexploited or at the threshold limit, and more active management and catch limits may soon be necessary. Current catches in the last several years in Virginia have averaged around 25 million pounds, a significant decrease from the long-term average. This remains the case today, though the population is increasing rapidly due to restrictions in place on the fishery as well as establishment of a large sanctuary for blue crabs to allow for population recovery. Fishery restrictions put in place, along with this sanctuary, are reducing the catch by approximately 15% to allow for increased stock size, and it appears these management measures are working and collapse of the blue crab fishery seems unlikely at this time. With continued attention to effective management, it is likely the catch will increase.

Oysters were an important part of the benthic community and were formerly one of the most important commercial and recreational fisheries in the Chesapeake Bay. Current harvest levels in Virginia waters are about 5 percent of the peak harvest, and this parallels the collapse of the oyster population Chesapeake Bay-wide. At its peak in the late 1800's, approximately 20 million bushels of oysters were harvested from the Chesapeake Bay and Eastern Shore (Hargis, 1999).

Non-Commercial Benthos

Non-commercial benthos are also of high importance in the ecology of the Chesapeake Bay. The abundance and diversity of the benthic community is an important indicator of overall water quality and productivity. Benthic organisms are often detritivores that consume dead organic matter and recycle these nutrients when they are in turn eaten by predators higher on the aquatic food chain. A monitoring station within the Pocomoke Sound has documented a fairly wide variety of benthic organisms. Benthic samples included the bivalves *Macoma mitchelli, Leucon americanus,* and *Acteocina canaliculata*. Several gastropod species were also documented and include *Acteon punctostriatus* and *Mulinia lateralis*. A wide variety of polychaetes were found, including *Glycera dibranchiata, Glycinde solitaria, Heteromastus filiformis, Mediomastus ambiseta, Paraprionospio pinnata, Spiochaetopterus costarum,* and *Streblospio benedicti*. This data was collected in June 1999 and is fairly representative of the benthic organisms likely to be found in the study area.

Nekton

The nekton of the study and surrounding areas includes primarily estuarine fish species. Anadromous fish include the Atlantic sturgeon (*Acipenser oxyrhynchus*) a newly listed species (Threatened, 2012), a Virginia species of special concern, Alewife *(Alosa pseudoharengus),* and striped bass *(Morone saxitalis)*, blueback herring *(Alosa aestivalis)*, sea lamprey *(Petromyzon marinus)*, and American shad *(Alosa sapidissima)*.

Other fish documented to inhabit waters in and around the study area include the Atlantic croaker *(Micropogonias undulates)*, spot *(Leiostomus xanthurus)*, winter flounder *(Pleuronectes americanus)*, windowpane flounder *(Scopthalmus aquosus)*, summer flounder *(Paralicthys dentatus)*, bluefish *(Pomatomus saltatrix)*, scup *(Stenotomus chrysops)*, black sea bass (*Centropristus striata)*, king mackerel *(Scomberomorus cavalla)*, Spanish mackerel *(Scomberomorus maculates)*, cobia *(Rachycentron canadum)*, red drum *(Sciaenops occelatus)*, white perch *(Morone Americana)*, silver perch *(Bairdiella chrysoura)*, sand tiger shark *(Odontaspis taurus)*, Atlantic sharpnose shark *(Rhizoprionodon terraenovae)*, dusky shark *(Charcharinus obscurus)*, and the sandbar shark *(Charcharinus plumbeus)* (NOAA, 1999). All of these fish species represent a diverse assemblage from planktivores (alewife) to open water predators (bluefish) to benthic feeders (winter flounder).

Avian Resources

The local area provides ideal colonial waterbird habitat, providing an ample food source and protection. The following colonial waterbird species have been identified on the local islands and in the nearby shore areas: glossy ibis *(Plegadis falcinellus*), great-blue heron *(Ardea herodias),* great egret *(Casmerodius albus)*, snowy egret *(Egretta thula)*, tricolored heron *(Hydranassa tricolor)*, little blue heron *(Egretta caerulea)*, cattle egret *(Bubulcus ibis)*, black-crowned night-heron *(Nycticorax nycticorax)*, and yellow-crowned night-heron *(Nyctanassa*

violacea) (Smith Island Feasibility Study). Other wading birds found in the area include the black rail *(Laterallus jamaicensis),* piping plover *(Charadrius melodus melodus).*

Non-wading waterbirds, terns and gulls, also utilize the marshes found on the islands. These include: brown pelican *(Pelecanus Occidentalis),* double-crested cormorant *(Phalacrocorax auritus*), great black-backed gull *(Larus marinus),* herring gull *(Larus argentous),* 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*), gull-billed tern *(Sterna nilotica*), and black skimmer *(Rynchops niger*).

The following shorebirds have also been identified on shorelines in the study area: 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, and sanderling. The local islands provide important breeding area for the American black duck *(Anas rubripes*), mallard *(Anas platyrhynchos*), and gadwell *(Anas strepera*). However, numerous other waterfowl are believed to use Smith Island and Tangier Island as a stopover point during their spring and fall migrations, including: Canadian goose *(Branta canadensis*), canvasback *(Anythya valisineria*), widgeon *(Anas Americana*), pintail *(Anas acuta*), redhead *(Aythya americana*), bufflehead *(Bucephala albeola*), black scoter *(Melanitta nigra*), oldsquaw *(Clangula hyemalis*), brant *(Branta bernicla*), and tundra swan *(Cygnus columbianus*).

Reptiles and Amphibians

An abundant variety of reptiles utilize the island habitat, but due to the estuarine nature of the Uppards, it is unlikely that any amphibians, except possibly toads, can be found. Species of reptiles that could be found in the study area include the Atlantic hawksbill, Kemp's Ridley, leatherback, loggerhead, green sea turtles, and the Northern diamondback terrapin, a semi-aquatic turtle.

Threatened and Endangered Species and State Species of Special Concern

Species known to or believed to inhabit or utilize the open waters of the study area listed as federally-endangered include the Atlantic hawksbill sea turtle *(Eretmochelys imbricata imbricate),* Kemp's Ridley sea turtle *(Lepidochelys kempii),* and the leatherback sea turtle *(Dermochelys coriacea).* Although none of these turtles nest or overwinter in the Chesapeake Bay, it is possible these turtles may move through or forage in nearby waters (Bruenderman, S. and K. Terwilliger, 1994).

The federally threatened Northeastern beach tiger beetle (*Cincindela dorsalis dorsalis*) was found historically on Tangier and the Uppards. A survey by USFWS (2014) was conducted for larval tiger beetles within the proposed project footprint and also at any potential tiger beetle

larval stage habitat throughout the Uppards and Tangier Islands. No larvae or adults were found within the proposed project footprint, as no suitable habitat was present.

Species known to or believed to inhabit or utilize the open waters of the study area listed as federally threatened include the Atlantic sturgeon (*Acipenser oxyrinchus)*, the green sea turtle *(Chelonia mydas)*, and the loggerhead sea turtle *(Caretta caretta caretta)*.

Federal and State Species of Concern include the Northern diamondback terrapin *(Malaclemys terrapin terrapin)*, gull-billed tern *(Sterna nilotica aranea)*, the Atlantic sturgeon *(Acipenser oxyrhynrchus)*, brown pelican *(Pelecanus occidentalis carolinensis)*, Caspian tern *(Sterna caspia)*, sandwich tern *(Sterna sandvicensis acuflavidus)*, Forster's tern *(Sterna forsteri)*, the least tern *(Sterna antillarum)*, and the river otter *(Lontra canadensis lataxina)*.

Cultural Resources

Although the recorded history of Tangier begins in the 17th century, there is some evidence that Tangier and its adjacent islands, such as Goose and Watts Islands, were visited by Indian populations possibly prior to 8000 B.C. The archaeological evidence that has been found on these islands indicates that the Indians were most likely using the islands as a source of food but not for settlement (Cultural Resources, Inc., 2003). An archaeological site on Goose Island identified in 2001 encompasses almost the entire island and spans all periods of prehistoric occupation. No determination of this site's eligibility for listing on the National Register of Historic Places has been made. The earliest record of European settlement on Tangier Island occurred in 1778 when Joseph Crockett and his family moved to the island after he purchased 450 acres on the island. Prior to this time, the island had become part of the holdings of the wealthy families of the Eastern Shore, and it was used for livestock grazing. For most of the period from 1778 to 1860, the Tangier residents were farmers who lived on the various ridges on Tangier, Uppards and Watts Islands. At that point, there was considerably more high ground than there is today.

As part of a related Detailed Feasibility Study (Tangier 206, Aquatic Ecosystem Restoration), a cultural resources reconnaissance study was carried out in 2003. This study resulted in a report entitled *An Assessment of Cultural Resource Potential within "Uppards" and Goose Island, Tangier Island, Accomack County, Virginia* (Cultural Resources, Inc.). As a result of this cultural resources investigation, two historic period sites were identified. The first of these was located on the northern tip of Uppards and contained the remains of a 19th century cemetery and well. Since this investigation was carried out, both the well and the cemetery have fallen victim to erosion and sea level rise and are now totally submerged. The second site was located on the northwestern tip of Goose Island and consisted of the remains of the pier associated with a store that once existed on the island. Neither of these sites has been evaluated for eligibility to the National Register of Historic Places, though the Town of Tangier was named to the national register in 2014 as an historic district.

This Detailed Project Report has been coordinated with the Virginia Department of Historic Resources (VDHR) in order to comply with Section 106 of the National Historic Preservation Act. VDHR reviewed the cultural resources reconnaissance report and concurred with the report's recommendations.

Socio-Economic Resources

The Town of Tangier, which is part of Accomack County, was initially incorporated in 1906. In 2010, the Town's population was 727, a 20 percent increase from 2000 and a reversal of a trend of population decline that began in 1960 (U.S. Census). Accomack County, by contrast, increased from 1970 to 2000, but then decreased in 2010 to a population of 33,164, a 13 percent decline from 2000. Tangier's population does not contain any racial or ethnic minorities.

Income levels in Tangier in 2000 varied depending on the measure. Median annual household income for Tangier for the time period 2005-2009 was estimated to be $39,375 compared to $40,343 for Accomack County, both of which are considerably below the $60,316 for the state as a whole (American Community Survey, 2011). Poverty levels for the Town show 22 percent of the population below the poverty level compared to 16 percent for the county. Estimates for 2008 from the Bureau of Economic Analysis show Accomack County with a per capita income that was 63 percent of the state average and 70 percent of the national average, indicating an area significantly less prosperous than the rest of the state.

Housing in Tangier is almost totally owner-occupied and single family according to data from the American Community Survey. As of 2005-2009, 86 percent of the units were single family, 11 percent were manufactured or mobile homes, and only 3 percent were multifamily. At least 70 percent of the housing was built before 1960. The average value of the owner-occupied housing in Tangier was approximately $62,000 less than the value of owner-occupied housing in Accomack County, which is significantly below the state average.

Land Use

Development on Tangier Island is located on the three sand ridges that run north to south and are known as Main Ridge, West Ridge, and Canton Ridge. Land use in Tangier is predominantly residential with most of the commercial uses concentrated in the northern part of the island. Commercial development consists of facilities associated with the seafood industry and the harbor, small shops, and several restaurants. Public and semi-public uses include a church, school, post office, airstrip, and the sewage treatment plant. The streets that run through the Town are very narrow and used by primarily by motorized carts, bicycles, and pedestrians.

Recreational Resources

The predominant recreation resources in the study area are water related. Boating, fishing, and wildlife observation are the primary options for recreation on the island. Canada geese,

various species of ducks, grebes, loons, herons, and egrets frequent the area. Saltwater fishing opportunities include striped bass, flounder, gray and speckled trout, croaker, bluefish, black drum, and channel bass.

Air Quality

The open and nearshore waters of the study area are located in Accomack County, Virginia. Accomack County is located within the Northeastern Virginia Intrastate Air Quality Control Region (9VAC5-20-203). Accomack County is not included in any designated maintenance (9VAC5-20-203) or nonattainment area (9VAC5-20-204) for criteria air pollutants. Air quality in the study area is in compliance with current USEPA National Ambient Air Quality Standards for ozone, sulfur dioxide, nitrogen oxides, carbon monoxide, airborne lead, and particulate matter.

Hazardous, Toxic, and Radioactive Waste

Coordination with VDEQ, Office of Waste Programs and a subsequent search of their database revealed that the study area around Uppards and Goose Islands is not located near any documented hazardous waste sites, management facilities, or Superfund sites.

4. WITHOUT PROJECT CONDITION

The future without project condition is defined as the land use and related conditions likely to occur under existing improvements, laws, regulations and policies. This condition provides the basis for the evaluation of potential measures the will be considered to address the navigation and structure damage problems described previously in this report.

In the absence of a Federal project, it is likely that current conditions will continue into the foreseeable future and may even deteriorate further as the uninterrupted wave action along the North Channel continues. The wave energy would continue to damage vessels moored in the harbor and the harbor facilities. As land continues to erode from the northern shoreline at the mouth of the North Channel, it is predicted that the wave energy entering the North Channel would increase over time; resulting in increased damage to vessels and harbor facilities. Additionally, long-term erosion rates experienced at Tangier Island are expected to increase due to sea level rise, which would further increase impacts experienced by the community.

If the erosion on the western shore of the navigation channel is not halted, the channel, harbor and associated boating and seafood industry facilities are in danger from increased wave energy and the resulting damages could make it prohibitive to operate working boats out of the harbor. This would damage, if not end, the local seafood industry on the island, forcing islanders to abandon the island and relocate to the mainland.

Currently, there are no other projects or programs, sponsored by USACE or other agencies, being planned for Tangier Island to address the impacts of erosion on the shoreline or wave energy on the harbor and its infrastructure. A small rehabilitation project that will address the corrosion of the metal on the docks within Tangier Harbor will be funded by the Virginia Port Authority. Although the time frame of this project has not yet been determined.

The future without project economic analysis identified the damages currently incurred in the project area and projected how these damages would be increased due increase of wave energy. The current damages and increased costs relevant to the project under consideration include: structural damages to harbor facilities, damages to boats, and costs of avoiding damages due to wave attack. More detailed information regarding these damages can be found in Appendix B of the supporting documentation to this report.

5. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS

5.1 Plan Formulation Rationale

Plan formulation is the process of building alternative plans that meet planning objectives and avoid planning constraints. Alternatives are a set of one or more management measures functioning together to address one or more planning objectives. A management measure is a feature or activity that can be implemented at a specific geographic location to address one or more planning objectives. A feature is a "structural" element that requires construction or assembly on-site whereas an activity is defined as a "nonstructural" action. Each alternative plan shall be formulated in consideration of criteria stated in Section 2.4.

5.2 Management Measures

Navigation improvement is a declared USACE mission and business line. This mission involves the provision of safe, reliable, and efficient waterborne transportation systems (channels, harbors, and waterways) for movement of commerce, national security needs, and recreation. There are various measures that could be considered as navigation improvements including, but not limited to: channels, jetties, breakwaters, locks and dams, and basins or water areas for vessel maneuvering, turning, passing, mooring, or anchoring incidental to transit of the channels and locks. Dredged material disposal areas and sediment basins related to the maintenance of navigation features are also included in this business line.

Five measures were considered for this study: (1) revetment, (2) revetment with a jetty, (3) offshore breakwaters, (4) geotextile tubes, and (5) relocation of harbor facilities. These measures are discussed and evaluated in the following paragraphs.

5.2.1 <u>Revetments.</u> A revetment is a shore stabilization structure that consists of an erosion- resistant facing that is built to protect a scarp, embankment, or other shoreline

features against erosion. It is built on a slope, so it is not considered a vertical structure. The major components of a revetment are the armor layer, filter layer, and toe. The armor layer provides the basic protection against wave action; while the filter layer supports the armor, providing passage for water through the structure, and prevents the underlying soil from being washed through the armor. The toe prevents displacement of the seaward edge of the revetment. Wave modeling, completed by VIMS for an earlier CAP Section 206 project, demonstrated that this measure would prevent further erosion of the shoreline, but would provide little protection from wave energy when used alone. The measure did not meet the national criteria of completeness or effectiveness and would not meet the objectives and needs of the study; therefore it was eliminated from further considered because it was not effective.

5.2.2. Jetties. A jetty is a stone or concrete structure that projects into a body of water. Jetties are used to influence local currents or tides and to protect coastal structures from storms and erosion. A jetty would provide protection against wave energy as well as prevent displacement of the seaward edge of the revetment. Since a jetty alternative satisfies many of the study objectives and needs, met the national evaluation criteria and is technically feasible, this measure is considered further in this study.

5.2.3 Breakwaters. Breakwaters are also shore stabilization structures, which may be built singly or in series spaced along the shoreline. Investigation of this measure demonstrated that breakwaters would only prevent further erosion of the Uppards Island shoreline and would not address the impacts of wave energy. For these reasons, this alternative was determined not to be effective or complete and did not receive further consideration.

5.2.4 Geotextile Tubes. Geotextile tubes are large bags made of sewn geosynthetic sheets that are filled with a slurried material, usually sand or finer-grained sediment. The tubes are placed along the shoreline as a deterrent to erosion caused by low energy wave activity. Upon investigation of this measure, it was determined that the wave energy experienced in the study area was too high to support the use of geotextile tubes. If implemented, this measure was not effective and would not meet the objectives and needs of the study area over the project life. It was eliminated from further considered.

5.2.5 Relocation of Harbor Facilities. This measure, the relocation of the harbor facilities, would involve the transfer of all harbor functions and services to another location with established harbor facilities or to a site where new facilities would be constructed. This measure was investigated during this study which included moving harbor structures further upstream within the Federal Navigation Channel. This measure would eliminate the problem of increased wave action and associated damage to harbor facilities and moored boats. There were a number of drawbacks to this plan. First, there are no nearby facilities that could be used to dock the vessels currently using the Tangier Harbor facilities. Also it would be prohibitively expensive to

move or construct a new harbor with all associated infrastructure to another location. Finally, the negative, environmental impacts involved in creating a new harbor and associated facilities would likely be significant. For these reasons, this alternative was not considered to be acceptable or efficient and was not considered further in this report.

6. COMPARISON AND SELECTION OF PLANS

Only those alternative plans that are practical in terms of the engineering, economic, environmental, and social impacts were developed. As a result, only plans that involved the construction of a jetty were carried forward for further consideration. Five alternatives with the construction of jetties of varying locations, heights and measurements were investigated, plus the No Action Alternative. A summary of each alternative is given in this report, but more detailed engineering information for each alternative, can be found in the *Modeling Study for Tangier Island Jetties, Tangier Island, VA,* dated March 2015, prepared by the Engineering Research Development Center (ERDC), Coastal Hydraulics Laboratory (CHL). This document can be found in Appendix A.

6.1 Detailed Alternative Plans Description

6.1.1 Alternative 1. Alternative 1 (Alt 1) is a one-piece straight structure that is tied into the southern shoreline of Uppards Island along the northern opening of the North Channel into the Chesapeake Bay (Figure 5). The length, crest elevation, and crest width of the Alt 1 structure are 494 ft (151 m), 3.3 ft (1 m, MTL) and 13 ft (4 m), respectively.

6.1.2 Alternative 2. Alternative 2 (Alt 2) consists of a two-piece dogleg structure. The first leg of the structure will be anchored into the same area of the Uppards Island as Alt 1 and will run perpendicular to the shore. The jetty will then dog-leg to the west, running parallel to the navigation channel. The total length, crest elevation, and crest width of the structure are 757 ft (231 m), 3.3 ft (1 m, MTL) and 13 ft (4 m), respectively.

6.1.3 Alternative 3. Alternative 3 (Alt 3) consists of the same two-piece dogleg north structure as Alt 2, with the addition of a straight spur anchored into the southern shore of the navigation channel and the existing seawall, pointing to north. Total length, crest elevation, and crest width of Alt 3 north structure are 757 ft (231 m), 3.3 ft (1 m, MTL) and 13 ft (4 m), respectively. The south spur is 131 ft (40 m) long with its crest height and width the same as those of the north structure.

6.1.4 Alternative 4. Alternative 4 (Alt 4) has a similar design as Alt 3, a two-piece dogleg north structure and a straight spur. In this design, the southern spur will point towards the northwest. Total length, crest elevation, and crest width of Alt 4 north structure are 757 ft (231 m), 3.3 ft (1 m, MTL) and 13 ft (4 m), respectively. The south spur is 131 ft (40 m) long with its crest height and width the same as those of the north structure.

6.1.5 <u>Alternative 5</u>. Alternative 5 (Alt 5) consists of two stone jetties. The first is a straight stone structure that would key into the southern shoreline of Uppards Island and extend southward into the navigation channel; while the second, smaller structure would connect to the existing sea wall and extend northwest towards the navigation channel. The length, crest elevation, and crest width of the larger structure are 494 ft (151 m), 3.3 ft (1 m, MTL) and 13 ft (4 m), respectively. The south spur is 131 ft (40 m) long with its crest height and width the same as those of the north structure.

6.1.6 <u>No-Action Alternative.</u> The No Action Alternative (NAA) consists of no protective action taking place on or around Tangier or Uppards Islands to protect the west opening of the navigation channel, anchorage basin or seafood processing facilities near or within the harbor. In order to predict what the Uppards Island would look like at the end of the 50-year period of analysis if no action was taken, the impact of erosion and other geological forces were modeled by USACE (Schulte et al. 2015). The Schulte et al. study concluded that "most of Uppards Island is predicted to be inundated by 2063, which would significantly reduce the protection it provides to the Town of Tangier. Tangier Island itself is becoming increasingly inundated and split into three distinct sections by the expected widening of several large tidal creeks that traverse the island lengthwise with continued loss of land is expected to occur at all margins of the island except where the stone revetment continues to protect much of Tangier Island's western shore". The impacts of past erosion and sea level rise were mapped in order to determine historic rates of land loss (Figure 4). With no action, Tangier Island and the Uppards Island near the navigation channel will continue to experience significant erosion. The navigation channel, harbor, seafood processing facilities and harbor infrastructure will experience stronger wave action and associated damages as additional land erodes from the western shore of Tangier and the Uppards Islands. The NAA is predicted to result in these areas becoming unusable for the purposes they currently serve. As there is no better site to relocate the anchorage basin on Tangier Island to, the NAA might result in abandoning the town of Tangier, as the local watermen have no local alternative site.

Although the NAA would not meet the goals or objectives of the project and is not considered acceptable, it will be used as a basis of comparison for all other plans of improvement. As required by the NEPA, this alternative will be carried through the analysis.

A study that investigated the effectiveness of all design alternatives, except for the No Action Alternative, at various wind directions and wind speeds was completed by ERDC in 2015 (Appendix A). Ranking of alternatives based on a single number was not recommended by the study, but the authors recognized that this type of ranking would be useful for preliminary analysis. The ranking was based on the wave reduction factors calculated at the low water level for each alternative averaged over nine wind directions for the channel centerline, north shoreline, and south shoreline, respectively. By averaging the results for the centerline and north

and south shoreline, a single number was calculated and used as a preliminary ranking of each alternative (Table 1). Each alternative demonstrated some ability to reduce wave energy, with Alt 4 producing the highest representative wave reduction. Since all five designs were determined to be effective in reducing wave energy, acceptable, and complete , all of the alternatives, in addition to the NAA, were included in a cost/benefits analysis.

Figure 5: DESIGNS OF ALTERNATIVES 1 THROUGH 5

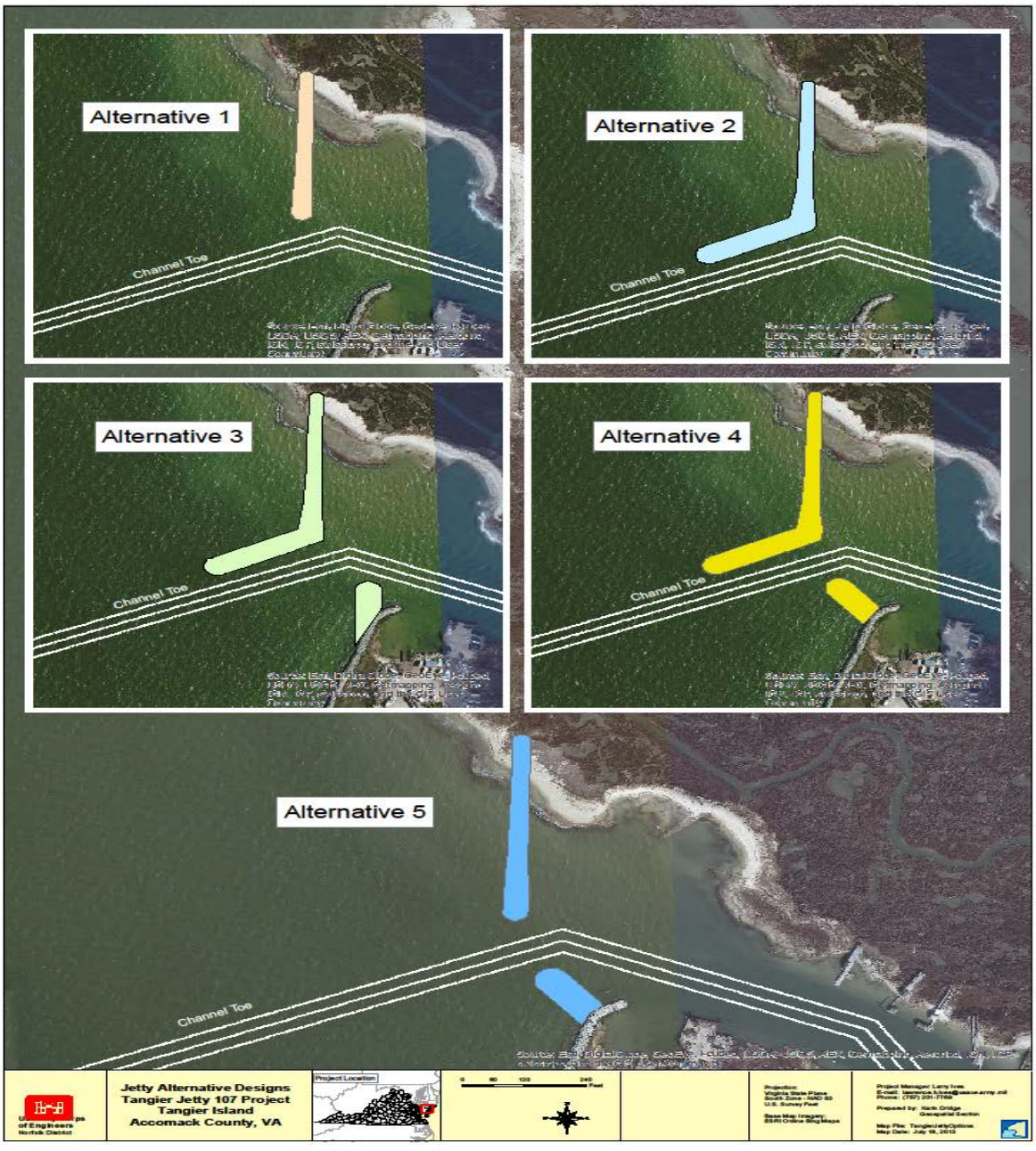


Table 1: REPRESENTATIVE WAVE REDUCTION RATINGS FOR ALT 1 THROUGH 5.

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Average Wave Reduction (%)	11.6	25.8	46.4	49.1	34.0

6.2 Alternative Plan Costs

6.2.1 Construction and Investment Costs. The costs for constructing the different alternatives were developed using the Micro-Computer Aided Cost Estimating System (MCACES). These costs represent total or fixed fee cost estimates, as detailed in Appendix A, and are a conceptual representation of the approximate order-of-magnitude costs associated with the design concepts described. These estimates are based upon representative unit costs for similar construction projects in the area.

The costs for each alternative plan include the following: plans and specifications; real estate; construction and plantings; construction management; contingency; and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). Plans and specifications would include such costs as field surveys and investigations; design; preparation of specifications and construction drawings; coordination of any required environmental permits; and the development, approval, and execution of the PPA. The costs for plans and specifications under consideration are $241,000, $420,000, $532,000, $536,000, $357,000 for plans one through five respectively.

Real estate costs cover lands, easements, rights-of-way, relocations, and disposal areas (LERRD's). The real estate costs associated with this project are $31,000 and consist of only administrative costs. Real estate assumptions and estimates are defined in more detail in the Real Estate Plan, Appendix D of the supporting documentation.

Construction management costs cover the contractor's management, supervision, and overhead. These costs were approximately seven percent of the total construction costs. A 19.1 percent contingency cost was added to reflect the effects of unforeseen conditions on estimates of construction costs. These costs do not allow for inflation or for omissions of work items that are known to be required; however, they take into account any unforeseen construction problems. The rationale for the 19.1 percent contingency is further described in the Engineering Appendix (AppendixA), Attachment A-3, Cost and Schedule Risk Analysis Report. The major factors considered in this contingency include mobilization, material supplier, material delivery,

shallow water conditions, productivity, and real estate.

After total costs were determined, the cost of interest during construction (IDC) was calculated based upon a three month design period and eight month construction period, and a 3.125 percent discount rate. The total costs plus costs of the IDC yield the investment cost, as seen in the following table.

Table 2. INVESTMENT COSTS

Cost	No Action Alternative ($)	Alt1 ($)	Alt2 ($)	Alt3 ($)	Alt4 ($)	Alt 5 ($)
Plans and specifications	0	241,000	420,000	532,000	536,000	357,000
LERRD	0	31,000	31,000	31,000	31,000	31,000
Construction	0	2,135,000	3,731,000	4,695,000	4,755,000	3,161,000
IDC	0	11,872	17,517	22,127	22,387	14,842
Total Investment Costs	0	2,418,872	4,199,517	5,280,127	5,344,387	3,563,842

6.2.2 Average Annual Costs. OMRR&R costs of five percent of the construction cost were included annually for the first five years after construction is completed and every three years thereafter. The average annual OMRR&R costs over the life of the project, varies by alternative and covers monitoring and evaluation of the project's performance.

Using the total costs and annual OMRR&R, the average annual equivalent costs were derived for each alternative plan. All costs used in this analysis are in October 2015 (Fiscal Year 2016) price levels, with a 3.125 percent discount rate used in the present value and annualized over a 50-year period of analysis. The average annual costs can be found in the Table 4 Average Annual Benefits.

Table 3: AVERAGE ANNUAL COSTS

Cost	No Action Alternative ($)	Alt1 ($)	Alt2 ($)	Alt3 ($)	Alt4 ($)	Alt 5 ($)
Average Annual Construction	0	95,800	158,185	199,816	202,164	134,026
Interest and amortization	0	472	697	881	891	591
Average annual OMRR&R	0	53,681	88,640	111,968	113,284	75,103
Total Average Annual Costs	0	149,953	247,522	312,665	316,339	209,720

6.3 Average Annual Benefits

The average annual benefits attributable to the alternatives under consideration have been evaluated in detail in Appendix B. The benefit evaluation is based on information obtained from site visits, meetings with local watermen and town of Tangier staff members, interviews with local business owners conducted in April 2013, and two detailed questionnaire surveys conducted in July 2013. The questionnaire survey forms are included as attachments to Appendix B.

The average annual benefits are the difference between the Without Project Condition and the With Project Condition. The average annual benefits considered in this study include benefits to commercial fishing, passenger ferry and maintenance dredging. The commercial fishing industry will benefit from the project in a number of ways including decreased damages to both structural facilities (docks, etc.) and boats in the study area. In addition, the savings from no longer having to avoid damages by transporting or securing boats with the jetty in place are included in the average annual benefits. Table 4 shows the average annual benefits in dollars for each alternative.

Table 4: AVERAGE ANNUAL BENEFITS

Average annual benefits	**No Action Alternative ($)**	**Alt 1 ($)**	**Alt 2 ($)**	**Alt 3 ($)**	**Alt 4 ($)**	**Alt 5 ($)**
Commercial fishing benefits	0	142,047	135,512	142,542	143,463	138,310
Ferry benefits	0	15,368	14,244	17,538	17,970	15,555
Maintenance dredging benefits	0	587	11,725	11,725	11,725	587
Total average annual benefits	**0**	**158,002**	**161,481**	**171,805**	**173,158**	**154,452**

6.4 Comparison of Alternative Plans

The economic analysis uses net economic benefits to determine economic feasibility. From survey results, the existing condition was quantified along with associated costs to repair damaged vessels during heavy wave action as well as watch checks and evacuation costs associated with these heavy wave events. In order to quantify the benefits to costs, it was assumed that there was a direct relationship between wave height and reduction in costs. The result of the economic analysis captures benefits using transportation cost savings to compute the benefits of the selected plan (Table 5). The following table shows the results of the economic evaluation comparing alternative plans, including average annual benefits and costs; net remaining benefits; and benefit-to cost ratios (BCRs) for each alternative.

Table 5: RESULTS OF ECONOMIC ANALYSIS

Alternative	Average annual benefits ($)	Average annual costs ($)	Net remaining benefits ($)	Benefit-to-cost Ratio (BCR)
No Action Alternative	0	0	0	n/a
Alt 1	158,002	149,953	8,049	1.05
Alt 2	161,484	247,522	(86,041)	0.65
Alt 3	171,805	312,665	(140,860)	0.55
Alt 4	173,158	316,339	(143,181)	0.55
Alt 5	154,452	209,720	(55,268)	0.74

The navigation project is economically justified only for Alternative 1, with a BCR greater than 1.0. Alternative 1 has the only positive net remaining benefit. This alternative consists of a single straight jetty and provides an average wave height reduction of 11.6%. This design does not provide the highest level of wave reduction of all of the plans that were analyzed (Table 1); however it does provide the greatest net benefit. The benefits provided by additional structures would not counter the additional cost of construction.

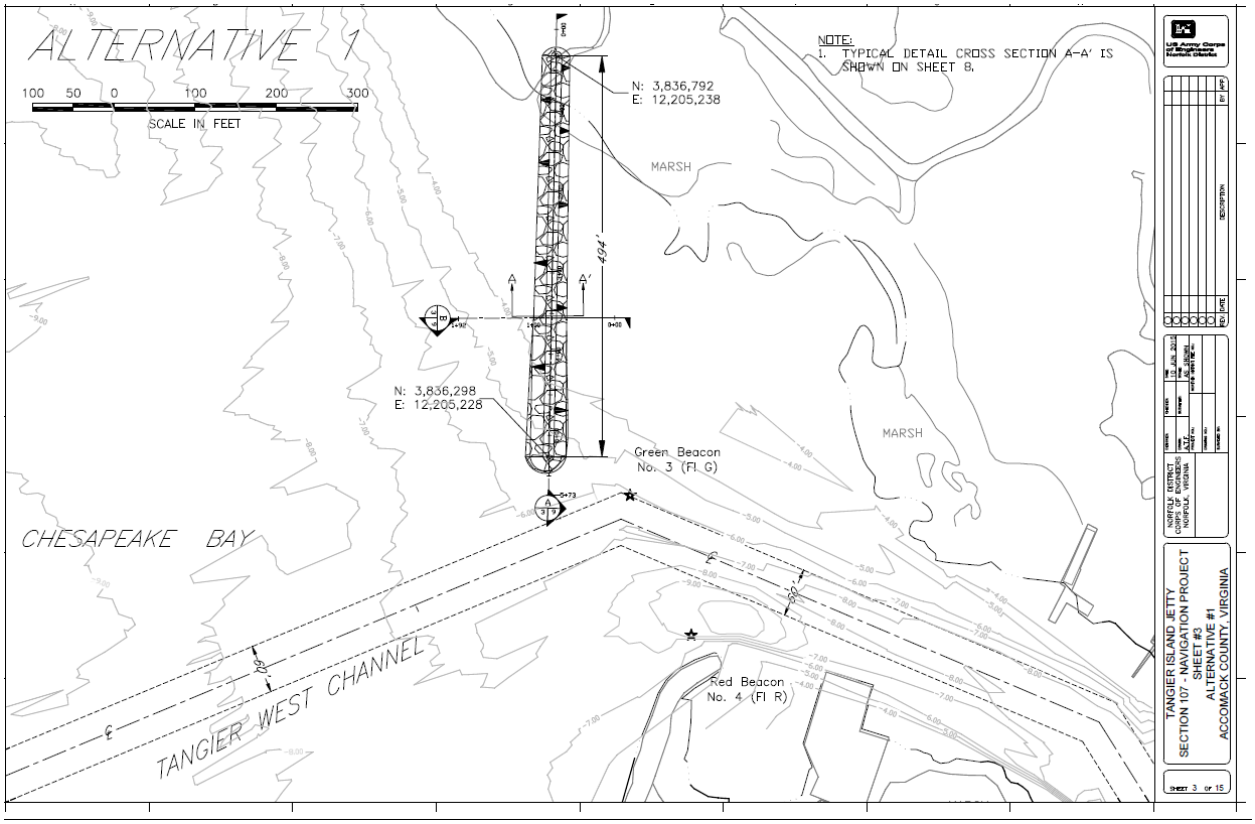
7. TENTATIVELY SELECTED PLAN

7.1 Description of Tentatively Selected Plan

The tentatively selected plan is Alternative 1. This plan maximized net National Economic Development benefits and was selected as the National Economic Development plan. The plan is the largest acceptable project to the non-Federal partner and was selected as the Tentatively Selected Plan (TSP). Alternative 1 (Alt 1) consists of a straight stone structure that would key into the southern shoreline of Uppards Island and extend southward into the navigation channel. The length, crest elevation, and crest width of the structure are 494 ft (151 m), 3.3 ft (1 m, MTL) and 13 ft (4 m), respectively. The only construction materials that will be used to build the two jetties are clean stone and geotextile.

The estimated amount of land that would be affected by the construction of the project includes 0.07 acres supratidal land, 0.09 acres of inter-tidal habitat, and 0.6 acres of subaquatic shallow Bay bottom. An additional acre may be required during the construction phase. No excavation of the Bay bottom or sand fill is expected to be required during construction.

Figure 6: DESIGN DRAWING OF THE SELECTED ALTERNATIVE (ALT 1)



7.2 Integration of Environmental Operating Principles

Environmental operating principles have been integrated into the planning process wherever possible. Specific considerations are included below.

Foster sustainability as a way of life throughout the organization: This project contributes to a more sustainable waterway. The without-project condition sees continued erosion of the shoreline, which will result in continued shoaling. This protection will extend the lifespan of the Island and the Town, both of which may ultimately erode/drown within the next 100 years due to storm-induced erosion and sea level rise. The project should have a 50-year life, and the stone could remain in place as a reef or be removed and used elsewhere in the event the island is abandoned in the future. In addition, the without project condition would not provide protection of the existing harbor and facilities from wave energy. By constructing a permanent structure, the need for annual dredging may be eliminated or reduced. The continued reconstruction and repair of existing facilities will be reduced.

Proactively consider environmental consequences of all Corps activities and act accordingly: Environmental consequences were considered throughout the planning process and every effort has been made to avoid, minimize, or mitigate all anticipated impacts. These actions include best practices during construction to avoid impacts to SAV

and other sensitive habitat types located adjacent to the project area.

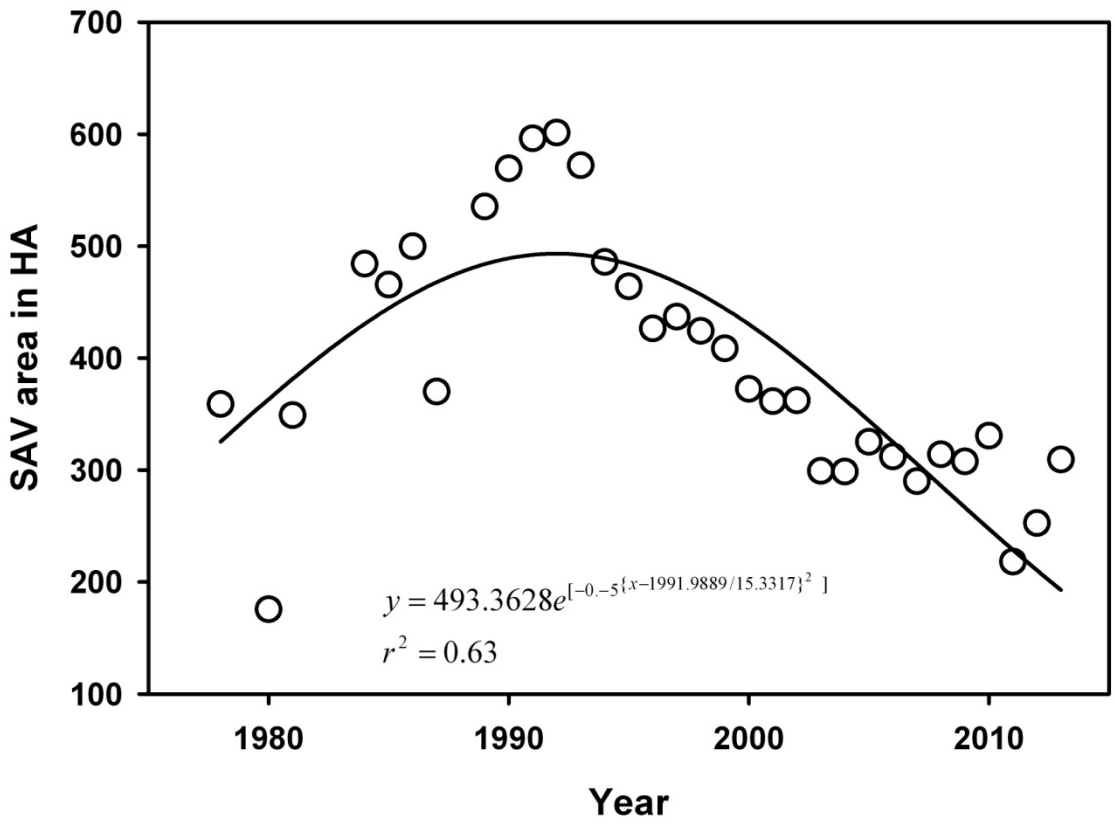
Create mutually supporting economic and environmentally sustainable solutions: The recommended plan is the National Economic Development plan and therefore provides the maximum amount of benefits to the nation. The project was formulated in a way that makes it lasting, requiring very little in maintenance, and avoids long term environmental impacts wherever possible.

Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps which may impact human and natural environments: An environmental assessment was conducted as required by the National Environmental Policy Act. In addition, the principles of avoidance, minimization, and mitigation were enacted to the extent possible. The project design was developed to avoid impact to sensitive habitat types and species. For example, the design avoids the placement of stone on vegetated wetlands and surveys were completed in order to ensure that the project would not negatively impact a threatened insect species that is known to inhabit Uppards Island. Impacts to the environment were minimized by ensuring that the minimum of rock would be placed to provide the reduction of wave energy. There will be no mitigation required for this project.

Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs: For this study, a systems approach was utilized to examine the interaction between wave energy, flow within the navigation channel and the surrounding shoreline.

Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner: The USACE worked closely with the town of Tangier throughout this study. In addition, ERDC completed a modeling study of the project area and the data and conclusions presented in the study was used to determine the best project design. Finally, VIMS completed a study that investigated erosion of the island for a previous CAP Section 206 study and provided information regarding SAV beds in the project area. Results of a USACE analysis on local SAV acreage around Tangier Island can be seen in the following figure.

Figure 7: LOCAL ACREAGE OF SAV IN THE TANGIER ISLAND AREA IN RECENT DECADES



Employ an open, transparent process that respects the views of individuals and groups interested in Corps activities: The USACE has followed all guidelines for public involvement and made every effort to be responsive to stakeholder concerns. Public input has been solicited throughout the study and used for both environmental and economic analysis purposes.

7.3 Real Estate Considerations

The town of Tangier either owns or will have sufficient property interests in the areas of construction above MLW. The land above MLW on Uppards Island is privately owned at the time of the writing of this document. The owner will be donating the land to the town in June 2015. Federal Navigational Servitude will be used for the placement of the jetties on the state-owned bottomlands needed for the Project. The Real Estate plan can be found in Appendix D of this report.

7.4 Summary of Accounts

7.4.1 National Economic Development. The recommended plan is the National Economic Development plan and provides the greatest amount of net annual benefits to the

nation. It is the most effective plan to address the identified navigation problems in the project area and reducing damages to the infrastructure of Tangier Harbor and commercial fisheries equipment, in addition to reduce sedimentation of the navigation channel.

7.4.2 Regional Economic Development. The Tangier Sound is one of the most sought-after areas for blue crabbing. Commercial and recreational fishermen frequent Tangier Island because of its close approximation to the Tangier Sound. In addition to fishermen, Tangier Island is a tourist attraction as well with many historical attributes and perseveration of the native culture. This historic character, and the excellent fresh seafood available, make Tangier a popular tourist destination in the summer months. The implementation of the jetty would allow easier access to the channel, which will in turn encourage tourism.

7.4.3 Environmental Quality. Tangier is a unique community, a long settled town with a rich history, recognized by listings in the National Register of Historic Places and Virginia Landmarks Registry in 2014. First mapped and called the "Russell Isles" by Captain John Smith in 1608 the island was periodically inhabited by Native Americans and early colonists. An established community dates to the 1700's. In the War of 1812 the British established a military base called Fort Albion there. Home to a community that retains the culture and dialect of the Chesapeake Bay 'watermen,' the town of Tangier has many buildings dating to the 19th and early 20th centuries, and a small condensed street system adapted to the limited space available.

7.4.4 Other Social Effects. Tangier Island is located approximately 12 miles from mainland Virginia with the closest departure to the island from Onancock, Virginia on the Eastern Shore with no direct rail or highway link to another community. The people on the island depend on the Tangier Channel for majority of the channel's goods and services including food, medical equipment, and carrier services navigate through the Tangier Sound to the island via boat. Because of this, the harbors within the Tangier Channel are considered subsistence harbors, as defined in 33 U.S. Code, Section 2242. Harbor maintenance is not only economically critical for the fishermen of Tangier, but it is also an obligation for the government to maintain as it relates to public health and safety of the local community as well.

7.5 Risk and Uncertainty

Uncertainty and variability are inherent in water resources planning. The risk and uncertainty aspects associated with this navigation project cannot be characterized by probability distributions based on existing empirical data. Therefore, the potential uncertainty aspects in which different degrees of uncertainty are likely are described in the following paragraphs. Relevant assumptions are varied where appropriate to measure potential impacts on project costs and benefits.

7.5.1 Sea Level Rise and Local Subsistence. The structure designs presented in this report incorporated the latest USACE guidance on sea level rise and will incorporate both

relative SLR and settlement due to soft substrate. The subsidence refers to the general subsidence of the Chesapeake Bay. Borings taken at the proposed jetty location indicated local subsidence should be expected. More detailed information on Sea Level Rise and Local Subsidence and how they are incorporated in the design are presented in the March 2015 ERDC CHL Report provided in Attachment A-1, Chapter 3, paragraph 3.6 of Appendix A.

Taking the NRC-I sea level rise as a most likely case, and adding 0.65 ft for subsidence, depth at the structure will increase by 1.34 ft in 50 yrs. Assuming the NRC-II as the upper bound of the expected sea level rise, and adding 0.65 ft for subsidence, the depth at the structure could increase by as much as 2 ft in 50 yrs.

If depth at the structure increases, the jetty freeboard is reduced by the same amount. The seaside armor stone calculations are not affected by the freeboard, but the leeside armor stones will be unstable if the freeboard is reduced. If depth increases by 1.34 ft (NRC-I plus subsidence) or 2.0 ft (NRC-II plus subsidence) near the jetties then the project design using adapative management measures must be altered, specifically jetty headstone weights have been increased by 25 percent to offset the depth increase resulting from sea level rise.

7.5.2 Sensitivity Analysis. A sensitivity analysis of the TSP was completed using two different scenarios were developed. The first scenario included a decline in the fishing population at the projected rate to 25% of the current population. The second, or “worst case” scenario, included no fishermen on Tangier Island by 24 years into the project life resulting benefits to commercial fishing drop to zero. The sensitivity analysis indicated that even if the fishing population were to decline at less realistic rates, including the “worst case” scenario, the project would still produce positive net benefits.

7.6 Cost Sharing

Cost sharing for the project would be in accordance with the requirements of the Section 101 of the Water Resources Development Act of 1986 (Public Law [PL] 99-662), as amended for the study authority, the non-Federal sponsor is responsible for 10 percent of total costs of construction of the general navigation features (GNF), or in this case, a jetty.* The Federal government is responsible for the remaining 90 percent. Operation and maintenance (O&M) of the GNF of the Authorized project will be the Federal responsibility.

*The Non-Federal Sponsor is also responsible for providing an additional 10 percent of total construction costs of the general navigation feature up to 30 years upon completion of construction.

8. ENVIRONMENTAL CONSEQUENCES

This section is summary of the environmental impacts that would result from the implementation of two project alternatives, the Tentatively Selected Plan (TSP) and the No Action Alternative (NAA). A complete discussion of the scientific and analytic basis for the comparisons of the two project alternatives is included in the Environmental Assessment (EA) in Appendix C.

8.1 Water Quality

The terrestrial area adjacent to the project is either wetlands or intertidal beach habitat and would not support large construction vehicles. As a result, construction of the stone structure would be completed entirely by barges positioned offshore. Barges would be maneuvered in and around the proposed project area during construction. Clean stone and geotextile would be the only construction materials used in this project. The specifications will require that the product (stone) will be free of fines. No excavation of sand fill is anticipated during the construction of the project

The TSP could result in a minor, adverse impact to water quality, which is predicted to be temporary in nature and localized to a small area around and including the placement site. Impacts may include an increase in turbidity and total suspended solids (TSS). Increases in turbidity and TSS would be due to fine material included in the construction materials, as well as the suspension of bottom sediment at the placement site. Construction materials would be inspected and fine material would be removed prior to construction to ensure that excess amounts of fine material would not be introduced into the water column. TSS and turbidity levels are predicted to return to normal once construction activities have been completed. Increased turbidity and TSS levels also have the potential to lower the dissolved oxygen (DO) concentration in the water column. Reduced DO levels within the water column can stress aquatic organisms if the levels are low enough. If DO levels are affected by construction activities, they would return to normal once construction has been completed.

Over the life span of the project, it is predicted that water quality will improve locally. The project would reduce wave, storm and current energy within the project area, ultimately reducing shoreline erosion. As a result, the amount of peat and organic sediment entering the water column from the eroding shoreline would be reduced, resulting in the reduction of TSS and turbidity.

The NAA would not change the existing water quality conditions.

8.2 Wetlands

Construction of this project is projected to result in the loss of less than a quarter acre non-vegetated intertidal sand flats located along the shore of Uppards Island. The northern dike

will extend from the navigation channel and key into the existing sandy shoreline (Figure 5). As a result an area of beach would be permanently covered by stone. Although construction will be completed entirely from a barge, there is a potential the additional non-vegetated intertidal sand flats (less than 1 acre) adjacent to the jetty may experience temporary minor impacts. These areas may experience higher levels of foot traffic and other usage during construction. These impacts are expected to dissipate once construction has been completed.

Long term, local wetlands would benefit from project implementation. The construction of the jetty would protect remaining vegetated wetlands and non-vegetated sand flats in the project area from wave energy and greatly reducing erosion. This protection may allow a more positive sediment and peat deposition rate, relative to sea level rise, which, along with the physical protection provided against erosive forces, should enable the wetlands to persist longer than predicted trajectories under the NAA.

The NAA will result in the continued loss of wetlands at current or increased rates due to erosion and sea level rise.

8.3 Submerged Aquatic Vegetation

The most recent SAV surveys indicate that there are no beds of SAV, of either species found in the area, eelgrass or widgeongrass, located in the area affected by the TSP, nor have there been for at least the past 10 years (VIMS, 2014).

Overall impacts to local SAV populations would be minor, but positive. By protecting the local area of the southwestern shore of Uppards Island from further erosion, existing SAV beds along the eastern shore of Uppards Island may become denser due to local improvements to water quality (reduced TSS and turbidity) that would result from shoreline protection and reduction in wave and current energy.

Water visibility would either remain the same or decrease if the NAA was implemented. As a result, SAV resources in areas adjacent to the project would either not change or decline.

8.4 Fauna of the Project Area

Adverse impacts to the fauna within the proposed project area are predicted to be minor. Construction of the TSP would impact a total of two acres, of which approximately 0.7 acres will be shallow-water and intertidal benthic habitat. This area would be permanently covered with stone. The direct impacts to aquatic fauna resulting from the implementation of this project would include injury and mortality of slow moving or sessile organisms. Non-motile organisms currently residing in the sediments within the footprints of the jetties would be crushed and/or buried. Although individuals would be lost due to construction, this habitat is common in the local area. Therefore, this project is not expected to adversely impact the health of the entire population of species which rely on subaquatic sandy bottom or unvegetated beach habitats.

Although the TSP would permanently change the type of substrate in the footprint of the jetties, from sandy bottom to a rock reef, the project would provide hard structure, which is a habitat type that supports a different faunal community. Horseshoe crabs and terrapin that may currently utilize the project footprint area will no longer be able to do so. The jetty would provide attachment sites for a wide variety of estuarine invertebrates, as well as foraging habitat for more motile aquatic life. Although of lesser habitat value than natural hard structure, such as oyster reefs, rock structures do provide hard substrate and crevices for protection that many species utilize. Over time, the proposed stone structures would become habitat to various organisms that are important for supporting base-level food chains, including filter feeders (such as oysters and mussels), and others. Additionally, the rock structure generally attract mobile aquatic fauna, which subsequently make these areas attractive for foraging birds, such as terns.

Impacts to avian fauna should be minimized due to the expected time-of-year restrictions. Construction would not take place during the bird nesting season. During construction, birds will likely avoid the project area due to the noise and earthmoving. This disturbance would be temporary, lasting only while construction is taking place.

The NAA would result in no change to the fauna within the project area.

8.5 Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Management and Conservation Act require Federal action agencies to consult with the NOAA regarding the potential effects of their actions on EFH, which is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growing to maturity. Step 1 of the EFH consultation process was accomplished by notifying NOAA that this EA was being prepared. Step 2 involved the preparation of an EFH Assessment by the Federal agency proposing the action. The EFH assessment included: (1) a description of the proposed action; (2) an analysis of the effects of the action on EFH and associated species; (3) the Federal agency's views regarding the effects of the action on EFH; and (4) a discussion of proposed mitigation, if applicable. The EFH assessment can be found in Appendix C. Step 3 of the consultation process will be completed after NOAA reviews the Draft EA. NOAA will then provided EFH Conservation Recommendations as needed. This response, in writing, will describe the measures proposed by the agency to avoid, mitigate, or offset the impacts of the action on EFH pursuant to NOAA recommendations. We will consult with NOAA during the Planning Engineering Design (PED) to ensure compliance with ESA and EFH guidelines.

8.5.1 Description of proposed action. See Section 7.0 of this report.

8.5.2 Analysis of the effects of the action on EFH. A description of the species, which include winter flounder, windowpane flounder, scup, black sea bass, king mackerel, Spanish mackerel, cobia, red drum, sand tiger shark, Atlantic sharpnose shark, dusky shark, and sandbar

shark and at which life stage EFH has been determined by NOAA to be in the vicinity of the project can be found as an attachment to the Environmental Appendix. No Habitat Area of Particular Concern (HAPC) designations for any species exist in the project area. HAPC are described in regulations as subsets of EFH that are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally-stressed area.

Potential adverse effects to EFH species result may result from the construction of the proposed project. These include changes in water quality, direct encounters with construction materials and equipment during project construction, conversion from one habitat type to another and impacts to populations of prey items.

Construction of the stone jetty may result in a temporary decrease in water quality; specifically, turbidity and the concentration of suspended solids and dissolved nutrients may increase while dissolved oxygen levels and water clarity may decrease. These changes could impact fish by interfering with the respiration of organisms with gills and predators which hunt by sight. Water quality will quickly return to pre-project levels once construction has been completed.

There will be a conversion of a small area of open shallow water and beach habitat to hard structure due to the construction of the TSP. The transitions would result in population increases for structure dependent species. The transitions of soft bottom habitat to a rock structure may cause a decline in populations that rely on soft habitat at the construction sites; although this project is not expected to cause significant changes to the overall populations of species reliant on open bottom because significant amount of that habitat type will remain available.

Another direct impact of construction is the possibility that individual fish may be injured or killed due to direct encounters with stone and heavy equipment. Fish, however, are extremely motile and are expected move out of the area during construction. Injury or death to slower moving animals may result if the organisms are buried during construction or if the organisms cannot move away from the project site when heavy equipment is being operated. Natural behaviors such as foraging and hunting may be interrupted while construction activities occur. Organisms that are able to leave the immediate area may be temporarily displaced from the affected sites, but behaviors should return to normal once the construction phase has been completed. These benefits will result in increased productivity at higher trophic levels, such as in the finfish community, and will be especially beneficial to fish that favor hard structure habitat, such as black sea bass.

The placement of stone may reduce the population of prey species used by some EFH species. Relatively non-motile benthos, such as polychaetes and mollusks, will be destroyed at

the project sites; this may cause fish to move out of the project area for foraging. These impacts will be relatively minor due to amount of sandy bottom habitat that will remain unaltered that surrounds the project area. Fish species will have small distances to travel in order to locate populations of prey species.

8.5.3 Department of the Army's views regarding the effects of the action on EFH. USACE has determined that the construction of the proposed project may result in minor impacts that *may affect, but not likely to adversely affect*. The significance of direct impacts resulting from this project on EFH species will depend on life stage and the usage of the project area. For example, it is more likely that eggs and larval fish will be affected to a greater extent than adults and juveniles, because the older life stages have greater swimming abilities and will be able to move away from construction activities. However, eggs and larvae are widely distributed over the continental shelf, for some species, such as the scup, so the destruction of these life stages is not expected to cause significant impacts to fish populations. Demersal species, such as the windowpane flounder and the winter flounder, are mobile and should be able to avoid project construction as well; however, because of their demersal nature, individuals that remain on the seafloor during the placement of materials could be buried and destroyed.

Direct impacts to water quality are predicted to be minor and temporary in nature. Due to the relatively small amount of fine material that will be included with the stone that is placed, increases in turbidity and decreases in dissolved oxygen are expected to be small and localized to the construction area. Once construction has been completed, water quality is expected to return to pre-project conditions almost immediately.

The transition of shallow soft bottom habitat to stone habitat will not be temporary in nature. However, the area that will be converted is relatively small compared to the amount of soft bottom habitat that will remain undisturbed. The benthic and fish community that utilize soft bottom habitat will be able to move to sites adjacent to the project area to access the preferred habitat type.

Most indirect impacts of the project are also expected to be minor, temporary and localized to the footprint of the project area. It is expected that the benthic community in the project will recover and fish usage will return to pre-project conditions once construction has been completed.

8.5.4 Discussion of proposed mitigation. It is the opinion of USACE that no mitigation will be required for this project, because the project will not result in significant adverse effects on EFH for Federally managed species.

The NAA would have no effect on EFH fish species found in the project area.

8.6 Federally-Threatened and Endangered Species and State Species of Special Concern

No significant negative impacts to aquatic TES species are expected as a result of project implementation, including bottlenose dolphins, sea turtles, sturgeon, northern diamondback terrapin and bird species. Some species may derive some benefits from the construction of the project. Sea turtles, with the exception of the leatherback turtle, would likely derive benefits from the proposed project due to increased availability of prey items within the restored habitat. Green sea turtles are primarily herbivorous as juveniles and adults. SAV may experience minor positive benefits due to construction of the proposed project isdue to lowering of local TSS levels in nearshore waters.

The Northeastern Beach Tiger Beetle (*Cicindela dorsalis dorsalis*), federally-listed as threatened, was found in small numbers at two sites near the proposed project area during a survey that was completed in 2004. A more recent survey has shown that there are no tiger beetles present in the local project area (see the USFWS Planning Aid Report in the Environmental Appendix). Due to the erosion of the southern beach spit of Tangier Island, the island may no longer have a viable population, as USFWS only found one adult beetle during a survey in 2014. Because of the absence of tiger beetles in the project area, no significant negatives impacts on this species are expected. The lost beach habitat in the project area is not likely to be replaced as a result of project implementation, so no future benefits to the tiger beetle are expected.

The Atlantic sturgeon (*Acipenser oxyrinchus*) is currently listed as federally threatened. The known population in the Chesapeake Bay is very small. The largest remaining group are located in the James River, Virginia, and consists of approximately 300 individuals. As the sturgeon is an anadromous fish it is only in the Bay during part of the year. Adults migrate up tributary rivers of the Bay to spawn in fresh water in the spring. Juveniles may stay in the rivers and Bay mainstem for the first years of their life, but eventually migrate into oceanic waters where they spend most of their lives. Due to their migratory pattern in the Bay, it is unlikely that adults would be found in the project area. Construction will produce noise and turbulence such that any sturgeon that might be in the local area will depart. The Atlantic sturgeon, being a benthic feeder, may benefit from the increased diversity and numbers of benthic organisms within the study areas provided by the increased bottom habitat type. Both negative and positive impacts are unlikely, because sturgeon are not usually found in such nearshore island habitat. No significant negative impacts to sturgeon are expected.

USACE has consulted with USFWS and NOAA and will continue to consult with the two Federal agencies during the circulation of the draft EA. The USACE determined that the project *may affect but is not likely to adversely affect* the federally listed species found in the project area.

The NAA would have no effect on rare, threatened or endangered species found in the

project area.

8.7 Cultural Resources

No negative impacts to cultural resources are anticipated as result of the implementation of the proposed project. In accordance with Section 106 of the National Historic Preservation Act, implementation of the proposed project would have no adverse effect on any known cultural resources in the study area. The small section of the north jetty to be constructed along the shoreline (< 2 acres) would involve the disturbance of culturally sterile upper strata of recently deposited sand and salt marsh peat. Offshore sections would involve little to no bottom disturbance, and construction access would be by barge. The proposed project would reduce erosion on the south west tip of Uppards, thereby providing some protection to any sites that may exist nearby on Uppards, as well as protect buildings in the Tangier Island Historic District. Although it is possible that there are prehistoric resources buried deeply in the areas that would be covered by the jetty, it is impractical to investigate this possibility.

A brief survey was conducted in the project area of potential effect, reported along with historical research in a cultural resource survey report (Haynes 2014). No significant archaeological resources were identified; however, submerged portions of site 44CS0524 may be in or near the project area. Site 44CS05524 is a prehistoric site listed as contributing to the Tangier Island Historic District (DHR #309-0001). In consultation with Virginia Department of Historic Resources (DHR, i.e., State Historic Preservation Office [SHPO]), it was determined that this project would have no adverse effects to historic properties including site 44CS0524 and the Tangier Island Historic District (letter July 9, 2014, Greg LaBudde DHR, to John Haynes USACE-NAO, DHR file # 2014-3419).

8.8 Socio-Economic Resources

No negative effects on the socio-economic resources of the area are anticipated from construction of the proposed project, impacts are expected to be highly positive. Fishing or crabbing opportunities would not be reduced and would be enhanced by implementing the proposed project. Navigation needs would be met; the harbor would be better protected along with nearshore seafood industry infrastructure. No changes in the areas of public facilities and services, community cohesion, property values, and community and regional growth are expected from implementation of the proposed project. Similarly, no displacement of people, businesses, or farms would occur, and there would not be any adverse effect on any racial, ethnic, or other minority group.

8.9 Air Quality

The TSP would result in minor and temporary decreases of air quality while construction takes place. Increased air emissions would be associated with construction equipment, including a tugboat, cranes, front end loaders and other the diesel equipment used to place the stone. Air

emissions would include temporary increases in volatile organic compounds, nitrogen oxides, sulfur dioxide, and carbon monoxide. As the Accomack County is located in an attainment area, Northeastern Virginia Intrastate Air Quality Control Region (9VAC5-20-203), for all known air pollutants, calculations are not needed to estimate emissions of the six criteria pollutants. No formal Clean Air Act conformity determination for the proposed project is required (9VAC5-160-30). The emissions produced during transportation and construction is not expected to exceed ambient air quality standards. Any negative impacts as a result of implementing the TSP will br temporary and negligible.

The NAA would not be expected to result in changes to air quality in the project area.

8.10 Noise Pollution

The use of construction equipment to place the rock on the proposed sites and the barges required to transport the rock to the site would likely increase noise levels in the local area during the construction period. There are no residential areas in proximity to the proposed construction, and only local watermen are likely to notice the noise as they travel through the channel toward open water near the area. Local wildlife may be disturbed close to and on the sites, but should experience no adverse effects and should return to the area immediately after construction is complete. No significant impact from noise is expected.

The NAA would not result in noise pollution in the project area.

8.11 Hazardous, Solid, Toxic, and Radioactive Waste

Construction of the proposed project is not expected to result in the identification and/or disturbance of any hazardous, solid, toxic, or radioactive waste (HTRW). Best management practices (BMP's) would be used to secure any fuel supplies used by vessels or vehicles used during proposed project construction. No significant impacts involving HTRW are expected.

The NAA would not be expected to result in the identification or disturbance of HTRW or solid waste.

9. PUBLIC AND AGENCY INVOLVEMENT

9.1 Public and Federal, State, and Local and Agency Coordination

The draft Detailed Project Report and draft EA will be made available to the public by notice of availability for a 30-day review and comment period. Prior verbal coordination of the pending Draft EA was made with several outside agencies, including USFWS, NOAA, and state regulatory agencies. The documents will be made available on the USACE website and local libraries. The documents will also be sent to the following Federal, state and local agencies for review and comment.

NMFS - National Marine Fisheries Service
NPS – National Park Service
USEPA - U.S. Environmental Protection Agency
USFWS - U.S. Fish and Wildlife Service
VDGIF - Virginia Department of Game and Inland Fisheries
VDCR - Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation
VDEQ - Virginia Department of Environmental Quality
VDH - Virginia Department of Health
VDHR - Virginia Department of Historic Resources
VIMS - Virginia Institute of Marine Science
VMRC - Virginia Marine Resources Commission
Accomack-Northampton Planning District Commission
County of Northampton
County of Accomack
Town of Tangier

Comments that are received during the public review period will be addressed and include in the Comment and Response Section of the final version of this document. A FONSI will be signed and included in the final document.

9.2 Status of Environmental Compliance

1. Anadromous Fish Conservation Act of 1965, as amended

Compliance: Anadromous fish species would not be affected. The project has been coordinated with the NOAA and is in compliance with the act.

2. Archaeological and Historic Preservation Act of 1974, as amended, 16 U.S.C. 469 et seq.

Compliance: The VDHR has been coordinated with concerning historic and/or archeological resources in the study area. Continued coordination with VDHR, where required, signifies compliance.

3. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Compliance: Submission of this report to the Regional Administrator of the USEPA for review pursuant to Sections 176 (c) and 309 of the Clean Air Act signifies compliance. The project area is located in the Accomack County, Virginia (Chapter 20, Section 200), which is in attainment for all criteria pollutants; therefore an estimate of emissions is not required. Although there will be minor, temporary air pollution increases from construction equipment, these increases will be

short-term and below *de minimis* levels. No impacts to air quality will result from the project; therefore no permits would be required for this project.

4. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972 and Water Quality Act of 1987) PL 100-4, 33 U.S.C. et seq.

Compliance: A Section 404(b)(1) Evaluation and Compliance Review has been incorporated into this report. A VMRC permit and State Water Quality Certification under Section 401 will be obtained as required.

5. Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990

Compliance: There are no designated coastal barrier resources in the project area that would be affected by this project.

6. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1431 et seq.

Compliance: A Federal consistency determination will be submitted to VDEQ concurrently with the circulation of the Draft EA. Issuance of applicable permits and concurrence of consistent to the maximum extent practicable by VDEQ, VMRC, and the state agencies with that enforceable policies of the Virginia Coastal Zone Management Program signifies compliance.

7. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: Coordination with USFWS as well as coordination with NOAA has yielded no formal consultation requirements pursuant to Section 7 of the Endangered Species Act. USACE has agreed to follow USFWS recommended time-of-year restrictions for sand placement, therefore no formal consultation is required nor are impacts expected to be significant. Time-of-year restrictions were initially recommended due to the presence of the federally-threatened northeastern beach tiger beetle, *Cincindela dorsalis dorsalis*, within the project footprint. These beetles are no longer found in the project area, and the Corps has further coordinated with USFWS and the agency has determined that the time-of-year restriction is no longer necessary. NOAA (NMFS) and the USACE will coordinate regarding the listing of the Atlantic sturgeon with respect to any potential for project impacts to the sturgeon. None are expected.

8. Estuarine Areas Act, 16 U.S.C. 1221 et seq.

Compliance: Coordination of the Draft EA report, with appropriate Federal and state resource agencies, signifies compliance with this act.

9. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Coordination of the Draft EA with the National Park Service (NPS) and the Virginia Department of Conservation and Recreation, relative to the Federal and state comprehensive outdoor recreation plans, signifies compliance with this act.

10. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination of the Draft EA with the USFWS, NMFS, and the Virginia Department of Game and Inland Fisheries signifies compliance with this act.

11. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Compliance: Coordination is not required because the proposed project does not involve an undertaking that will or may affect properties of facilities acquired or developed with the assistance from this Act.

12. Magnuson – Stevens Fishery Conservation Act also known as the Fishery Conservation and Management Act of 1976

Compliance: This act has been fully described in Sections 8.6 of this report and the EA and EFH assessment that are located in Appendix C. The EFH Assessment for this project can be found in Appendix C and coordination with the NOAA will be included in Appendix E after coordination has been completed.

13. Marine Protection, Research, and Sanctuaries Act of 1972, as amended 33 U.S.C. 1401 et seq.

Compliance: Not applicable; proposed project does not involve the transportation or placement of dredged material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

14. National Historic Preservation Act of 1996, as amended, 16 U.S.C. 470 et seq.

Compliance: Completion of Section 106 review signifies compliance with this act, documented in letter of 9 July 2014 from VDHR.

15. National Environmental Policy Act of 1969, as amended, 42 U.S.C. 432 et seq.

Compliance: Preparation of the Draft EA and public coordination and comment signifies partial compliance with NEPA. Full compliance is achieved with the signing and issuing of the Finding of No Significant Impact (FONSI) statement which is included as a draft with this EA.

16. Rivers and Harbors Appropriation Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: Exempt.

17. Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.

Compliance: No requirements for USACE activities.

18. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.

Compliance: The proposed project has been evaluated reference to this act. The proposed project would not adversely impact any component of the Virginia Scenic Rivers System. There are no wild and scenic rivers in the proposed project area. Coordination of the Draft EA with the NPS and the Virginia Department of Conservation and Recreation, relative to the Virginia Scenic Rivers System, signifies compliance with this act.

19. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601-9675.

Compliance: The proposed project has been evaluated reference to this act. No hazardous substances on subaqueous lands in the proposed project construction area, including for construction operation and maintenance, have been currently identified. The proposed project is in compliance with this act following state and Federal agency concurrence with the findings of this EA.

Executive Orders
1. Executive Order 11988, Floodplain Management, 24 May 1977, as amended by Executive Order 12148, 20 July 1979.

Compliance: The proposed project would not stimulate development in the floodplain. Circulation of this report for public review fulfills the requirements of Executive Order 1988, Section 2(a)(2).

2. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: No significant negative impacts to wetlands would occur by implementing the proposed project. Wetlands would have significant positive impacts resulting from project implementation. SAV may experience minor but positive benefits as a result of project implementation. Circulation of this report for public review fulfills the requirements of Executive Order 11990, Section 2(b).

3. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not applicable; proposed project is located within the United States.

4. Executive Order 12898, Environmental Justice in Minority Populations and Low-Income Populations, 11 February 1994.

Compliance: No adverse impacts are expected to occur to any minority or low income communities in the study area. Indirect benefits that lead to increases in the commercial harvest of blue crabs would benefit local watermen and their communities, including the Town of Tangier. The Draft EA was made available for public comment to all individuals who have an interest or may be affected by the proposed project. This Draft EA will incorporate the comments made after public and agency review.

5. Executive Order 13508, Chesapeake Bay Protection and Restoration, 12 May 2009.

Compliance: The proposed project will provide some protection to Uppards Island wetlands against erosion.

6. Executive Order 13653, Preparing the United States for the Impacts of Climate Change, 1 November 2013.

Compliance: The proposed project will provide a small amount of protection to Tangier and Uppards Islands against the impacts of sea level rise by reducing climate-changed induced storm surge damage for the expected life of the project.

Executive Memorandum
1. Analysis of Impacts of Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not applicable; proposed project does not involve or impact agricultural lands.

9.3 Views of the Non-Federal Partner

The non-Federal sponsor supports the project and its willingness to move into the Design and Implementation phase of the project. The town of Tangier provided a Letter of Intent on August 18, 2009 (see Appendix E) that indicates their understanding of the cost share for the design and construction of the project. The letter stated their willingness to enter a Project Partnership Agreement with the Federal Government.

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

The navigation problems at Tangier Island North Channel in Accomack County, Virginia, have been reviewed and evaluated with regard to the overall public interest and with consideration to engineering, environmental, and social concerns. The conclusions drawn by the study are as follows. The proposed construction of new jetties at the mouth of the North Channel as discussed in this document would have minor but largely controllable short term impacts. However, in the long term it would help improve the overall quality of the human environment. This assessment supports the conclusion that the proposed project does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, a finding of no significant impact will be prepared.

10.2 Recommendations

In view of the conclusions just presented, it is recommended that Alternative 1 be approved as the recommended plan.

I recommend that the navigation measures at Tangier Island, Virginia be constructed generally in accordance with the plan herein, and with such modifications thereof as at the discretion of the Chief of Engineers may be advisable at an estimated total Federal cost of $2,419,000 and $54,000 annually for Federal maintenance provided that prior to construction the non-Federal partner agrees to the following:

a. Provide, during the period of design, 10 percent up-front for design costs allocated by the Government to navigation features in accordance with the terms of a design agreement entered into prior to commencement of design work for the project; and provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated to the Government for general navigation features (GNF) navigation features in accordance with the cost sharing as set out in paragraph b., below;

b. Provide, during construction, 10 percent of the total cost of construction of the navigation features. The Non-Federal Sponsor is also responsible for providing an additional 10 percent of total construction costs of the general navigation feature up to 30 years upon completion of construction.

c. Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction or operation and maintenance of the general navigation features:

d. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government;

e. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share thereof, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;

f. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 United States Code 4601-4655), and the Uniform Regulations contained in 49 Code of Federal Regulations Part 24, in acquiring lands, easements, and rights-of-way required for construction of the navigation features, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

g. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal partner owns or controls for access to the project for the purpose of inspecting the navigation features;

h. Hold and save the United States free from all damages arising from the construction of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

i. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total costs of construction of the navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations Section 33.20;

j. Comply with all applicable Federal and State laws and regulations, including, but not limit to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 United States Code 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7 entitled “Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army”; and all applicable Federal labor standards requirements including, but not limited to, 40 United States Code 3141-3148 and 40 United States Code 3701-3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 United States Code 276a *et seq.*) the Contract Work Hours and Safety Standards Act (formerly 40 United States Code 327 *et seq.*) and the Copeland Anti-Kickback Act (formerly 40 United States Code 276c *et seq.*);

k. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act, Public Law 96-520, as amended (42 United States Code 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction of the navigation features;

l. Assume, as between the Federal Government and the non-Federal partner, complete financial responsibility for necessary cleanup and response costs of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction of the navigation features;

m. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under the Comprehensive Environmental Response, Compensation, and Liability Act; and

n. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 United States Code 1962d-5b), and Section 101(e) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 United States Code 2211), which provides that the Secretary of the Army shall not commence the construction of any water resources project, or separable element thereof, until each non-Federal partner has entered into a written agreement to furnish its required cooperation for the project or separable element.

The recommendations for implementation of navigation measures at Tangier Island, Virginia reflect the policies governing formulation of individual projects and the information available at this time. They do not necessarily reflect the program and budgeting priorities inherent in the local and State programs or the formulation of a national civil works water resources program. Consequently, the recommendations may be changed at higher review levels of the executive branch outside Virginia before they are used to support funding.

NOTE ON THE INFORMATION PRESENTED IN THIS DOCUMENT

The information contained herein reflects the policies governing formulation of individual projects and the information available at this time. It does not necessarily reflect program and budgeting priorities inherent in the local and state program or the formulation of a National Civil Works Construction Program. Consequently, the recommendations may be modified before they are implemented.

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