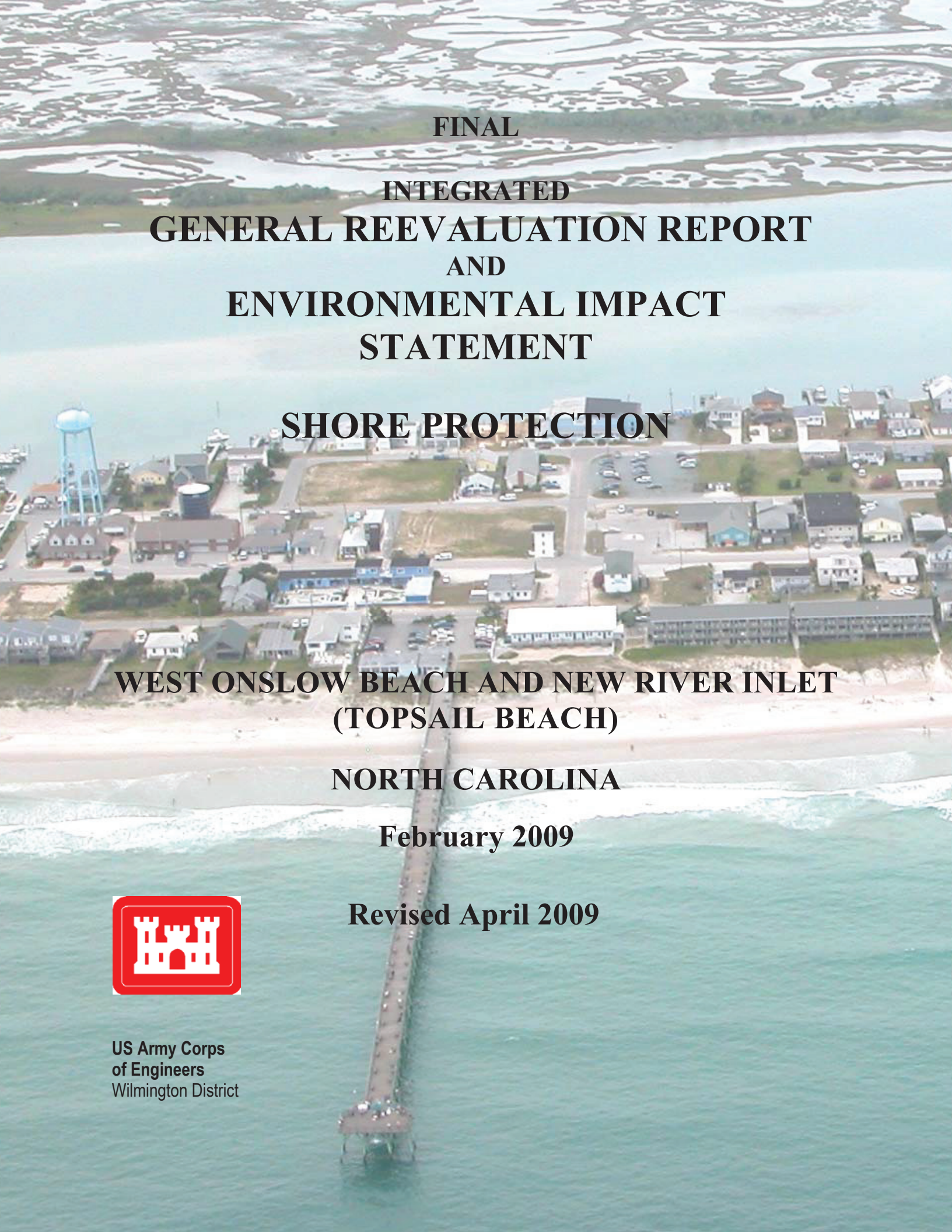

FINAL

INTEGRATED
GENERAL REEVALUATION REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT

SHORE PROTECTION

WEST ONSLOW BEACH AND NEW RIVER INLET (TOPSAIL BEACH)

NORTH CAROLINA

February 2009

Revised April 2009

US Army Corps of Engineers
Wilmington District

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EXECUTIVE SUMMARY

This General Re-evaluation Report (GRR) summarizes efforts directed at evaluating the continued feasibility of not yet constructed hurricane and storm damage reduction features along the coastline adjacent to the Town of Topsail Beach, on Topsail Island, North Carolina. Originally authorized as the West Onslow Beach and New River Inlet, NC shore protection project in the Water Resources Development Act (WRDA) of 1992, the local sponsor was not able to execute the Project Cooperation Agreement, and it was not subsequently constructed. During the intervening years, increasing storm damage has occurred along many portions of the shoreline of this part of North Carolina, notably by Hurricanes Bertha and Fran in 1996, and Hurricane Floyd in 1999. This increased coastal erosion threat, along with the increasing threat to existing and new development within the Town of Topsail Beach, led to initiation of this post-authorization General Re-evaluation study in 2001. This report was prepared in compliance with the Energy and Water Development Appropriations Act of 2001 that pertains to the authorized project for Topsail Beach.

The study area consists of the Town of Topsail Beach, its shoreline, and adjacent borrow areas off the coast. The remainder of Topsail Island to the north of the Town of Topsail Beach is being studied under a separate study authority. This study serves as a re-evaluation of the original report to the Congress of the United States and to identify if there are technically, environmentally, and economically feasible means of reducing damages caused by coastal hurricanes and storms within the identified study area. It also serves to examine the feasibility of providing hurricane and storm damage reduction features along a portion of the shoreline not originally authorized for construction, within the Town of Topsail Beach.

The study team integrated representatives of Federal, State, and local governments, in the effort to identify cost-effective and environmentally- and technically-sound alternatives to reduce damages within the Town of Topsail Beach, and to its adjacent shoreline. The process fully integrated the Corps' "Twelve Actions for Change", in all aspects of the study process. The study effort identified a "National Economic Development" (NED) plan, which would maximize net benefits to the nation through reduction of future storm damages, as well as a "Locally-Preferred Plan (LPP), which is a plan that the local sponsor, the Town of Topsail Beach, supports. The recommended plan of action is construction of the Locally-Preferred Plan.

The recommended plan, referred to in the GRR as "Plan 1250X", consists of a sand dune constructed to an elevation of 12 feet above the National Geodetic Vertical Datum (NGVD), fronted by a 50-foot wide beach berm constructed to an elevation of 7 feet above NGVD. This dune and berm feature would extend 23,200 feet, with a 2,000 foot northern transition fill, and a 1,000 foot southern transition fill, for a total length of 26,200 feet. This total project length exceeds the originally authorized project length of 19,200 feet.

The recommended plan will provide for expected annual benefits estimated at $13,328,000, at October 2008 price levels, at estimated annual costs of $4,450,000, for an overall benefit to cost ratio of 3.0 to 1. The originally authorized plan segment of the LPP possesses a benefit-cost ratio of 2.3 to 1, while the newly-proposed increment not originally authorized possesses a benefit-cost ratio of 5.5 to 1. For construction beginning in late 2011, the estimated cost of the recommended plan would be $40,060,000.

The more significant departures from the Authorized Plan to the recommended plan are the borrow site location, the project length increase, the lowering of the dune, and change in renourishment interval. Since original project authorization in 1992, Topsail Beach has changed both physically and economically. The total structure value has increased and therefore the resulting increase in storm damage reduction benefits can now justify a longer project. The south end of the island between New Topsail Inlet and the project area has been accreting and New Topsail Inlet has shifted southwest and away from the project area. This has reduced the renourishment requirements. The new inlet location places the original borrow site in a CBRA zone. Changes in the project plan are shown schematically in Figure i.

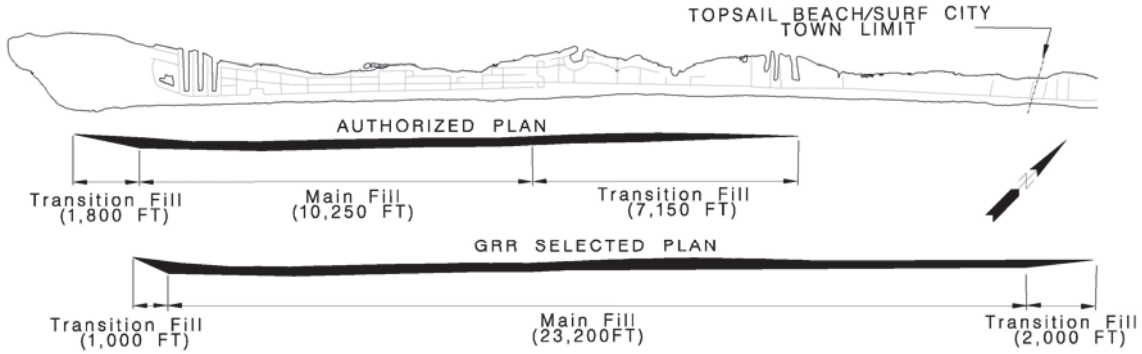

Figure i. Authorized Plan (HD 393/102/2) and GRR Selected Plan, Plan view

Detailed comparisons of the changes in geographic scope, project features, and source borrow area, are summarized in Table i. Detailed comparisons of the differences and incremental increases in first costs, annual costs, annual and net benefits, and benefit-cost ratios between the recommended Locally-Preferred Plan and the Authorized Plan, made at October 2008 levels are shown in Table ii.

Table i. Plan Comparison Table. The Locally Preferred Plan (LPP) (bold text) is the selected plan.

Dimensions	Plan		
	Authorized # HD 393/102/2	**GRR, LPP, Plan 1250X**	GRR, NED, Plan 1550
Dune, topwidth,	25 feet	25 feet	25 feet
Dune, elevation, NGVD	13.6 feet	12 feet	15 feet
Dune, landward slope	5H:1V	5H:1V	5H:1V
Dune, seaward slope	5H:1V	10H:1V	10H:1V
Dune and storm berm, width	35 feet	None	None
Dune and storm berm, elevation, NGVD	9.6 feet	None	None
Dune and storm berm, seaward slope	5H:1V	None	None
Beach berm, width	40 feet	50 feet	50 feet
Beach berm, elevation, NGVD	7.6 feet	7 feet	7 feet
Beach berm, seaward slope	12H:1V	15H:1V	15H:1V
Dune and berm fill, length	10,250 feet	23,200 feet	22,800 feet
North transition section, length	7,150 feet	2,000 feet	2,000 feet
South transition section, length	1,800 feet	1,000 feet	1,400 feet
Total Length	19,200 feet	26,200 feet	26,200 feet
Volume, initial, in-place CY	*2,659,000 CY	2,387,000	3,420,000
Volume, renourishment, in place, CY	372,000 CY	690,000	690,000
Renourishment interval	2 years	4 years	4 years
Borrow source	Banks Channel	Off shore	Off shore

*including 372,000 CY advance nourishment # revised volumes from DM.

Table ii. Incremental Analysis, in thousands. October 2008 levels, 4.625% interest rate

Item	Segments		
	GRR Selected (LPP)	Authorized	Incremental
Total First Cost	$37,712	$29,152	$8,560
Interest During Construction	$302	$233	$69
Total Investment Cost	$38,014	$29,385	$8,629
Renourishment, every 4 years	$9,492	$7,446	$2,046
Present Value, TIC & Renourish.	$80,431	$62,658	$17,773
Annual Costs			
Interest and Amortization	$4,153	$3,235	$918
Monitoring	$275	$233	$42
OMRR&R	$22	$16	$6
Total	$4,450	$3,484	$966
HSDR Benefits	$7,741	$4,837	$2,904
Net Benefits (HSDR only)	$3,291	$1,353	$1,938
BCR (HSDR only)	1.7	1.4	3.0
Recreation and Other Benefits	$5,587	$3,143	$2,444
Total Benefits (all)	$13,328	$7,980	$5,348
Net Benefits (all)	$8,878	$4,496	$4,382
BCR (all)	3.0	2.3	5.5

The Section 902 limit for the authorized project is $27,293,000, as updated to October 2008 price levels, and applies to initial construction. Because the cost of both the NED and Locally-Preferred Plans exceeds that of the Section 902 limit, and the recommended plan's physical scope exceeds the length of the authorized project, this new recommended plan requires re-authorization by the Congress.

The recommendation for implementation of a Locally-Preferred Plan is based on the sponsor's need for the lower first cost of this plan when compared to the NED Plan, its higher benefit-to-cost ratio, and the apparent greater protection it may provide to the southern end of town adjacent to Godwin Avenue. The sponsors understand that the Locally-Preferred Plan has a greater risk of damage, due to the lower height of the LPP as compared to the NED plan.

Based on the recommendation of use of public funds for the reduction of damages along this shoreline, the Sponsors will provide public access and parking in accordance with Corps of Engineers guidelines, at intervals of no more than a half mile, throughout the reach of Topsail Beach protected by the cost-shared project.

The recommended plan of improvement is considered to be environmentally acceptable. Piping plover were documented to feed along the primary study area. This species is common throughout the year in North Carolina as either a migrant or winter resident and frequently uses the surf zone. The project may affect piping plover foraging distribution on the beach since beach food resources may be affected by beachfill operations. The green sea turtle, loggerhead sea turtle, Kemp's ridley sea turtle, and leatherback sea turtle are known to nest in North Carolina and could nest in the project area. For this reason, they could be affected by initial project construction and periodic nourishment. These sea turtles occur in offshore waters and may also be affected if hopper dredges are used. Periodic nourishment activities will be timed, to the extent practicable, to avoid the sea turtle nesting season and avoid hopper dredging during months when water temperatures are warm and turtles may be present. This combined GRR and Final Environmental Impact Statement (GRR/FEIS) includes a biological assessment of project impacts as Appendix I. This biological assessment pursuant to Section 7 of the Endangered Species Act of 1973 has been provided to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Consultation with these agencies will continue concurrently with the circulation and public review of the GRR/FEIS. The requirements of Section 404(r) of Public Law 92-500, as amended, have been met.

Independent Technical Review (ITR) was conducted in accordance with the Corps' "Peer Review of Decision Documents" process, has been reviewed by Corps staff outside the originating office, conducted by a regional and national team of experts in the field, and coordinated by the National Center of Expertise in Hurricane and Storm Damage Protection, North Atlantic Division, U.S. Army Corps of Engineers. Comments and responses will accompany the report to the Assistant Secretary of the Army for Civil Works (ASA(CW)) and the Office of Management and Budget (OMB). Documentation of ITR certification will accompany the final report.

In analyzing potential measures, the study team considered, in all cases where technically sound and environmentally feasible, both structural and non-structural measures. Non-structural measures, such as removal and relocation, were found to be of greater cost than benefits, and therefore, were not recommended for the purposes of storm damage reduction. However, the recommendations of the study team that accompany all structural recommendations for dune and berm construction is that of continued and vigilant attention to the need for pro-active hurricane and storm threat education, storm and hurricane warning and evacuation planning procedures, floodplain management, and other non-structural activities directed at both damage reduction and preservation of life and safety, and are thus, provided as recommended actions, although many do not fall within current Corps implementation authorities.

The analyses and design of the recommendations contained in this report comply with the National Environmental Policy Act (NEPA). A separate Environmental Impact Statement (EIS) will not be provided, as the draft document is a fully-integrated report that complies with both NEPA requirements and the Corps (and Federal) water resources planning process and its requirements. The report complies with all applicable environmental statutes.

The draft report fully discusses areas of risk, uncertainty, and consequences, where that information is appropriate, and describes them with sufficient detail that decisions can be made with knowledge of the degree of reliability of the estimated benefits and costs and of the effectiveness of alternative plans. All recommendations made in the report are capable of being adaptively managed, should that capability be needed, as re-nourishment may be needed more often or less often, depending on the occurrence of large storms and accompanying erosion.

It should be noted that the Administration's position on funding support for hurricane and storm damage reduction projects is as follows: "The Office of Management and Budget advises that while the Water Resources Development Act of 1999 (WRDA 99) changed the cost-sharing formula for the long-term sand renourishment component of certain future shore protection projects, these changes did not go far enough considering the long-term cost of most of these projects. Further, because WRDA 99 delayed the effect of the change in cost sharing for up to a decade or more, it did not address current constraints on Federal spending. The Administration intends to work with Congress to address these problems. However, until these issues are satisfactorily resolved, the Administration will not support authorization of new shore protection projects that involve significant long-term Federal investments beyond the initial construction of these projects, and will give new shore protection projects that are already authorized low priority for funding." As stated above, the Administration has expressed concern about significant long-term Federal investments associated with hurricane and storm damage reduction projects. Clearly, substantial long-term Federal investments would be required to implement the current project proposal. The Administration's projections of future inflation are effectively 2.0 percent annually. Based on these data, the total inflation adjusted (fully funded) project costs are estimated to be $277,000,000 over the 50-year period of Federal participation for the recommended plan of improvement. The Federal

share of the fully funded project costs is currently estimated at $144,000,000. The non-Federal share of the fully funded costs is currently estimated at $133,000,000. Given the Administration's declared budgetary concerns, potential long-term costs associated with the proposed project may be vital to decision making. As previously indicated, the total project benefit-cost ratio is 3.0, which means that for every dollar spent for the project there are 3 dollars and 0 cent realized in National Economic Development (NED) benefits from the project.

Recommendations

Hurricane Risk Education

Numerous people die each year as a result of hurricanes, primarily due to the failure to evacuate to an area of safety. Any loss of life is tragic, and any number of those deaths may have been prevented. Even one death prevented is sufficient reason to improve our methods of educating the public on hurricane and storm threats, and to ensure that all is done to warn all those residents or visitors to the coastline of North Carolina as to the dual hazards of wind and surge/waves. It is particularly vital to inform the public as to the potential for hurricane occurrence, particularly within the dangerous hurricane season, so they pay continued attention to media reports on weather. Education needs to include articulation of effects related to the potential magnitude of the threat, the urgency to heed potential calls to evacuate, and providing the means by which to make wise choices on evacuation methods and route (see recommendations given below under "Hurricane Evacuation Planning"). The following are suggested guidelines for implementation by State and local government, in the interests of good education on hurricane storm threats:

- Provide good science and information to the residents and visitors to coastal North Carolina, so they can understand the nature of the threat, and its possibility of happening at any time within the hurricane season. This information should be provided in both written form, and as an initial "page" on televisions provided in visitor's housing, and also in a variety of venues, including:
    - Posting and televised education in supermarkets, libraries, and public buildings;
    - Teacher-provided, posted and televised education in schools and at public meetings and gatherings, at intervals not to exceed 1 year;
    - Publically-posted and visitor-housing-posted information on evacuation routes, and procedures, on publicly-accessible websites, updated regularly (minimum 1 yr.).

There is nothing humanly possible to maintain the lives and safety of coastal North Carolina residents and visitors, if they do not have sufficient warning, and if they then do not use that knowledge to evacuate in a timely manner.

Education of hurricane risks is an on-going effort of multiple agencies and educational institutions, and not a funded program under existing Corps authorities. Updating of websites containing evacuation routes and procedures should be done under existing programs implemented by the state and local governments.

Hurricane and Storm Warning

Residents and visitors to the coast of North Carolina need to recognize that they live in, or visit, a high-hazard area. Although certain times of the year pose less risk than others, each year's hurricane season provides a strong possibility of hurricane impact somewhere along the coast of North Carolina. All residents and visitors need to be made aware of the current hurricane threat, but first meteorological conditions must be evaluated, and any threat must be assessed and characterized by experts with the National Oceanic and Atmospheric Administration's National Weather Service, and that interpretation passed to national and local media for dissemination. Continued support of NOAA's program, and the following supportive activities is critical to an adequate warning process:

- On-going efforts to upgrade the existing system of NOAA buoys, transmission capabilities, and advanced warning measures that provide data on the location and nature of weather conditions.
- Efforts directed at the interpretation of that data and its dissemination to the media and public, through the National Weather Service.
- Public appreciation for the need to be aware at all times of, and the need to listen to weather reports and advice given on various media. Television weather reports, radio, and the internet all provide excellent up-to-date information on weather conditions, and the development of threatening situations. Simply living in or visiting the barrier islands of North Carolina should be sufficient to create a consistent and on-going process of being exceptionally aware of the weather, and its potential consequences.
- The vital importance of heeding the advice of experts. One should know what needs to be done in the event of an approaching storm. Family members should conduct evacuation drills, keep needed phone numbers and travel supplies on hand, and be prepared to leave on short notice. One should be aware of evacuation routes, keeping a full tank of gas during the hurricane season, and having a plan for where one should go, how to maintain contact with other family members, and where one will re-locate temporarily, particularly if this turns out to be longer than expected.

Hurricane Evacuation Planning Upgrading

The critical need for adequate evacuation planning was borne out by Hurricanes Bertha, Fran, and Floyd, of the late 1990's, and brought even more to the forefront by the monumental impacts of Hurricane Katrina in 2005. An evacuation plan is an essential component of a comprehensive plan for ensuring the safety of residents of, and visitors, to the coast of North Carolina. The preservation of life is the single most important goal and objective of the recommendations. Joint Federal Emergency Management Agency (FEMA)/ NOAA/Corps/State of North Carolina studies of evacuation routes and

populations along the coastline has provided a tremendous amount of value to-date in aiding local government, individual and family readiness, in the face of approaching events. Support for this program is a critical element of the recommendations for the Town of Topsail Beach, in support of its residents and visitors. The following are important recommendations in support of efforts to support Hurricane Evacuation Planning:

- There is still much that can be done to update this on-going effort, and to provide new, and more widely-disseminated data and tools for evacuation planning by the State and the Town of Topsail Beach, and also for use by individuals and families in their preparation for an impending event.
- Evacuation route signage is an important part of a successful evacuation campaign. Maintenance of hurricane evacuation route signage is viewed as a vital link in ensuring the safety of residents and visitors alike.
- The provision of additional signage illustrating surge height achieved during past events would be an added and continual link to on-going education efforts. This could take the form of signs placed in locations in which there is significant traffic, such as major thoroughfares, where pedestrians walk, and particularly in those highest hazard zones based on elevation/depth data.

Evacuation Planning is an on-going effort of multiple agencies, including the Corps of Engineers, but its implementation is not a funded program under existing Corps authorities. Updating of websites containing evacuation routes and procedures should be periodically updated under existing programs implemented by the State of North Carolina.

Floodplain Management

Management of the floodplain is a non-Federal responsibility, yet is considered a key component of all plans for hurricane and storm damage reduction. The Town of Topsail Beach participates in the National Flood Insurance Program, which requires the town to engage in active and responsible floodplain management. The majority of residences and businesses within the Town of Topsail Beach possess flood insurance. Since so much of the Town of Topsail Beach is within a recognized floodplain, the Town continues to engage in activities that reduce threats to existing and potential future development, including structure setbacks, building code and construction monitoring, and flood zone management. The Town of Topsail Beach is encouraged to continue to update building codes, and encourage strong pursuit of activities such as first-floor elevation and building code upgrading, in the effort to reduce the potential for future structural and content damage.

Building Codes

The Town of Topsail Beach has adopted the International Building Code (IBC) to guide the design and construction of residential and commercial structures in the study area. In order to assure that the latest design and construction techniques are being used that apply to hurricane-resistant construction, all future construction is encouraged to follow

the latest version of the IBC (2007) and ensure enforcement of the codes through diligent building permit processing and on-site inspections of construction. Annual training classes on the use and enforcement of the new IBC should be encouraged. In addition, the Town of Topsail Beach should consider adopting the document "FEMA 550 Guidelines for Elevating Residential Structures on the Gulf Coast" as a part of their updated building codes for construction, due to the possibility of surge inundation associated with hurricane events.

Long-term Critical Infrastructure and Services Upgrading

The upgrading of critical infrastructure and services, such as Fire and Police services, is considered a vital recommendation in the reduction of threats to lives and property. The need to bring these services up to immediate restoration in the wake of a hurricane is of vital importance to the community. The methodical upgrading of the Town's Fire and Police services facilities as past of their Capital Improvement Program will provide long-term savings in capital outlay, and potentially save lives and residential and commercial property damage. This program may be instituted under a modified Capital Improvement Program, where structures reaching the end of their economic life are successively replaced by upgraded structures, locating vital communications and power supplies above the elevation of a Maximum Probable Surge event, and capable of surviving the ravages of wind and/or surge, as funds become available.

Upgrading or replacement of services is primarily a local charge, implemented through Capital Improvement Plans, with funding from a variety of Federal, State, and local resources, and will take many years to accomplish, due to the varying age and condition of each facility.

Structural Damage Reduction Features

Structural damage reduction features recommended for implementation include the previously-discussed sand dune constructed shoreward of the Town of Topsail Beach, at an elevation of 12 feet above the National Geodetic Vertical Datum (NGVD), fronted by a 50-foot wide beach berm constructed to an elevation of seven feet above NGVD. The dune and berm complex would extend 23,200 feet, with a 2,000 foot northern transition fill, and a 1,000 foot southern transition fill, for a total length of 26,200 feet. The recommended plan would provide for expected annual benefits estimated at $13,328,000, at October 2008 price levels, at an estimated annual cost of $4,450,000, for a benefit to cost ratio of 3.0 to 1. For construction beginning in late 2011, the estimated cost of the recommended plan would be $40,060,000.