



DEPARTMENT OF THE ARMY

CHIEF OF ENGINEERS  
2600 ARMY PENTAGON  
WASHINGTON, DC 20310-2600

REPLY TO  
ATTENTION OF

DAEN

2 3 DEC 2014

THE SECRETARY OF THE ARMY

SUBJECT: Flagler County, Florida, Hurricane and Storm Damage Reduction Project

1. I submit for transmission to Congress my report on hurricane and storm damage reduction at Flagler County, Florida. It is accompanied by the report of the district and division engineers. This report is in partial response to Resolution 2676 adopted 22 May 2002 by the Committee on Transportation and Infrastructure of the United States House of Representatives. The resolution requested the Secretary of the Army to review the feasibility of providing shoreline erosion protection, hurricane and storm damage reduction, and related purposes to the shores of Flagler County, Florida. Pre-construction engineering and design activities for the project will continue under the authority cited above.

2. The reporting officers recommend a project for coastal storm damage reduction. Based on an evaluation of alternative plan costs and economic benefits, the national economic development (NED) plan consists of a 10-foot dune and beach profile extension along 2.6 miles of shoreline in Flagler Beach and mainly prevents damage to State Road A1A (SR A1A). SR A1A is considered critical infrastructure and serves as the only viable hurricane evacuation route for over 2,300 residents of Flagler Beach, as well as a necessary component of post storm emergency response and recovery. This segment of SR A1A in the project area is located on the highest elevation in the Flagler Beach barrier island and is a vital link within a 14 mile segment that connects two bridges that are the primary routes off and onto the island during evacuation and recovery efforts. The non-federal sponsor, Flagler County, supports the NED plan. The recommended plan is the NED plan and consists of the following improvements:

a. The project would extend the dune and beach profile 10 feet seaward from a construction baseline 20 feet east of, and parallel to, SR A1A along 2.6 miles of shoreline from survey monuments R80 to R94, with subsequent periodic nourishments;

b. The plan would include construction of the dune to an elevation 19 feet North American Vertical Datum 88 (NAVD88) to match the elevation of the existing dune. From the seaward end of the dune extension, a 1 vertical on 3 horizontal dune slope would extend to the design berm elevation of 11 feet NAVD88 to match the existing berm elevation. The constructed berm would extend 35 feet seaward from the toe of the dune with a 1 vertical on 100 horizontal berm slope. The foreshore fill would extend from the seaward edge of the berm to approximately -2 feet NAVD88 with a slope of 1 vertical on 5

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horizontal. This template, dimensioned for constructability, will then equilibrate into the project (10-foot dune and profile extension) template;

c. The berm taper, or transition from the constructed berm to the existing adjacent berm, would extend 200 feet at the north and south ends of the project;

d. Initial construction will require approximately 330,000 cubic yards of sand, and each periodic nourishment event will require approximately 320,000 cubic yards. The renourishment interval is expected to be approximately 11 years, equaling 4 renourishment events in addition to initial construction over the 50-year period of federal participation;

e. The borrow areas identified for the project, areas 2A and 2B, are located approximately 7 miles offshore from the placement area. There is approximately 3 million cubic yards (mcy) of beach quality sand in these two areas. The estimated volume to be dredged from areas 2A and 2B over the 50-year recommended plan is 2,028,600 mcy, assuming 26% dredging losses; and

f. Native vegetation will be planted on areas of the existing dune disturbed by construction, as well as the newly constructed dune and dune slope to stabilize the fill. It is assumed that dune planting will only be necessary for initial construction and that vegetation will spread and naturally grow and spread to any areas that are renourished in the future.

3. Flagler County is the non-federal cost sharing sponsor for all features. Based on Fiscal Year 2015 price levels, the estimated total project cost of the NED Plan is \$44,962,000, which includes the project first cost of initial construction of \$14,182,000 and a total of four periodic renourishments at a total cost of \$30,780,000. Periodic renourishments are planned at 11-year intervals. Cost sharing is applied in accordance with the provisions of Section 103 of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S.C. 2213), as follows:

a. The federal share of the total first cost would be about \$9,218,300 and the non-federal share would be about \$4,963,700, which equates to 65 percent federal and 35 percent non-federal. The non-federal costs include the value of lands, easements, rights-of-way, relocations and dredged or excavated material disposal areas (LERRD) estimated to be \$3,336,000.

b. The federal share of future periodic renourishment is estimated to be \$15,390,000 and the non-federal share is estimated to be \$15,390,000 which equates to 50 percent federal and 50 percent non-federal.

4. Based on a 3.375 percent discount rate and a 50-year period of analysis, the total equivalent average annual costs of the project are estimated to be \$1,235,000. All project costs are allocated to the authorized purpose of hurricane and storm damage reduction.

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The selected plan would reduce average annual coastal storm damages by about \$2,172,000. The equivalent average annual benefits, which include recreation and traffic re-routing benefits, are estimated to be \$2,372,000 with net average annual benefits of \$1,137,000. The benefit to cost ratio is approximately 1.9 to 1. The project would reduce damages to a hurricane evacuation route. The project would also establish at least 3.15 acres of beach habitat that could provide suitable nesting habitat for threatened and endangered species such as loggerhead, green, and leatherback sea turtles and piping plover and rufa red knot shorebirds along 2.6 miles of shoreline.

5. Risk and uncertainty has been explicitly factored into the economic analysis of this project. Chapter 6 of Corps Engineering Regulation 1105-2-100, entitled "Risk-Based Analysis for Evaluation of Hydrology/Hydraulics and Economics in Shore Protection Studies" specifies the analysis requirements for shore protection projects, the fundamental requirement being that all shore protection analyses adopt a life cycle approach. A statistical risk based model, Beach-fx, was used in this study to formulate and evaluate the project in a life-cycle approach. Beach-fx integrates the engineering and economic analyses and incorporates uncertainty in both physical parameters and environmental forcing, which enables quantification of risk with respect to project evolution and economic costs and benefits of project implementation. The application of Beach-fx in this study is to estimate future without project damages and quantify the damages prevented by various storm damage reduction alternatives for Flagler County over the 50 year project life.

6. The project is intended to address erosion and prevent damages to structures and infrastructure; it is not intended to, nor will it, reduce the risk to loss of life during major storm events. Loss of life can only be prevented by residents and visitors following the local evacuation plans that are already in place. The proposed project would greatly reduce, but not completely eliminate future storm damages. Coastal storm damages are reduced by approximately 96% in the location of the recommended plan, and by approximately 65% across the entire study area. These residual risks have been communicated to the residents of Flagler County.

7. In accordance with the ER 1100-2-8162 on sea level change, the study performed a sensitivity analysis to evaluate the effects that different rates of sea level change could have on the recommended plan. The NED plan was formulated using the historical or low rate of sea level change. Beach-fx was used to model the performance of the NED plan for what the ER defines as intermediate and high rates of sea level rise. The benefits of the project increase significantly in the intermediate and high sea level rise scenarios, but the costs also increase. Thus, the project performance (in terms of the benefit-cost ratio) is relatively constant throughout the three scenarios. As both costs and benefits are increasing, the net benefits actually increase with increasing rates of sea-level rise. Overall, these results suggest that the NED plan is both effective and robust in all three simulated sea level rise scenarios. Adaptive management will be used including adjusting the timing of periodic renourishments and project volume requirements based on monitoring reports to

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compensate for any significant accelerated sea level rise beyond the historical or low rate should it become necessary.

8. In accordance with the Corps Engineering Circular (EC 1165-2-214) on review of decision documents, all technical, engineering and scientific work underwent an open, dynamic and rigorous review process to ensure technical quality. This included District Quality Control review, Agency Technical Review (ATR), Major Subordinate Command (MSC) review and a Corps Headquarters (HQUSACE) policy and legal review. All concerns of the ATR have been addressed and incorporated into the final report. The requirement to perform Independent External Peer Review (IEPR) was waived by HQUSACE since there was no Environmental Impact Statement (EIS) for the study, it had negligible adverse impacts to the environment and is not controversial. All comments from the above referenced reviews have been addressed and incorporated into the final documents. Overall, the reviews resulted in improvements to the technical quality of the report.

9. Washington level review indicates that the project recommended by the reporting officers is technically sound, environmentally and socially acceptable, and economically justified. The plan complies with all essential elements of the 1983 U.S. Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Land Related Resources Implementation studies and complies with other administrative and legislative policies and guidelines. Also the views of interested parties, including federal, state and local agencies have been considered.

10. I concur in the findings, conclusions and recommendations of the reporting officers. Accordingly, I recommend that the plan to reduce hurricane and storm damages for Flagler County, Florida is authorized in accordance with the reporting officers' recommended plan at an estimated total project cost of \$44,962,000, which includes the project first cost of initial construction of \$14,182,000 and a total of four periodic renourishments at a total cost of \$30,780,000, with such modifications as in the discretion of the Chief of Engineers may be advisable. My recommendation is subject to cost sharing, financing and other applicable requirements of federal and state laws and policies, including Section 103 of the WRDA of 1986, as amended (33 U.S.C. 2213). The non-federal sponsor would provide the non-federal cost share and all LERRD. Further, the non-federal sponsor would be responsible for all operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) costs. This recommendation is subject to the non-federal sponsor agreeing to comply with all applicable federal laws and policies including that the non-federal sponsor must agree with the following requirements prior to project implementation.

a. Provide 35 percent of initial project costs assigned to hurricane and storm damage reduction, plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits; and 50 percent of periodic nourishment costs assigned to hurricane and storm damage reduction, plus 100 percent of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits and as further specified below:

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(1) Enter into an agreement that provides, prior to construction, 35 percent of design costs;

(2) Provide all lands, easements, and rights-of-way, and perform or ensure the performance of any relocations determined by the federal government to be necessary for the initial construction, periodic nourishment, and operation and maintenance of the project; in particular, the federal government and the project sponsor shall coordinate with the Bureau of Ocean Energy Management for use of offshore borrow areas and provide a copy of the lease agreement to the federal government; and

(3) Provide, during construction, any additional amounts as are necessary to make their total contribution equal to 35 percent of initial project costs assigned to hurricane and storm damage reduction, plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits; and 50 percent of periodic nourishment costs assigned to hurricane and storm damage reduction, plus 100 percent of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits.

b. For so long as the project remains authorized, operate, maintain, and repair the completed project, or functional portion of the project, at no cost to the federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable federal and state laws and regulations, and any specific directions prescribed by the federal government;

c. Give the federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-federal sponsor, now or hereafter, owns or controls for access to the project for the purpose of inspecting, operating, maintaining, repairing, replacing, rehabilitating, or completing the project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the federal government shall relieve the non-federal sponsor of responsibility to meet the non-federal sponsor's obligations, or to preclude the federal government from pursuing any other remedy at law or equity to ensure faithful performance;

d. Hold and save the United States free from all damages arising from the initial construction, periodic nourishment, mitigation, operation, maintenance, repair, replacement, and rehabilitation of the project and any project related betterments, except for damages due to the fault or negligence of the United States or its contractors;

e. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project 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 (CFR) Section 33.20;

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f. Perform, or cause to be performed, 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 (CERCLA), as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the federal government determines to be required for the initial construction, periodic nourishment, operation, and maintenance of the project. However, for lands that the federal government determines to be subject to the navigation servitude, only the federal government shall perform such investigations unless the federal government provides the non-federal sponsor with prior specific written direction, in which case the non-federal sponsor shall perform such investigations in accordance with such written direction;

g. Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the federal government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;

h. Agree that the non-federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, and repair the project in a manner that will not cause liability to arise under CERCLA;

i. If applicable, comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the initial construction, periodic nourishment, operation, and maintenance of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

j. Comply with all applicable federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; the Age Discrimination Act of 1975 (42 U.S.C. 6102); the Rehabilitation Act of 1973, as amended (29 U.S.C. 794) and Army Regulation 600-7 issued pursuant thereto; and 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (labor standards originally enacted as the Davis-Bacon Act, the Contract Work Hours and Safety Standards Act, and the Copeland Anti-Kickback Act);

k. Provide the non-federal share of that portion of the costs of data recovery activities associated with historic preservation, that are in excess of 1% of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement;

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l. Participate in and comply with applicable federal floodplain management and flood insurance programs;

m. Do not use federal funds to meet the non-federal sponsor's share of total project costs unless the federal granting agency verifies in writing that the expenditure of such funds is authorized;

n. Prescribe and enforce regulations to prevent obstruction of or encroachment on the project that would reduce the level of protection it affords or that would hinder future periodic nourishment and/or the operation and maintenance of the project;

o. Not less than once each year, inform affected interests of the extent of protection afforded by the project;

p. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the floodplain, and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with protection levels provided by the project;

q. For so long as the project remains authorized, the non-federal sponsor shall ensure continued conditions of public ownership and use of the shore upon which the amount of federal participation is based;

r. Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms;

s. Comply with Section 221 of the Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the WRDA of 1986, as amended (33 U.S.C. 2213(j)), which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

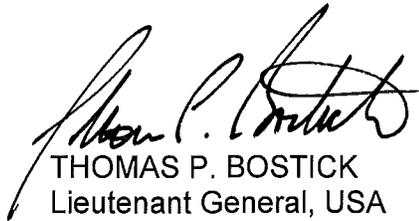
t. At least twice annually and after storm events, perform surveillance of the beach to determine losses of nourishment material from the project design section and provide the results of such surveillance to the federal government; and

u. Comply with Section 402 of the WRDA of 1986, as amended (33 U.S.C. 701b-12), which requires the non-federal sponsor to participate in and comply with applicable federal floodplain management and flood insurance programs, prepare a floodplain management plan within one year after the date of signing the project partnership agreement (PPA), and implement the plan no later than one year after project construction is complete.

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11. The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. These recommendations do not reflect program and budgeting priorities inherent in the formulation of national civil works construction program nor the perspective of higher review levels within the executive branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the non-federal sponsor, the state, interested federal agencies and other parties will be advised of any modifications and will be afforded an opportunity to comment further.



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