



**DEPARTMENT OF THE ARMY**  
CHIEF OF ENGINEERS  
2600 ARMY PENTAGON  
WASHINGTON, D.C. 20310-2600

DAEN

SUBJECT: Florida Keys, Monroe County, Florida Coastal Storm Risk Management

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on coastal storm risk management for the Florida Keys, Monroe County, Florida. It is accompanied by the report of the Norfolk District Commander. This report is an interim response to the study authority contained in Public Law 84-71, dated 15 June 1955 which authorizes an examination and survey of the coastal and tidal areas of the eastern and southern United States, with particular reference to areas where severe damages have occurred from hurricanes. Preconstruction engineering and design (PED) activities, if funded, would be continued under the authority cited above.

2. The National Economic Development (NED) Plan resulting from this study includes the following elements:

a. Dry floodproofing 53 critical infrastructure buildings that were identified at risk to damage from coastal storms. Dry floodproofing will reduce the damage caused by storm surge during coastal storm events so that emergency and critical services can resume more quickly after a coastal storm event.

b. Nonstructural measures to reduce coastal storm damage to 4,698 residential and 1,052 nonresidential structures at risk throughout the Keys. The nonstructural measures in the recommended plan include elevation of residential structures and dry floodproofing of nonresidential structures.

3. In addition, stabilization of U.S. Route 1 (Overseas Highway) is critical to allowing evacuation and re-entry to and from the Florida Keys before and after major storm events. Maintaining this access would minimize risks to life safety and would reduce delays to post storm recovery while increasing total project costs by less than one percent. The Acting Assistant Secretary of the Army (Civil Works) has approved a request to include the stabilization of U.S. Route 1 as part of the recommended project. Shoreline stabilization would be constructed at six locations along U.S. Route 1 that were identified as having risk of damage due to erosion and/or wave energy during a coastal storm event. These six rock revetment structures range in height from +4 feet North Atlantic Vertical Datum of 1988 (NAVD88) to +10 feet NAVD88 and were designed to reduce damage to a total of approximately 5,500 feet of roadway by stabilizing the shoreline and reducing the risk of washout.

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<sup>1</sup> This report contains the proposed recommendation of the Chief of Engineers. The recommendation is subject to change to reflect Washington-level review and comments from federal and state agencies.

DAEN

SUBJECT: Florida Keys, Monroe County, Florida Coastal Storm Risk Management

4. Monroe County, Florida is the non-federal cost sharing sponsor for all features. Project costs for the recommended project are based on October 2020 (fiscal year 2021) price levels.

a. Project First Cost. The estimated first cost of the recommended project is \$2,103,462,000. This estimate includes \$1,451,001,000 for construction, \$50,305,000 for lands, easements, rights-of-ways, relocations, and dredged or excavated material disposal areas (LERRDs), including federal administrative costs; \$230,781,000 for PED; and \$230,781,000 for construction management.

b. Estimated Federal and Non-Federal Share. In accordance with the cost sharing provisions of Section 103 of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S. Code 2213), the federal share of the project first cost is estimated to be \$1,367,250,000 and the non-federal share is estimated to be \$736,212,000, which equates to 65 percent federal and 35 percent non-federal. The non-federal costs include the value of LERRDs.

c. The non-federal sponsor is responsible for the annual operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project after construction, estimated at \$161,000 per year.

5. Based on a 2.50 percent discount rate and a 50-year period of analysis, the total equivalent average annual costs of the project are estimated to be \$85,557,000. All project costs are allocated to the authorized purpose of coastal storm risk management. The equivalent average annual benefits are estimated to be \$131,603,000 with net average annual benefits of \$46,046,000. The benefit to cost ratio is approximately 1.5 to 1. The project will reduce coastal storm damage to critical infrastructure, residential and coastal structures, and U.S. Route 1, the singular evacuation route and connection to mainland Florida.

6. Risk and uncertainty factored into the economic analysis through the use of statistical risk-based models. The Generation II Coastal Risk Model (G2CRM) was used to evaluate the suite of alternatives within the study area. G2CRM is a desktop computer model that implements an object-oriented probabilistic life cycle analysis using event-driven Monte Carlo simulation, asset (structure) inventory, and damage relationship functions to compute equivalent annual damage (with and without project). This allows for incorporation of time-dependent and stochastic event-dependent behaviors such as sea level change, tide, and structure raising and removal. The project is intended to address structure damage caused by storm surge inundation and manage coastal storm risk.

7. In accordance with Engineering Regulation 1100-2-8162, Incorporating Sea Level Change in Civil Works Programs, the study's analysis evaluated the effects of different rates of sea level change in the with- and without-project conditions. Analysis showed

DAEN

SUBJECT: Florida Keys, Monroe County, Florida Coastal Storm Risk Management

that the historic sea level rise recorded for the study area is tracking with the U.S. Army Corps of Engineers (USACE) high rate of sea level change and the most likely future scenario would be consistent with the high rate of sea level change. Therefore, the recommended project was formulated and evaluated using the high rate of sea level change. To address uncertainty, project performance was also assessed at the low and intermediate rates of sea level change.

8. In accordance with USACE policy 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, Agency Technical Review, Independent External Peer Review, and a headquarters policy and legal review. All comments from these reviews have been addressed and incorporated into the final documents.

9. Washington level review indicates that the project recommended by the reporting officers 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 with the findings, conclusions, and recommendations of the reporting officers. Accordingly, I recommend that the plan to manage coastal storm risk to the Florida Keys be authorized in accordance with the report officers' recommended plan at an estimated project first cost of \$2,103,462,000 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 WRDA 1986, as amended. The non-federal sponsor would provide the non-federal cost share and all LERRDs. Further, the non-federal sponsor would be responsible for all OMRR&R. Federal implementation of the project for coastal risk management is subject to the non-Federal sponsor agreeing to perform, in accordance with applicable Federal laws, regulations, and policies, the required items of local cooperation for the project, including but not limited to the following:

- a. Provide 35 percent of construction costs, as further specified below:
  - i. Provide, during design, 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;
  - ii. Provide all real property interests, including placement area improvements, and perform all relocations determined by the Government to be required for the project;

DAEN

SUBJECT: Florida Keys, Monroe County, Florida Coastal Storm Risk Management

iii. Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 35 percent of construction costs;

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of coastal storm risk reduction the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Inform affected interests, at least yearly, of the extent of risk reduction afforded by the project; participate in and comply with applicable federal floodplain management and flood insurance programs; prepare a floodplain management plan for the project to be implemented not later than one year after completion of construction of the project; and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with the project;

d. Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof at no cost to the Government, in a manner compatible with the project's authorized purposes and in accordance with applicable federal laws and regulations and any specific directions prescribed by the Government;

e. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-federal sponsor owns or controls for access to the project to inspect the project, and, if necessary, to undertake work necessary to the proper functioning of the project for its authorized purpose;

f. Hold and save the Government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of the project, except for damages due to the fault or negligence of the Government or its contractors;

g. Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal Government determines to be necessary for construction, operation and maintenance of the project;

h. Assume, as between the Government and the non-federal sponsor, complete performance and financial responsibility for all necessary cleanup and response actions and costs of any HTRW regulated under applicable law that are located in, on, or under

DAEN

SUBJECT: Florida Keys, Monroe County, Florida Coastal Storm Risk Management

real property interests required for construction, operation, maintenance, repair, rehabilitation, or replacement of the project;

i. Agree, as between the Government and the non-federal sponsor, that the non-federal sponsor shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause HTRW liability to arise under applicable law; and

j. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4630 and 4655) and the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

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 the national civil works 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.

SCOTT A. SPELLMON  
Lieutenant General, USA  
Chief of Engineers