



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

DAEN

SEP 16 2021

SUBJECT: San Juan Metropolitan Area, Puerto Rico, 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 San Juan metropolitan area, Puerto Rico. It is accompanied by the report of the Jacksonville District Commander. This study is an interim response to the study authority in Section 204 of the Flood Control Act of 1970, Public Law 91-611, which authorizes the Secretary of the Army, acting through the Chief of Engineers, to prepare plans for the development, utilization and conservation of water and related land resources of drainage basins and coastal areas in the Commonwealth of Puerto Rico. Preconstruction engineering and design (PED) activities, if funded, will continue under the authority cited above.

2. The reporting officers recommend authorizing the National Economic Development plan that will reduce the risk of potential damage caused by coastal storms. The recommended plan includes the construction of structural and natural and nature-based features along back bay areas in the municipality of San Juan and the adjacent municipality communities of Cataño, Guaynabo, and Toa Baja.

a. The recommended plan consists of structural, and natural and nature-based features in strategic locations. These features are designed to appropriate elevations which work together to reduce the risk of damages because of coastal flooding from extreme high-water events due to storm surge, waves, tides and sea-level change, and combinations of these factors, in the San Juan metropolitan area. The plan will reduce risk to residential structures, industries, businesses, vehicles, and infrastructure which are critical to the nation's economy. The recommended plan includes the following features:

- i. levees, approximately 1.5 miles long at an elevation of 8.5 to 9.0 feet Puerto Rico Vertical Datum of 2002 (PRVD02);
- ii. a series of breakwaters, approximately 0.7 miles long along the Cataño shoreline at an elevation of 6 feet PRVD02;
- iii. seawall/floodwalls, approximately 6.5 miles long at an elevation of 8.5 to 9.0 feet PRVD02;
- iv. an elevated living shoreline, approximately 0.7 miles long at an elevation of 7.5 feet PRVD02;
- v. a discharge structure on the Malaria Canal; and
- vi. associated inland hydrology features to ensure that rainfall runoff can continue to outflow as it currently does, with the recommended plan features in place.

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vii. Additionally, it includes mitigation for unavoidable environmental impacts. This plan will also contribute to creation of mangrove habitat along the living shoreline (0.7 miles) and provide recreation opportunities on the crests of the levees and at the living shoreline.

b. Although the recommended plan was formulated to avoid and minimize impacts to the extent possible, impacts are expected to occur and will be addressed with mitigation for submerged aquatic vegetation (SAV), mangroves, and wetlands. The proposed project will have some adverse impacts to the environment and mitigation is required. It is estimated that approximately 13.9 acres of SAV, 22 acres of mangroves, and 6.2 acres of palustrine emergent wetlands will be impacted. The recommended plan includes compensatory mitigation and associated monitoring and adaptive management. Impacts will be mitigated by planting seagrasses, mangroves, and wetland species at an estimated cost of \$9,531,000. It is anticipated that the mitigation can be constructed near the project. However, the final siting of compensatory mitigation will be conducted during the PED phase of the project when site-specific survey data is available to assess existing conditions, hydrology, water quality, and the presence of protected species. An additional \$7,986,000 was estimated for monitoring and adaptive management.

3. The Puerto Rico Department of Natural and Environmental Resources is the non-federal cost sharing sponsor for all features of the project. Based on October 2020 (Fiscal Year 2021) price levels, the estimated total project first cost of the recommended plan is \$365,190,000. The non-federal sponsor is responsible for the operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project after construction, which has an estimated average annual cost of \$819,000.

4. In accordance with the cost sharing provisions of Section 103 of the Water Resources Development Act (WRDA) 1986, as amended (33 U.S.C. §2213), the non-federal sponsor must contribute a minimum of 35 percent of construction costs. The remaining portion of the non-federal share can be provided in lands, easements, rights-of-way, relocations and dredged or excavated material disposal areas; in-kind contributions; cash; or a combination. The estimated share of costs is adjusted based on Section 1156 of WRDA 1986, as amended (33 U.S.C. §2310), which provides a waiver for a portion of non-federal cost sharing for Puerto Rico, Territories, and Indian Tribes. As a result, the non-federal share would be reduced by approximately \$511,000, and the federal and non-federal shares of construction costs would be approximately \$237,885,000 and \$127,306,000, respectively. The non-federal costs include the value of lands, easements, rights-of-way, relocations, and disposal areas (LERRD) which are estimated at \$33,400,000.

5. Based on a 2.50 percent discount rate and a 50-year period of analysis, average annual equivalent costs of the project are estimated to be \$15,300,000, including costs for OMRR&R. All project costs are allocated to the authorized purpose of coastal storm risk management. The average annual equivalent benefits, inclusive of incidental

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recreation benefits, are estimated to be \$72,900,000, with net average annual benefits of \$57,600,000. The benefit-to-cost ratio is approximately 4.8 to 1.

6. The proposed project would greatly reduce, but not eliminate, future coastal storm damages. All residual risks have been communicated to the residents of the San Juan metropolitan area.

a. The design features will reduce risk under the 0.44% to 0.18% annual exceedance probability event with 90% assurance, depending on the reach. Coastal storm damages, caused primarily by coastal flooding, would be reduced by approximately 98% to 100% in the location of the project area over the 50-year period of analysis; therefore, the residual damages would be in the range of 0% to 2%. Under the low or intermediate sea-level change scenarios, within the 100-year adaptation horizon, no adaptation measures are anticipated for the recommended plan. Under the high sea-level rise scenario, adaptation could be evaluated with adaptation being defined as either adapt, rebuild, and/or retreat, depending on the proposed feature. Periodically revisiting sea-level rise trends will be important for understanding changes in risk and the potential need for project modifications.

b. Reaches West San Juan Bay 1A and East San Juan Bay were screened out from the study after the analysis showed that the cost to build a project in these reaches would be higher than the benefit received. As a result, these areas are not economically feasible to pursue; along with additional considerations under planning criteria, these reaches were screened from further analysis. However, the analysis indicates there is low risk of coastal flooding damages to the communities. The risk of coastal flooding in these reaches is not affected by the proposed recommended plan.

c. Preliminary analysis showed that there are flooding problems in reaches 4 through 6, resulting in potential risk of damages to assets and socially vulnerable communities from hydrologically-induced flooding (precipitation) in addition to storm surge. These areas are recommended to be evaluated under a separate study to adequately address both storm surge and precipitation holistically.

7. Life safety has been explicitly factored into this analysis, following guidance in the U.S. Army Corps of Engineers (USACE) Engineering and Construction Bulletin 2019-15 and Planning Bulletin 2019-04. Under the Other Social Effects account, life safety considerations were paramount, and the robustness of measures in terms of life safety considerations were fully considered. Life safety was the primary criteria in areas where life safety was assessed to be high risk. High risk areas were assessed to be reaches West San Juan Bay 1B (WSJB-1B) and WSJB-3, both located to the west of San Juan Bay. Another focus area of consideration included design heights, which looked at the most realistic scenarios in terms of water level under annual exceedance probabilities and public acceptability of the height of structures.

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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. The comprehensive review process included district quality control review, agency technical review, independent external peer review, public review, and a headquarters policy and legal review to confirm the planning analyses, alternative design and safety, and the quality of decisions. Washington level review indicates that the plan 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, as well as other administrative and legislative policies and guidelines. The views of interested parties, including federal, state, and local agencies, were considered and all comments from the above referenced reviews have been addressed and incorporated into the final report documents where appropriate.

9. I concur in the findings, conclusions, and recommendations of the reporting officers. Accordingly, I recommend that coastal storm risk management improvements for the San Juan metropolitan area, Puerto Rico be authorized in accordance with the reporting officers' recommended plan at an estimated project first cost of \$365,190,000 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 of 1986, as amended (33 U.S.C. §2213). The non-federal sponsor would provide the non-federal share of project costs and all lands, easements, and rights of way, including those necessary for the borrowing of material and the disposal of dredged or excavated material, and would perform or assure the performance of all relocations, including utility relocations. Federal implementation of the project for coastal risk management includes, but is not limited to, the following required items of local cooperation to be undertaken by the non-federal sponsor in accordance with applicable federal laws, regulations, and policies:

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 Federal Government to be required for the project;

iii. Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 35 percent of construction costs, subject to a reduction per Section 1156 of WRDA 1986, as amended (33 U.S.C. §2310);

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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 Federal Government, in a manner compatible with the project's authorized purpose and in accordance with applicable federal laws and regulations and any specific directions prescribed by the Federal Government;

e. Give the Federal 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 Federal 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 Federal 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 USC. §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. Agree, as between the Federal Government and the non-federal sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal Government;

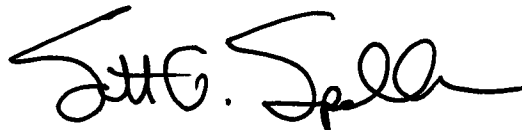
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i. Agree, as between the Federal Government and the non-federal sponsor, that the non-federal sponsor shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities 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 USC §4630 and 4655) and the Uniform Regulations contained in 49 CFR 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.

10. The recommendation contained herein reflects 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 Commonwealth, 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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