

# Final Independent External Peer Review Report San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment

Prepared by  
Battelle Memorial Institute

Prepared for  
Department of the Army  
U.S. Army Corps of Engineers  
Coastal Storm Risk Management Planning Center of Expertise  
Baltimore District

BPA No. W912HQ-20-A-0003  
Call No. W912HQ20F0096

October 7, 2020

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## Executive Summary

### Project Background and Purpose

The San Juan Metropolitan Area (San Juan Metro Area) is located along the Northern Coastal areas of Puerto Rico. The study area is located in the back bay area of San Juan and adjacent municipalities, which is surrounded by a high-density urban residential area, recreation areas, hotels and tourist facilities, and commercial areas. During coastal storms, storm surge, tidal influences, and wave contributions cause extreme flooding. This results in damages to critical infrastructure and to residential and commercial structures; negative environmental and social effects; losses to the regional and national economy; and lack of resilience for affected communities. Additionally, the flooded conditions are hazardous to the community (bringing disease and mold during extended periods); pollute the lagoon with automobile fluids; corrode the underside of vehicles; affect economic development of stores, hotels, and restaurants; and decrease property values. This shoreline contains resources that represent potential National Economic Development benefits for the San Juan area, including large hotels, businesses, and condominiums and other residences of high structure value.

Originally, the study was scoped to assess shoreline erosion along the coastline of only the San Juan Metro Area. A National Environmental Policy Act (NEPA) scoping meeting was held in San Juan on November 8, 2018, where the study team presented the general study scope and requested feedback from communities. During that process, several communities expressed concerns regarding back bay flooding in the Cataño municipality, as well as the Condado Lagoon area within the San Juan municipality. As a result, the feasibility of addressing shoreline erosion as a Federal project along the coastline of the San Juan Metro Area was incorporated into another ongoing U.S. Army Corps of Engineers (USACE) study, called the Puerto Rico Coastal Storm Risk Management (CSRSM) Study, to allow this study to focus solely on back bay flooding.

This study assesses back bay flooding risks due to storm surge, which also includes wave contributions and tidal influences, as well as sea level change under the CSRSM mission. Three data sets were overlaid in a Geographic Information System (GIS) to determine the study area extent based on a high risk of storm surge and sea level rise (SLR). These three data sets are 1) Flood Risk Zones (Federal Emergency Management Agency [FEMA] 2018 Advisory: 0.2% VE and AE Flood Zones; 2) Sea Level Rise Forecasts (National Oceanic and Atmospheric Administration [NOAA] sea level viewer at 6 feet above mean higher high water); and 3) Flooding (ADCIRC + SWAN: Cat 5 Maximum of MEOWs (Maximum Envelopes of Water) plus 1 meter of SLR). Areas within this initially defined region were separated into six reaches based on their respective watershed basins: Reach 1 - West San Juan Bay, Reach 2 - East San Juan

Bay, Reach 3 – Condado Lagoon, Reach 4 - Caño Martin Pena, Reach 5 - Los Corozos and San Jose Lagoon, and Reach 6 -Torrecilla Lagoon. During further investigation, Reaches 1 and 3 were carried forward, while Reaches 4 through 6 and Reach 2 were screened from further analysis in this study. The rationale for this descoping of the study is described in the following paragraphs.

Reaches 1 through 3 have a single source of back bay flooding influence (the Atlantic Ocean), and the flooding problem within these reaches is driven primarily by storm surge. These areas can be modeled within the existing economic model, Generation 2 Coastal Risk Model (G2CRM), for a direct link to damages and benefits from storm surge versus design alternatives, and the study can be completed within three years. After further analysis of Reaches 4 through 6, the study team determined that those reaches have multiple sources of back bay flooding influences, and the uncertainty in the exchanges of flow between them is too high without performing more extensive hydrologic modeling. The problem in these reaches is a combination of precipitation with storm surge. This type of analysis (involving the inclusion of precipitation as well as an understanding of the complexity of storm surge from multiple points) would necessitate the use of multiple models and complex model interfaces, which would cause the existing study to exceed the scope. The study team acknowledges that flooding problems in Reaches 4 through 6 are likely to result in potential risk to critical infrastructure and socially vulnerable communities from hydrologic-induced flooding (precipitation) in addition to storm surge. These areas are recommended to be evaluated under a separate study in order to adequately address both storm surge and precipitation holistically.

Reach 2 was also screened from further analysis. The majority of the area in Reach 2 is owned, operated, and maintained by the Port of San Juan, with some residential areas around the perimeter area. Modeling of future without-project conditions showed that damages were very low. After further analysis, it was determined that the cost of the alternatives most likely to reduce damages in the area would be higher than the benefits, creating negative net benefits and a benefit-to-cost ratio of less than 1.0. USACE cannot recommend a project with a benefit-to-cost ratio of less than 1.0, per USACE guidance.

The reduced study area includes Reach 1 (the West San Juan Bay reach) and Reach 3 (the Condado Lagoon reach). The combined study area encompasses roughly 9.5 square miles and contains an estimated 20,000 assets (infrastructure and vehicles), with approximately 22 structures identified as critical infrastructure. This area also contains approximately 14 schools and major hurricane and tsunami evacuation routes. The combined value of the study area is \$3.4 billion.

## Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an Independent External Peer Review (IEPR) of the San Juan Metro Area CSRM Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (IFS/EA) (hereinafter: San Juan Metro Area IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2018). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate this IEPR. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2018) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for

selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the decision documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: plan formulation/economics, environmental law compliance, hydrology and hydraulic (H&H)/coastal engineering, and civil/geotechnical engineering. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the four-person Panel from this list.

The Panel received electronic versions of the decision documents (581 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2018) and OMB (2004), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference at the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process.

IEPR panel members reviewed the decision documents individually and produced individual comments in response to the charge questions. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment.

Battelle received from USACE one public comment in the form of a PDF and one Word file containing the contents of nine letters in total on the San Juan Metro Area project. All letters received by USACE in Spanish were translated by USACE into English, and the translation was provided to Battelle. Battelle provided the two files containing the public comments to the IEPR panel members for review. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the San Juan Metro Area review documents. After completing its review, the Panel identified two new issues and subsequently generated two Final Panel Comments that summarized the concerns.

Overall, 14 Final Panel Comments were identified and documented. Of these, one has been identified as having medium/high significance, two have medium significance, five have medium/low significance, and six have low significance.

## Results of the Independent External Peer Review

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2018) in the San Juan Metro Area review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

The Panel noted that a number of benefits and impacts remain to be identified, clarified, and addressed. The Final Panel Comments provided by the Panel take into account USACE's statements that the Draft IFS/EA is based on a 10 percent design. The Panel recognized that once additional details regarding the project have been determined, USACE will conduct the appropriate modeling and impact analyses to complete an assessment that complies with all USACE guidance and National Environmental Policy Act (NEPA) requirements as noted throughout the documents.

Based on the Panel's review, the report is very well-written and easy to understand. The report provides a balanced assessment of the economic, engineering, and environmental issues of the overall project; however, the Panel identified several elements of the project that should be documented, clarified, or revised.

**Environmental:** The Panel noted that many of the environmental impacts from this project cannot be determined until additional design occurs during the pre-construction engineering and design (PED) phase. That being said, the Panel's main concern is that although mitigation is identified as a potential need in the Draft IFS/EA and Appendix F, Plan Formulation, the cost of mitigation does not appear to have been a factor in analyzing the alternatives and the Tentatively Selected Plan (TSP) other than a brief footnote in the Executive Summary. The alternatives proposed in the Draft IFS/EA pose varying levels of impacts to submerged aquatic vegetation (SAV), mangroves, and freshwater marsh that would require mitigation. Mitigation is noted as possibly being at a level where acres of these habitats would need to be replaced, bringing with it the potential for costing millions of dollars. However, review of the economic analyses and alternatives assessment showed no indication that mitigation costs were considered.

The Draft IFS/EA also does not provide information regarding impacts to stormwater runoff and water quality under the TSP. Although controlling stormwater runoff and improving water quality are not part of the project objectives, moving forward with the TSP could impact future stormwater runoff and water quality in these areas. The Panel noted that the public mentioned similar concerns.

**Engineering:** The Draft IFS/EA provided a balanced mixture of alternatives with structural measures and natural and nature-based features (NNBFs). It was clear to the Panel that USACE took into consideration the need to build a resilient and adaptable project, recognizing the need for monitoring and adaptation of project components to account for changes in future conditions such as an underprediction of SLR. However, given the limited information currently available on the subsurface geological conditions, the Panel is concerned that the assumptions used to develop the estimated cost computations for the alternatives analyses, and the assumption that King Piles can be driven into the limestone as part of the seawall construction, are not supported by credible site-specific information. Without adequate information on the actual subsurface geology, a high degree of uncertainty remains as to whether the TSP can be implemented in the manner described in the report without modifications and increased costs.

The Panel is also concerned about the use of offshore wave data to determine the design of project elements along the San Juan Bay shoreline. The design of the breakwater and seawall in San Juan Bay relies in part on the characteristics of transformed waves that reach the shore. The Draft IFS/EA does not include information on the design wave heights (transformed from offshore) or the calculations used for wave transformation and wave runup. An analysis of design wave heights, along with wave transformation and runup calculations, would directly support the analysis of project costs.

**Plan Formulation/Economics:** The planning and economic analyses were properly conducted, and the analyses were adequately reported in the Draft IFS/EA. However, during their review, panel members noted that it is unclear whether the alternatives assessment is consistent with the requirements of USACE Engineer Regulation (ER) 1105-2-101, Risk Assessment for Flood Risk Management Studies. The Draft IFS/EA did not provide confidence intervals for the calculated percent damage reduction or residual risk. Therefore, the Panel could not determine the level of uncertainty that remains based on the data used. The Panel also noted that a life safety hazard analysis does not appear to have been conducted for the TSP or the alternatives.

**Table ES-1. Overview of 14 Final Panel Comments Identified by the San Juan Metro Area IEPR Panel**

No.	Final Panel Comment
<b>Significance – Medium/High</b>	
1	It is not clear if the cost of mitigation was considered when analyzing the net benefits under each alternative.
<b>Significance – Medium</b>	
2	The inclusion of estimated cost computations based upon assumed subsurface geological conditions creates a level of credibility that is not supported by the level of actual site-specific information.
3	The transformation of offshore waves and the potential impacts to project design elements along the San Juan Bay shoreline (specifically, the WSJB-3 reach) are not discussed in the Draft IFS/EA.
<b>Significance – Medium/Low</b>	
4	The need for a long-term achievable operation and maintenance (O&M) plan for local government agencies to ensure project resiliency over the 50-year lifespan is not identified or discussed.
5	The assumption that the underlying limestone bedrock is soft enough to allow the driving of King Piles into the limestone to construct a seawall as part of the TSP is not supported by site-specific data.
6	It is unclear whether the alternatives assessment is consistent with the requirements of USACE guidance for assessing flood risk, because no confidence intervals are provided for the calculated percent damage reduction or residual risk.

**Table ES-1. Overview of 14 Final Panel Comments Identified by the San Juan Metro Area IEPR Panel (continued)**

No.	Final Panel Comment
7	A life safety hazard analysis for the TSP and alternatives does not appear to have been conducted.
8	Descriptions of the changes to the shoreline, based on the implementation of the TSP, do not discuss changes to stormwater runoff and impacts to water quality.
<b>Significance – Low</b>	
9	Although the TSP includes a significant length of cantilevered sheet pile wall, a cross-section that depicts the potential configuration of this section is not provided.
10	The Draft IFS/EA does not describe how seepage through the interlocks of the sheet pile seawall structures would be addressed.
11	The public comments identified concerns about physical and visual impacts to local businesses under the proposed project.
12	A discrepancy in the intermediate 50-year SLR used in the design of the project was noted between the Draft IFS/EA and the appendices.
13	The Draft IFS/EA does not provide quantitative estimates for the Regional Economic Development (RED) projections.
14	Cumulative impacts on SAV are not assessed in the Draft IFS/EA as a stand-alone item.

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## LIST OF ACRONYMS

<b>ADM</b>	Agency Decision Milestone
<b>CEDES</b>	Center for Development of Sustainable Studies
<b>COI</b>	Conflict of Interest
<b>CSRM</b>	Coastal Storm Risk Management
<b>DrChecks</b>	Design Review and Checking System
<b>EC</b>	Engineer Circular
<b>EFH</b>	Essential Fish Habitat
<b>ER</b>	Engineer Regulation
<b>ERDC</b>	Engineer Research and Development Center
<b>FEMA</b>	Federal Emergency Management Agency
<b>G2CRM</b>	Generation 2 Coastal Risk Model
<b>GIS</b>	Geographic Information System
<b>H&amp;H</b>	Hydrology and Hydraulic
<b>HEC-FDA</b>	Hydrologic Engineering Center Flood Damage Reduction Analysis
<b>HEC-LifeSim</b>	Hydrologic Engineering Center Life Loss Simulation
<b>IEPR</b>	Independent External Peer Review
<b>IFS/EA</b>	Integrated Feasibility Study/Environmental Assessment
<b>IWR</b>	Institute for Water Resources
<b>MEOW</b>	Maximum Envelope of Water
<b>NEPA</b>	National Environmental Policy Act
<b>NNBF</b>	Natural and Nature-Based Feature
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>O&amp;M</b>	Operation and Maintenance
<b>OEO</b>	Outside Eligible Organization
<b>OMB</b>	Office of Management and Budget
<b>PDT</b>	Project Delivery Team
<b>PED</b>	Pre-construction Engineering and Design
<b>PFMA</b>	Potential Failure Mode Analysis
<b>psf</b>	Pounds per Square Foot
<b>RED</b>	Regional Economic Development

<b>SAV</b>	Submerged Aquatic Vegetation
<b>SLR</b>	Sea Level Rise
<b>SPT</b>	Standard Penetration Test
<b>TSP</b>	Tentatively Selected Plan
<b>USACE</b>	United States Army Corps of Engineers
<b>WIS</b>	Wave Information Study

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## 1. INTRODUCTION

The San Juan Metropolitan Area (San Juan Metro Area) is located along the Northern Coastal areas of Puerto Rico. The study area is located in the back bay area of San Juan and adjacent municipalities, which is surrounded by a high-density urban residential area, recreation areas, hotels and tourist facilities, and commercial areas. During coastal storms, storm surge, tidal influences, and wave contributions cause extreme flooding. This results in damages to critical infrastructure and to residential and commercial structures; negative environmental and social effects; losses to the regional and national economy; and lack of resilience for affected communities. Additionally, the flooded conditions are hazardous to the community (bringing disease and mold during extended periods); pollute the lagoon with automobile fluids; corrode the underside of vehicles; affect economic development of stores, hotels, and restaurants; and decrease property values. This shoreline contains resources that represent potential National Economic Development benefits for the San Juan area, including large hotels, businesses, and condominiums and other residences of high structure value.

Originally, the study was scoped to assess shoreline erosion along the coastline of only the San Juan Metro Area. A National Environmental Policy Act (NEPA) scoping meeting was held in San Juan on November 8, 2018, where the study team presented the general study scope and requested feedback from communities. During that process, several communities expressed concerns regarding back bay flooding in the Cataño municipality, as well as the Condado Lagoon area within the San Juan municipality. As a result, the feasibility of addressing shoreline erosion as a Federal project along the coastline of the San Juan Metro Area was incorporated into another ongoing U.S. Army Corps of Engineers (USACE) study, called the Puerto Rico Coastal Storm Risk Management (CSRSM) Study, to allow this study to focus solely on back bay flooding.

This study assesses back bay flooding risks due to storm surge, which also includes wave contributions and tidal influences, as well as sea level change under the CSRSM mission. Three data sets were overlaid in a Geographic Information System (GIS) to determine the study area extent based on a high risk of storm surge and sea level rise (SLR). These three data sets are 1) Flood Risk Zones (Federal Emergency Management Agency [FEMA] 2018 Advisory: 0.2% VE and AE Flood Zones; 2) Sea Level Rise Forecasts (National Oceanic and Atmospheric Administration [NOAA] sea level viewer at 6 feet above mean higher high water); and 3) Flooding (ADCIRC + SWAN: Cat 5 Maximum of MEOWs (Maximum Envelopes of Water) plus 1 meter of SLR). Areas within this initially defined region were separated into six reaches based on their respective watershed basins: Reach 1 - West San Juan Bay, Reach 2 - East San Juan Bay, Reach 3 – Condado Lagoon, Reach 4 - Caño Martin Pena, Reach 5 - Los Corozos and San Jose Lagoon, and Reach 6 -Torrecilla Lagoon. During further investigation, Reaches 1 and 3 were carried forward, while Reaches 4 through 6 and Reach 2 were screened from further analysis in this study. The rationale for this descoping of the study is described in the following paragraphs.

Reaches 1 through 3 have a single source of back bay flooding influence (the Atlantic Ocean), and the flooding problem within these reaches is driven primarily by storm surge. These areas can be modeled within the existing economic model, Generation 2 Coastal Risk Model (G2CRM), for a direct link to damages and benefits from storm surge versus design alternatives, and the study can be completed within three years. After further analysis of Reaches 4 through 6, the study team determined that those reaches have multiple sources of back bay flooding influences, and the uncertainty in the exchanges of flow between them is too high without performing more extensive hydrologic modeling. The problem in these reaches is a combination of precipitation with storm surge. This type of analysis (involving the

inclusion of precipitation as well as an understanding of the complexity of storm surge from multiple points) would necessitate the use of multiple models and complex model interfaces, which would cause the existing study to exceed the scope. The study team acknowledges that flooding problems in Reaches 4 through 6 are likely to result in potential risk to critical infrastructure and socially vulnerable communities from hydrologic-induced flooding (precipitation) in addition to storm surge. These areas are recommended to be evaluated under a separate study in order to adequately address both storm surge and precipitation holistically.

Reach 2 was also screened from further analysis. The majority of the area in Reach 2 is owned, operated, and maintained by the Port of San Juan, with some residential areas around the perimeter area. Modeling of future without-project conditions showed that damages were very low. After further analysis, it was determined that the cost of the alternatives most likely to reduce damages in the area would be higher than the benefits, creating negative net benefits and a benefit-to-cost ratio of less than 1.0. USACE cannot recommend a project with a benefit-to-cost ratio of less than 1.0, per USACE guidance.

The reduced study area includes Reach 1 (the West San Juan Bay reach) and Reach 3 (the Condado Lagoon reach). The combined study area encompasses roughly 9.5 square miles and contains an estimated 20,000 assets (infrastructure and vehicles), with approximately 22 structures identified as critical infrastructure. This area also contains approximately 14 schools and major hurricane and tsunami evacuation routes. The combined value of the study area is \$3.4 billion.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the San Juan Metro Area CSRM Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (IFS/EA) (hereinafter: San Juan Metro Area IEPR) in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE), Engineer Circular (EC) *Review Policy for Civil Works* (EC 1165-2-217) (USACE, 2018) and the Office of Management and Budget (OMB), *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, and plan formulation analyses contained in the San Juan Metro Area IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational COI form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the San Juan Metro Area IEPR.

## 2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review, as described in USACE (2018).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the engineering, economic, environmental, and plan formulation analyses of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the San Juan Metro Area IFS/EA was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-217). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

### **3. METHODS FOR CONDUCTING THE IEPR**

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan; the due dates are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected four panel members to participate in the IEPR based on their expertise in the following disciplines: plan formulation/economics, environmental law compliance, hydrology and hydraulic (H&H)/coastal engineering, and civil/geotechnical engineering. The Panel reviewed the San Juan Metro Area documents and produced 14 Final Panel Comments in response to 16 charge questions provided by USACE for the review. This charge also included two overview questions and one public comment question added by Battelle, for a total of 19 questions. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-217), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

### **4. RESULTS OF THE IEPR**

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

## 4.1 Summary of Final Panel Comments

The panel members agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2018) in the San Juan Metro Area IEPR review documents. The following summarizes the Panel’s findings.

The Panel noted that a number of benefits and impacts remain to be identified, clarified, and addressed. The Final Panel Comments provided by the Panel take into account USACE’s statements that the Draft IFS/EA is based on a 10 percent design. The Panel recognized that once additional details regarding the project have been determined, USACE will conduct the appropriate modeling and impact analyses to complete an assessment that complies with all USACE guidance and National Environmental Policy Act (NEPA) requirements as noted throughout the documents.

Based on the Panel’s review, the report is very well-written and easy to understand. The report provides a balanced assessment of the economic, engineering, and environmental issues of the overall project; however, the Panel identified several elements of the project that should be documented, clarified, or revised.

**Environmental:** The Panel noted that many of the environmental impacts from this project cannot be determined until additional design occurs during the pre-construction engineering and design (PED) phase. That being said, the Panel’s main concern is that although mitigation is identified as a potential need in the Draft IFS/EA and Appendix F, Plan Formulation, the cost of mitigation does not appear to have been a factor in analyzing the alternatives and the Tentatively Selected Plan (TSP) other than a brief footnote in the Executive Summary. The alternatives proposed in the Draft IFS/EA pose varying levels of impacts to submerged aquatic vegetation (SAV), mangroves, and freshwater marsh that would require mitigation. Mitigation is noted as possibly being at a level where acres of these habitats would need to be replaced, bringing with it the potential for costing millions of dollars. However, review of the economic analyses and alternatives assessment showed no indication that mitigation costs were considered.

The Draft IFS/EA also does not provide information regarding impacts to stormwater runoff and water quality under the TSP. Although controlling stormwater runoff and improving water quality are not part of the project objectives, moving forward with the TSP could impact future stormwater runoff and water quality in these areas. The Panel noted that the public mentioned similar concerns.

**Engineering:** The Draft IFS/EA provided a balanced mixture of alternatives with structural measures and natural and nature-based features (NNBFs). It was clear to the Panel that USACE took into consideration the need to build a resilient and adaptable project, recognizing the need for monitoring and adaptation of project components to account for changes in future conditions such as an underprediction of SLR. However, given the limited information currently available on the subsurface geological conditions, the Panel is concerned that the assumptions used to develop the estimated cost computations for the alternatives analyses, and the assumption that King Piles can be driven into the limestone as part of the seawall construction, are not supported by credible site-specific information. Without adequate information on the actual subsurface geology, a high degree of uncertainty remains as to whether the TSP can be implemented in the manner described in the report without modifications and increased costs.

The Panel is also concerned about the use of offshore wave data to determine the design of project elements along the San Juan Bay shoreline. The design of the breakwater and seawall in San Juan Bay relies in part on the characteristics of transformed waves that reach the shore. The Draft IFS/EA does not include information on the design wave heights (transformed from offshore) or the calculations used for wave transformation and wave runup. An analysis of design wave heights, along with wave transformation and runup calculations, would directly support the analysis of project costs.

**Plan Formulation/Economics:** The planning and economic analyses were properly conducted, and the analyses were adequately reported in the Draft IFS/EA. However, during their review, panel members noted that it is unclear whether the alternatives assessment is consistent with the requirements of USACE Engineer Regulation (ER) 1105-2-101, Risk Assessment for Flood Risk Management Studies. The Draft IFS/EA did not provide confidence intervals for the calculated percent damage reduction or residual risk. Therefore, the Panel could not determine the level of uncertainty that remains based on the data used. The Panel also noted that a life safety hazard analysis does not appear to have been conducted for the TSP or the alternatives.

## [4.2 Final Panel Comments](#)

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

## Final Panel Comment 1

**It is not clear if the cost of mitigation was considered when analyzing the net benefits under each alternative.**

### Basis for Comment

Title 32, National Defense, Part 651, Environmental Analysis of Army Actions, Section 651.15(b), Mitigation and monitoring, states that the cost of mitigation must be identified in the decision document and will be "...budgeted and funded (or funding arranged) by the proponent...". With potential impacts to seagrasses, mangroves, and freshwater marsh being measured in acres, the cost of mitigation is likely to be substantial. Further, the cost of having multiple alternatives comprising the TSP may add to the cost of mitigation. The Panel believes that if the cost of mitigation needs to be included in the project budget, it should also be a factor in the cost-benefit analysis.

Mitigation is identified as a potential need in the Draft IFS/EA and Appendix F, Plan Formulation, but the cost of mitigation does not appear to have been a factor in analyzing the alternatives and the TSP. When mitigation is mentioned in Table 9, it is written using the phrase, "would likely require mitigation." This suggests that the cost of mitigation was not included when selecting the TSP. Also, there is no mention of the potential cost of mitigation in Appendix C, Economic Analysis, for the alternatives or TSP.

Section 7.0, of Appendix G, Environmental, states that the preliminary cost of mitigation for the TSP is \$7,791,195. The appendix indicates that cost of mitigation was not included in the benefits analysis. Based on this information, it appears that the cost of mitigation would have a significant impact on the net benefits of the alternatives presented in Table 14 of Appendix F. While the Panel understands that the cost of mitigation will be reinvestigated during the PED phase, omitting the estimated cost of mitigation from the initial net benefits analysis likely has had an impact on the alternative selection process.

Only footnote #5 in Table ES-1-1, Tentatively Selected Plan Cost Summary, states that the cost of the item "Fish and Wildlife Facilities" includes mitigation. "Fish and Wildlife Facilities" is not defined and is mentioned in the IFS/EA only as a footnote; therefore, the Panel could not clearly determine whether the cost of mitigation was included in selecting the TSP.

The Panel understands that the status of submerged aquatic vegetation (SAV), mangroves, and freshwater marsh is still being assessed, and that resulting impacts on these habitats will be refined in the PED phase. However, it is important to include the cost of mitigation in the alternative selection process in the Draft IFS/EA.

### Significance – Medium/High

The cost of mitigation appears to be quite high. If this cost was not included in the net costs of each alternative considered, the alternatives analysis could be incomplete.

## Final Panel Comment 1

### Recommendations for Resolution

1. Clarify what resources are included in the term “Fish and Wildlife Facilities.”
2. Clarify whether the cost of mitigation for impacts to seagrasses, mangroves, and freshwater marsh was considered when selecting the TSP.
3. Estimate the cost of mitigation and monitoring under each alternative and the TSP analyzed in Appendix F, Plan Formulation, if this cost was not originally included in the alternatives and TSP analysis.
4. Re-evaluate the alternatives for each reach in the economic evaluation (Appendix C, Economic Analysis), taking into account the cost of mitigation if it was not included in the TSP analysis.

### Literature Cited:

Code of Federal Regulations Title 32. National Defense Subtitle A. Department of Defense Chapter V. Department of the Army Subchapter K. Environmental Quality Part 651. Environmental Analysis of Army Actions (AR 200-2) Subpart B. National Environmental Policy Act and the Decision Process Section 651.15. Mitigation and monitoring. Available at <https://www.law.cornell.edu/cfr/text/32/651.15>. Accessed September 27, 2020.

## Final Panel Comment 2

**The inclusion of estimated cost computations based upon assumed subsurface geological conditions creates a level of credibility that is not supported by the level of actual site-specific information.**

### Basis for Comment

The preliminary designs for over 8 miles of seawall, floodwall, and levee that form the basis for the TSP and the related project cost estimates are based upon assumed foundation conditions. These conditions were inferred from 18 harbor borings taken from 1972 to 2000 in the harbor area to support harbor dredging. Seventeen of these borings show a subsurface profile that includes an upper layer of extremely soft clay underlain by stiffer, stronger deposits. The soft upper clay unit was so weak that it would not support the weight of the sampling tools. The weak layer varied in thickness from 0 to 31.5 feet, with an average thickness of approximately 8 feet.

The lack of site-specific geotechnical information does not allow credible analysis for the stability of the seawalls, floodwalls, or levees under flood loading conditions. The stability analyses documented in Appendix D, Geotechnical Analysis, assumed a subsurface profile that incorporated one clay unit with an undrained shear strength of 500 pounds per square foot (psf). The thickness of this clay layer was assumed to be 25 or 30 feet for different analyses. This subsurface model was assumed to be representative over the entire 8-mile length of the flood barrier. While the assumed shear strength of 500 psf may be appropriate for the material underlying the weak clay unit shown in the available harbor borings, this estimated strength is likely at least twice the value of the weak clay unit identified in available borings.

The preliminary slope stability analyses shown in Appendix D (page D-24) using this assumed profile and 500-psf soil strength indicate factors of safety of 1.5 for the global stability of the seawall and levee sections. If future subsurface investigations indicate the presence of the weak unit along the project alignment, the computed factors of safety could be well below this value, and the configuration of the seaward slopes and/or the alignment of the barrier would need to be modified to provide adequate factors of safety. Similarly, the design of the floodwall and seawall sections would need to be modified, which likely would include increased depths and decreased spacing of supporting piling, resulting in increased cost.

### Significance – Medium

The lack of definitive subsurface information creates uncertainty that the TSP can be implemented in the manner described in the report without modifications and increased cost.

### Recommendation for Resolution

1. Conduct a comprehensive subsurface investigation along all reaches of the flood barrier during the PED phase. It is recommended that the investigation be conducted in a two-phased approach to evaluate the presence and strength of any cohesive deposits in the foundation of the flood barrier. The initial phase would involve small-diameter drill holes utilizing standard penetration tests (SPTs) and extending from the ground surface to the firm bedrock to define

## Final Panel Comment 2

the subsurface profile along the various project reaches. After the profile has been established using the SPT holes, larger-diameter (5-inch) undisturbed sampling holes could be drilled at critical locations along the barrier alignment. Samples from these holes could then be tested to evaluate appropriate strength values for stability analyses and design of structures.

### Final Panel Comment 3

**The transformation of offshore waves and the potential impacts to project design elements along the San Juan Bay shoreline (specifically, the WSJB-3 reach) are not discussed in the Draft IFS/EA.**

#### Basis for Comment

Appendix A, Section 3.2, discusses waves based on the USACE Wave Information Study (WIS) hindcast database. However, the WIS station is located offshore in deep water and therefore is not representative of the nearshore wave conditions in San Juan Bay.

Appendix A (page A-33) states that "...some model areas are more susceptible to waves than others. At these model areas, the engineering team increased the design elevation to account for the 2% design wave runup using the Eurotop, Shore Protection Manual (SPM), and the Technical Advisory Committee for Water Retaining Structures (TAW) methodologies. The 2% design wave runup is the runup level exceeded by 2% of the incoming waves." However, the design wave heights (transformed from offshore) are not provided, nor are the calculations for wave transformation and wave runup. Waves penetrating through the San Juan Inlet can impact the WSJB-3 reach. The height and period of the transformed waves affects the design of the breakwater (crest elevation, width, armor stone size, gap width, etc.) and seawall (crest elevation and toe scour protection).

#### Significance – Medium

The design of the breakwater and seawall in reach WSJB-3 relies in part on the characteristics of transformed waves that reach the shore. An analysis of design wave heights, along with wave transformation and runup calculations, would directly support the analysis of project costs.

#### Recommendations for Resolution

1. Discuss the design wave heights (transformed from offshore, outside San Juan Bay) used to inform the breakwater and seawall designs for WSJB-3.
2. Include the wave runup/overtopping analysis used to determine structure elevations.
3. Provide the armor stone stability calculations for the breakwater and seawall scour aprons based on the transformed waves.

#### Final Panel Comment 4

The need for a long-term achievable operation and maintenance (O&M) plan for local government agencies to ensure project resiliency over the 50-year lifespan is not identified or discussed.

#### Basis for Comment

The Draft IFS/EA states that the local sponsor is responsible for 100% of the costs of operation, maintenance, repair, rehabilitation, and replacement of project features (page 4-14). However, the Center for Development of Sustainable Studies (CEDES) expressed a concern that projects in the past have not received adequate O&M from the local government. Specifically, CEDES (Public Comment CEDES-3) states, “In Puerto Rico, the construction of levees, seawalls, and storm surge protection systems, in the past 50 years, have not been adequately maintained by government agencies.”

#### Significance – Medium/Low

Lack of an O&M plan that can be implemented and funded by the non-Federal sponsor could undermine the ability of the project to retain its effectiveness in the future.

#### Recommendation for Resolution

1. Discuss the O&M plan that the non-Federal sponsor would be responsible for, and explain how this plan would be developed during the final design.

## Final Panel Comment 5

**The assumption that the underlying limestone bedrock is soft enough to allow the driving of King Piles into the limestone to construct a seawall as part of the TSP is not supported by site-specific data.**

### Basis for Comment

The available subsurface information for the TSP shown in Appendix D of the Draft IFS/EA included 18 borings that were located in the harbor area, not along the project alignments. Four of these borings penetrated the underlying limestone. The values of SPTs from these borings varied from 9 blows per foot to 99 blows per foot, with an average value of 48. The variation in the strength of this rock is likely attributable to differing amounts of weathering of the bedrock. A review of available literature indicates that driving sheet piling or other piling through rock with SPT values greater than 90 can be extremely difficult, if not impossible (Gallage et al., 2010; Chun Wo Construction & Engineering, 2013).

Although a subsurface exploration program is currently under way, the TSP design and cost estimate for the wall sections along the project alignment reach CL-1 using King Piles are not supported by any definitive information defining the depth or strength of the underlying limestone bedrock. It is possible that the overall configuration of the flood barrier could change depending upon the results of a future exploration program.

### Significance – Medium/Low

The ability to drive King Piles into the underlying limestone bedrock could impact the selection of the type of wall used in reach CL-1.

### Recommendations for Resolution

1. Consider using geophysical exploration to determine the profile of the bedrock surface along the project alignment.
2. Develop future subsurface exploration programs that can assess the variability of weathering and strength of the underlying bedrock in areas where piling will be required to penetrate the rock formation.
3. Consider driving test piles as part of the final design of walls which require bedrock penetration

### Literature Cited:

Gallage, C., Adam, B., and Look, B. (2010). Assessment of pile driving refusal using the standard test (SPT). In: Proceedings of the 11th IAEG Congress, 5 - 10 September 2010, Auckland, New Zealand.

Chun Wo Construction & Engineering Co. Ltd. (2013). Steel Sheet Piling – Drivability vs SPT-N Values; Vibrations & Noise Level. KMS / Technical Department, Technical Note 013. Available at <http://chunwo.com/chunwoimages/files/Construction/TECHNICAL%20NOTE%20013%20Steel%20Sheet%20Piling%20%E2%80%93%20Drivability%20vs%20SPT-N%20Values%20Vibrations%20and%20Noise%20Level.pdf>. Accessed October 6, 2020.

## Final Panel Comment 6

**It is unclear whether the alternatives assessment is consistent with the requirements of USACE guidance for assessing flood risk, because no confidence intervals are provided for the calculated percent damage reduction or residual risk.**

### Basis for Comment

Table 4-2 in the Draft IFS/EA presents the ‘% Damage Reduction’ for each component of the TSP, but there is no information about the risk distribution for these estimates. Similarly, Section 4.14.1, Residual Risk, states that the residual damages are in the “...range of 8% to 15%” (page 4-18), but these estimates also do not include risk distribution information. There are no confidence intervals to assess the differences between alternatives. Therefore, the Panel cannot determine the level of uncertainty that remains based on the data used. Section 4.14.1 also discusses the need for further hydrological modeling to fully assess flooding risks. Thus, it not clear that the assessment is consistent with ER 1105-2-101, Risk Assessment for Flood Risk Management Studies (USACE, 2019).

### Significance – Medium/Low

Information about the distribution of risks under the alternatives would more fully support the selection of the TSP.

### Recommendations for Resolution

4. Provide a more complete evaluation of the distribution of damage reductions benefits for the alternatives.
5. Provide a more complete evaluation of the residual risks for the alternatives and for the TSP.

### Literature Cited:

USACE (2019). Risk Assessment for Flood Risk Management Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) 1105-2-101. July 15.

## Final Panel Comment 7

**A life safety hazard analysis for the TSP and alternatives does not appear to have been conducted.**

### Basis for Comment

A life safety hazard analysis is not presented in the Draft IFS/EA. Appendix C, Economic Analysis, does provide some information about life loss for the future without-project condition (Figures 3-16 and 3-17), but no information about life loss reduction benefits is provided.

### Significance – Medium/Low

Information about the distribution of life loss reduction benefits under the alternatives would reinforce the selection of the TSP.

### Recommendation for Resolution

1. Conduct further analyses of the life loss risk reduction benefits under the alternatives, using models such as Hydrologic Engineering Center Life Loss Simulation 2.0 (HEC-LifeSim 2.0) model.

## Final Panel Comment 8

**Descriptions of the changes to the shoreline, based on the implementation of the TSP, do not discuss changes to stormwater runoff and impacts to water quality.**

### Basis for Comment

Section 2.2.1 of the Draft IFS/EA states that urban stormwater runoff degrades water quality, negatively impacting SAVs in Condado Lagoon. The relationship between the project and stormwater management issues is not discussed in sufficient detail in the Draft IFS/EA. While the Panel understands that the proposed action is not a stormwater management project, its effects may impact the existing stormwater management system. If stormwater and runoff can be reduced, water quality in the project area would be improved in the near term, enhancing SAVs, mangroves, and freshwater wetlands. In addition, reducing stormwater and runoff would have long-term beneficial impacts on these habitats.

The Panel's concerns were also shared by some local government agencies and organizations that provided public comments. Their comments indicate that portions of the proposed project, as currently designed, would impact stormwater discharge and runoff into San Juan Bay and Condado Lagoon, including specified areas where the project may adversely impact stormwater discharge and runoff. These impacts on water quality in San Juan Bay and Condado Lagoon are not addressed in the Draft IFS/EA.

### Significance – Medium/Low

Without information on stormwater runoff and runoff from the land surrounding San Juan Bay and Condado Lagoon, the Panel cannot determine potential water quality impacts under the TSP and other alternatives.

### Recommendations for Resolution

1. Document potential project impacts as they relate to local stormwater and runoff issues.
2. Revise the project design, to the extent possible, to address concerns of the local sponsor.

## Final Panel Comment 9

**Although the TSP includes a significant length of cantilevered sheet pile wall, a cross-section that depicts the potential configuration of this section is not provided.**

### Basis for Comment

As indicated in Chapter 4 of the Draft IFS/EA, the TSP includes 6.7 miles of seawall (Section 4.1). The cantilevered sheetpile seawall, therefore, is a major and critical component of the TSP. Although descriptions of the proposed seawall configuration are provided under each alternative description for the various reaches under the TSP, no figure of a cross-section of the cantilevered sheetpile seawall configuration is provided. Figure A-15 of Appendix A provides a cross-section of a typical seawall section; however, that cross-section does not match the descriptions of the cantilevered sheetpile seawall provided in Chapter 4 of the Draft IFS/EA.

### Significance – Low

The lack of an accurate cross-section of the cantilevered sheetpile seawall impacts the clarity of the Draft IFS/EA but does not impact the overall evaluation of alternatives.

### Recommendations for Resolution

1. Replace Figure A – 15 with a cross-section of the cantilevered sheetpile seawall that conforms to the descriptions provided in Chapter 4 of the Draft IFS/EA.
2. Consider including a cross-section of the cantilevered sheet pile seawall in Chapter 4 of the Draft IFS/EA describing the TSP.

## Final Panel Comment 10

**The Draft IFS/EA does not describe how seepage through the interlocks of the sheet pile seawall structures would be addressed.**

### Basis for Comment

The TSP includes a total length of 6.7 miles of seawall sections located in four of the five reaches. The seawall cross-section, as described in various sections of Chapter 4 of the Draft IFS/EA, consists of a driven sheet pile wall that is cantilevered into the supporting foundation. Above the ground surface, earth sections on the landward side of the wall provide lateral support for the sheet pile. Experience has shown that water-retaining structures utilizing sheet piling incur leakage through the interlocks connecting adjoining steel sheets. Although the volume of this leakage would likely not be large, the leakage could create erosion on the landward side of the sheet pile, through the supporting earth fill. The current description of the seawall cross-section does not provide any method to prevent or control this type of seepage.

### Significance – Low

The inclusion of seepage control features is an important design consideration for the PED phase but is not a major consideration for the selection of the TSP.

### Recommendations for Resolution

1. Identify the need for seepage control in the descriptions of the cantilevered sheet pile seawall in Appendix A, Engineering, and Appendix D, Geotechnical.
2. Evaluate seepage control features or methods during the PED phase. Potential seepage control methods could involve membrane coatings, geotextile coverings, or land-side drainage features.

## Final Panel Comment 11

**The public comments identified concerns about physical and visual impacts to local businesses under the proposed project.**

### Basis for Comment

In its public comments, Puma Energy Caribe, LLC, submitted comments that focused on the industrial infrastructure, including a dock and pipeline system located along the proposed project alignment at the southernmost shore of San Juan Bay. It is clear from Puma Energy's comments that there is a concern regarding physical impacts to its operations. Puma indicated that it would provide comments during the PED phase on this issue. The Panel did not see any mention of potential impacts to the dock and pipeline systems in the Draft IFS/EA.

Public comments from Mr. Daniel Torres also expressed concerns that the construction of a seawall along the shoreline in the Cataño area would impact the view from restaurants and other businesses along the shoreline and could discourage tourists from visiting attractions in the area along the southernmost shore of San Juan Bay. Although the report identified potential viewshed impacts to cultural property, the Panel did not see any mention of potential socioeconomic impacts to the viewshed from this seawall.

### Significance - Low

The public concerns are valid but do not have a major influence on the feasibility or desirability of the overall TSP.

### Recommendations for Resolution

1. Evaluate alternative designs and alignments during the PED phase where the seawall or floodwall could impact the operations and views for existing businesses.
2. During the PED phase, implement a program whereby local businesses could review and provide comments on alternative designs.

## Final Panel Comment 12

**A discrepancy in the intermediate 50-year SLR used in the design of the project was noted between the Draft IFS/EA and the appendices.**

### Basis for Comment

The Draft IFS/EA states that the intermediate 50-year SLR value of 1.26 feet was used to design project features (pages ES-3, 2-39, 3-18, 4-9). Table A-6 in the Engineering Appendix also lists 1.26 feet for the intermediate 50-year SLR. However, Appendix A: Engineering (page A-22) and Appendix F: Plan Formulation (page F-22) both state that 1.17 feet was used for SLR.

### Significance – Low

The discrepancy in SLR affects the clarity of the Draft IFS/EA.

### Recommendation for Resolution

1. Provide an explanation for the differing values of SLR, or revise the Draft IFS/EA and appendices to have consistent values of SLR.

### Final Panel Comment 13

**The Draft IFS/EA does not provide quantitative estimates for the Regional Economic Development (RED) projections.**

#### Basis for Comment

The Draft IFS/EA provides some general qualitative statements about RED impacts under the TSP, but there is no explicit quantitative evaluation.

#### Significance – Low

Information about the RED impacts would be useful to understand the economic consequences under the TSP.

#### Recommendation for Resolution

1. Provide a quantitative evaluation of the RED impacts under the TSP.

## Final Panel Comment 14

**Cumulative impacts on SAV are not assessed in the Draft IFS/EA as a stand-alone item.**

### Basis for Comment

The Draft IFS/EA discusses a variety of resources that may be impacted by implementing the TSP. The resources discussed include separate narratives on mangroves (identified as wetlands in the Draft IFS/EA) and SAVs. Mangroves and SAVs are mentioned in the discussion of Essential Fish Habitat (EFH), and cumulative impacts to these resources are listed in Table 5-4, Summary of Cumulative Effects, in the context of EFH. However, notably missing from Table 5-4 are topic-specific discussions of the cumulative effects on mangroves and SAVs.

Mangroves and SAVs are essential elements of the San Juan Bay and Condado Lagoon ecosystem. Cumulative impacts to these resources under the TSP should be identified and discussed in Table 5-4 for the future without-project and the future with-project conditions.

### Significance – Low

Identification of cumulative impacts on mangroves and SAVs would provide clarity and consistency with other sections of the Draft IFS/EA.

### Recommendations for Resolution

1. Revise Table 5-4 of the Draft IFS/EA to incorporate a summary of cumulative impacts to mangroves and SAVs under the future without-project and future with-project conditions.

## 5. REFERENCES

Code of Federal Regulations Title 32. National Defense Subtitle A. Department of Defense Chapter V. Department of the Army Subchapter K. Environmental Quality Part 651. Environmental Analysis of Army Actions (AR 200-2) Subpart B. National Environmental Policy Act and the Decision Process Section 651.15. Mitigation and monitoring. Available at <https://www.law.cornell.edu/cfr/text/32/651.15>. Accessed September 27, 2020.

Gallage, C., Adam, B., and Look, B. (2010). Assessment of pile driving refusal using the standard test (SPT). In: Proceedings of the 11th IAEG Congress, 5 - 10 September 2010, Auckland, New Zealand.

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

USACE (2018). Water Resources Policies and Authorities: Review Policy for Civil Works. Engineer Circular (EC) 1165-2-217. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. February 20.

USACE (2019). Risk Assessment for Flood Risk Management Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) 1105-2-101. July 15.

Chun Wo Construction & Engineering Co. Ltd. (2013). Steel Sheet Piling – Drivability vs SPT-N Values; Vibrations & Noise Level. KMS / Technical Department, Technical Note 013. Available at <http://chunwo.com/chunwoimages/files/Construction/TECHNICAL%20NOTE%2013%20Steel%20Sheet%20Piling%20%E2%80%93%20Drivability%20vs%20SPT-N%20Values%20Vibrations%20and%20Noise%20Level.pdf>. Accessed October 6, 2020.

# APPENDIX A

IEPR Process for the San Juan Metro Area Project

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## A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the major milestones and deliverables of the Independent External Peer Review (IEPR) of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (hereinafter: San Juan Metro Area IEPR). Due dates for milestones and deliverables are based on the award/effective date listed in Table A-1. The review documents were provided by the U.S. Army Corps of Engineers (USACE) on August 11, 2020. Note that the actions listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on December 15, 2020. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

**Table A-1. Major Milestones and Deliverables of the San Juan Metro Area IEPR**

Task	Action	Due Date
1	Award/Effective Date	8/6/2020
	Review documents available	8/11/2020
	Public comments available	9/16/2020
	Battelle submits draft Work Plan <sup>a</sup>	8/11/2020
	USACE provides comments on draft Work Plan	8/17/2020
	Battelle submits final Work Plan <sup>a</sup>	8/18/2020
2	Battelle submits list of selected panel members <sup>a</sup>	8/14/2020
	USACE confirms the panel members have no COI	8/17/2020
3	Battelle convenes kick-off meeting with USACE	8/13/2020
	Battelle convenes kick-off meeting with panel members	8/25/2020
	Battelle convenes kick-off meeting with USACE and panel members	8/25/2020
4	Panel members complete their individual reviews	9/16/2020
	Panel members provide draft Final Panel Comments to Battelle	9/25/2020
	Battelle sends public comments to panel members for review	9/17/2020
	Panel identifies two additional Final Panel Comments are necessary with regard to the public comments	9/23/2020
	Panel finalizes Final Panel Comments	9/30/2020
5	Battelle submits Final IEPR Report to USACE <sup>a</sup>	10/7/2020
6 <sup>b</sup>	Battelle convenes Comment Response Teleconference with panel members and USACE	11/25/2020
	Battelle submits pdf printout of DrChecks project file <sup>a</sup>	12/14/2020
	Agency Decision Milestone (ADM) meeting <sup>c</sup>	10/30/2020
	Contract End/Delivery Date	9/30/2021

<sup>a</sup> Deliverable.

<sup>b</sup> Task 6 occurs after the submission of this report.

<sup>c</sup> The ADM meeting was listed in the Performance Work Statement under Task 3 but was relocated in this schedule to reflect the chronological order of activities.

At the beginning of the Period of Performance for the San Juan Metro Area IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., terminology to use, access to DrChecks, etc.). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 16 charge questions provided by USACE, two overview questions and one public comment question added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge, as well as the review documents and reference/supplemental materials listed in Table A-2.

**Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information**

Review Documents	No. of Review Pages
Draft Integrated Feasibility Study for San Juan Metro Area Coastal Storm Risk Management Study	175
Appendix A Engineering	79
Appendix B Cost Engineering & Risk Analysis	19
Appendix C Economics	40
Appendix D Geotechnical	74
Appendix E Real Estate	43
Appendix F Plan Formulation	40
Appendix G Environmental (w/4 attachments: 1. Section 404(b) Evaluation; 2. Coastal Zone Management Consistency 3. Environmental Justice 4. Mitigation Plan	50
Appendix H Pertinent Correspondence	31
Appendix I Cultural Resources	30
<b>Total Number of Review Pages</b>	<b>581</b>
<b>Public Review Comments<sup>a</sup></b>	<b>200</b>

**Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information (continued)**

Supplemental Information <sup>b</sup>	
TSP Milestone Meeting Presentation	34
Risk Register	3
<b>Total Number of Reference Pages</b>	<b>37</b>

<sup>a</sup> USACE will submit public comments to Battelle upon their availability according to the schedule in Table A-1. Battelle will in turn submit the comments to the IEPR Panel for review.

<sup>b</sup> Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.

In addition to the materials provided in Table A-2, the panel members were provided the following USACE guidance documents.

- Review Policy for Civil Works (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018 and PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)
- Procedures to Evaluate SLR Change Impacts Responses Adaptation (ETL 1100-2-1 – June 30, 2014)
- Incorporating SLR Change in CW Programs (ER 1100-2-8162 – December 31, 2013).

About halfway through the review, a teleconference was held with USACE, Battelle, and the Panel so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 12 panel member questions to USACE. USACE was able to provide responses to all the questions during the teleconference, and followed up with written responses to all the questions prior to the end of the review.

## A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response form provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. At the end of the review, Battelle summarized the individual comments into a preliminary list of overall comments and discussion points. Each panel member's individual comments were shared with the full Panel.

### A.3 IEPR Panel Teleconference

Battelle facilitated a teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member should serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

### A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle distributed a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the San Juan Metro Area IEPR:

- **Lead Responsibility:** For each Final Panel Comment, one panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed a summary email detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- **Directive to the Lead:** Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- **Format for Final Panel Comments:** Each Final Panel Comment was presented as part of a four-part structure:
  1. Comment Statement (succinct summary statement of concern)
  2. Basis for Comment (details regarding the concern)
  3. Significance (high, medium/high, medium, medium/low, and low; see description below)
  4. Recommendation(s) for Resolution (see description below).
- **Criteria for Significance:** The following were used as criteria for assigning a significance level to each Final Panel Comment:
  1. **High:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.
  5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.
- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 12 Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The full text of the Final Panel Comments is presented in Section 4.2 of the main report.

## A.5 Conduct of the Public Comment Review

Following the schedule in Table A-1, Battelle received from USACE one public comment in the form of a PDF and one Word file containing the contents of nine letters in total on the San Juan Metro Area project. All letters received by USACE in Spanish were translated by USACE into English, and the translation was provided to Battelle for Panel review. Battelle then sent the public comments to the panel members in addition to the following charge question:

1. **Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**

The Panel produced individual comments in response to the charge question. Each panel member's individual comments for the public comment review were shared with the full Panel. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. The panel members confirmed that two new Final Panel Comments would be developed to summarize the additional issues raised by the public. One panel member was identified by Battelle as the lead author responsible for coordinating the development of the new Final Panel Comments and submitting them to the other panel members and Battelle. The new Final Panel Comments were developed as part of the four-part structure previously described in Section A.4.

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that the comments did not make any observations regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the Panel and USACE during the preparation of the additional two Final Panel Comments.

## **A.6 Final IEPR Report**

After concluding the review and preparation of the Final Panel Comments, Battelle prepared a final IEPR report (this document) on the overall IEPR process and the IEPR panel members' findings. Each panel member and Battelle technical and editorial reviewers reviewed the IEPR report prior to submission to USACE for acceptance.

## **A.7 Comment Response Process**

As part of Task 6, Battelle will enter the 14 Final Panel Comments developed by the Panel into USACE's DrChecks, a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

# APPENDIX B

Identification and Selection of IEPR Panel Members for the  
San Juan Metro Area Project

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## B.1 Panel Identification

The candidates for the Independent External Peer Review (IEPR) of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (hereinafter: San Juan Metro Area IEPR) Panel were evaluated based on their technical expertise in the following key areas: plan formulation/economics, environmental law compliance, hydrology and hydraulic (H&H)/coastal engineering, and civil/geotechnical engineering. These areas correspond to the technical content of the review documents and overall scope of the San Juan Metro Area project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected four experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

Candidates were screened for the following potential exclusion criteria or COIs. These COI questions were intended to serve as a means of disclosure in order to better characterize a candidate's employment history and background. Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. Guidance in OMB (2004, p. 18) states,

“...when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects.”

The term “firm” in a screening question referred to any joint venture in which a firm was involved. It applied to any firm that serves in a joint venture, either as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

### Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (IFS/EA)

1. Previous and/or current involvement by you or your firm in the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (hereinafter: San Juan Metro Area IFS/EA) and related projects.
2. Previous and/or current involvement by you or your firm in coastal storm risk management and the San Juan Metro Area.

## Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (IFS/EA)

3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in the San Juan Metro Area.

4. Current employment by the U.S. Army Corps of Engineers (USACE).

5. Previous and/or current involvement with paid or unpaid expert testimony related to the San Juan Metro Area IFS/EA.

6. Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, state, county, local, and regional agencies, environmental organizations, and interested groups (*for pay or pro bono*):

- Puerto Rico Department of Natural and Environmental Resources
- U.S. National Marine Fisheries Service
- U.S. Environmental Protection Agency
- Puerto Rico State Historic Preservation Officer
- Puerto Rico Environmental Quality Board
- Puerto Rico Office of Government Permits & Endorsements Management.

7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the San Juan Metro Area.

8. Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Jacksonville District.

9. Previous or current involvement with the development or testing of models that were used for, or in support of, the San Juan Metro Area IFS/EA.

Note – The following models were potentially used in the IFS/EA – Generation 2 Coastal Risk Model (G2CRM), Hydrologic Engineering Center (HEC) life loss simulation system (HEC-LifeSim).

10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Jacksonville District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Jacksonville District. Please explain.

11. Any previous employment by USACE as a direct employee, notably if employment was with the Jacksonville District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.

## Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (IFS/EA)

12. Any previous employment by USACE as a contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the Jacksonville District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning coastal storm risk management, and include the client/agency and duration of review (approximate dates).
14. Pending, current, or future financial interests in contracts/awards from USACE related to the San Juan Metro Area project.
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.
16. Significant portion of your personal or office's revenues within the last three years came from Puerto Rico Department of Natural and Environmental Resources contracts.
17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the San Juan Metro Area project.
18. Participation in relevant prior and/or current Federal studies related to the San Juan Metro Area IFS/EA.
19. Previous and/or current participation in prior non-Federal studies related to the San Juan Metro Area IFS/EA.
20. Has your research or analysis been evaluated as part of the San Juan Metro Area IFS/EA?
21. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

### B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. Battelle established subcontracts with the panel members when they

indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

**Table B-1. San Juan Metro Area IEPR Panel: Summary of Panel Members**

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
<b>Plan Formulator / Economist</b>					
Wally Milon	Independent consultant	Orlando, FL	Ph.D., Economics	No	40
<b>Environmental Law Compliance Specialist</b>					
Kris Thoenke	Eolas Consultants, LLC	Daytona Beach, FL	Ph.D., Biology	No	41
<b>H&amp;H / Coastal Engineer</b>					
Michael Giovannozzi	AquaTerra Consulting International	West Palm Beach, FL	B.S., M.S, Civil Engineering/ Coastal Engineering	Yes	20
<b>Civil / Geotechnical Engineer</b>					
Doug Spaulding	Spaulding Consultants	Minneapolis, MN	M.S., Geotechnical Engineering	Yes	50

Table B-2 presents an overview of the credentials of the final four members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information on the panel members and their areas of technical expertise is given in Section B.3.

**Table B-2. San Juan Metro Area IEPR Panel: Technical Criteria and Areas of Expertise**

Technical Criterion	Milon	Thoenke	Giovannozzi	Spaulding
<b>Plan Formulator / Economist</b>				
Minimum 10 years of demonstrated experience in public works planning	X			
M.S degree or higher in Economics	X			
Experience related to regional economic development, and capable of evaluating traditional National Economic Development plan benefits associated with hurricane and CSRMs projects	X			

**Table B-2. San Juan Metro Area IEPR Panel: Technical Criteria and Areas of Expertise (continued).**

Technical Criterion	Milon	Thoemke	Giovannozzi	Spaulding
Minimum of 5 years of experience directly dealing with the USACE SMART Planning process and risk-informed planning as outlined in the Planning Manual Part II: Risk-Informed Planning, and Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook	X			
Familiar with USACE plan formulation process, procedures, and standards as it relates to CSRMs projects	X			
Familiarity with Generation 2 Coastal Risk Model (G2CRM) and Hydrologic Engineering Center (HEC) life loss simulation system (HEC-LifeSim) modeling	X			
<b>Environmental Law Compliance Specialist</b>				
At least 10 years of experience directly related to evaluation and conduct of National Environmental Policy Act (NEPA) assessments, including cumulative effects analyses		X		
Experience in CSRMs and coastal watersheds		X		
Experience with the Endangered Species Act, essential fish habitat (EFH), and the Marine Mammals Protection Act		X		
Knowledge of construction impacts on marine and coastal regions		X		
<b>H&amp;H / Coastal Engineer</b>				
Registered Professional Engineer			X	
Minimum of 10 years of experience in coastal and hydraulic engineering			X	
M.S degree or higher in engineering			X	
Familiar with USACE application of risk and uncertainty analysis in hurricane and CSRMs projects			X	
Expert, with at least seven years of experience, in the field of coastal engineering and have a thorough understanding of CSRMs projects; experience with or knowledge of G2CRM, back bay dynamics, and coastal structures			X	
Active participation in related professional societies			X	
<b>Civil / Geotechnical Engineer</b>				
Registered Professional Engineer				X
At least 15 years of experience in civil engineering and design				X
B.S. or higher in engineering				X

**Table B-2. San Juan Metro Area IEPR Panel: Technical Criteria and Areas of Expertise (continued).**

Technical Criterion	Milon	Thoemke	Giovannozzi	Spaulding
Senior-level geotechnical engineer with expertise in the design of flood protection measures, such as seawalls, revetments, flood walls, and levees				X
Familiar with the structural and nonstructural measures used in a CSRM study				X

### B.3 Panel Member Qualifications

Detailed biographical information on each panel members’ credentials, qualifications and areas of technical expertise is provided in the following paragraphs.

<b>Name</b>	Wally Milon, Ph.D.
<b>Role</b>	Planning Formulator / Economist
<b>Affiliation</b>	Independent Consultant

Dr. Milon works as a Provost’s Distinguished Research Professor in the Department of Economics at the University of Central Florida’s College of Business Administration and is a founding faculty member of the National Center for Integrated Coastal Research at the University of Central Florida. He has 40 years of experience in natural resource and environmental economics and water resource economic evaluation and over 10 years of experience with public works projects.

Dr. Milon is a former member of the National Research Council Committee on USACE Water Resources Science, Engineering, and Planning; the Committee on Water Resources Science, Engineering and Policy; and the Southern Economics Association. He also is the co-editor of the recent book, Coastal Resource Economics and Ecosystem Valuation, as well as more than 15 book chapters, 45 reports, and 40 journal articles.

Dr. Milon is experienced in evaluating the USACE application of risk and uncertainty analyses in storm damage reduction studies in the southeastern United States. He is also experienced in Civil Works real estate laws, policies, and coastal property rights, and has conducted research on coastal property valuation. Dr. Milon has served as the lead economist on USACE IEPRs for large, complex Civil Works projects with high public and interagency interests involving flood risk management, ecosystem restoration, and coastal storm damage reduction, including the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico; the White Oak Bayou, Texas, Federal Flood Damage Reduction Plan; the Louisiana Coastal Areas Restoration Project; the Walton County, Florida, Hurricane and Storm Damage Reduction Project; and the Savannah Harbor Expansion Project, Fish Passage at New Savannah Bluff Lock and Dam.

Dr. Milon is familiar with USACE’s six-step planning formulation processes, procedures, and standards. He has more than 10 years of experience reviewing Federal water resource economic documents and evaluating construction projects for hurricane and coastal storm risk management, flood risk management, and ecosystem restoration, including projects developed under the USACE SMART Planning process and risk-informed planning. He has participated in planning and technical advisory support for the USACE Florida Everglades Restudy. In addition, he was an expert reviewer of the USACE Institute for Water Resources (IWR) “Monetary Measurement of Environmental Goods and Services: Framework and Summary of Techniques for Corps Planners.”

Dr. Milon has worked directly with USACE in applying Principles and Guidelines to Civil Works projects, analyzing National Economic Development benefits and costs, Regional Economic Development, and Other Social Effects. He was the principal investigator on the Socioeconomic Evaluation of Hurricane Evacuation Response project for the Florida Hurricane Research Alliance and was co-principal investigator on Florida’s Coastal Environmental Resources: Economic Valuation and Analysis project.

Dr. Milon has taught graduate courses and conducted research in benefit-cost analysis, risk management, and flood damage assessment modeling, which includes the use of the Hydrologic Engineering Center Flood Damage Reduction Analysis (HEC-FDA) modeling software. He has also reviewed USACE projects utilizing probabilistic life cycle analysis models such as HEC-LifeSim, Beach-fx, and Generation 2 Coastal Risk Model (G2CRM).

<b>Name</b>	Kris Thoenke, Ph.D.
<b>Role</b>	Environmental Law Compliance Specialist
<b>Affiliation</b>	Eolas Consultants, LLC

Dr. Thoenke has 41 years of experience as a National Environmental Policy Act (NEPA) expert and professional ecologist in South Florida. He has been a researcher and land manager for the State of Florida, a private ecological consultant, and an Everglades project manager.

For the past 17 years, Dr. Thoenke has conducted marine and estuarine environmental assessments (EAs), environmental permitting, and listed species surveys along all Florida coasts and the Mississippi Delta in Louisiana. He has conducted water resource environmental permitting and prepared NEPA compliance documentation, including the assessment of cumulative effects. His experience with wetlands and estuarine ecosystems and coastal watersheds derives from his Ph.D. work on estuarine invertebrates; 11 years as manager of Rookery Bay National Estuarine Research Reserve in Naples, Florida; 4 years as a wetlands ecologist conducting Everglades restoration work; and 17 years as a wetlands and estuarine consultant.

Dr. Thoenke’s direct experience includes work as a wetland scientist on the Florida Everglades restoration program; ongoing involvement as the environmental scientist for the Charlotte County, Florida, Erosion Control Project for Stump Pass; participation on a team working on large Civil Works restoration projects for the State of Louisiana in the Mississippi Delta region; and a professor teaching graduate-level environmental policy and management and NEPA classes. He has studied storm and construction impacts on the marine and terrestrial ecology of coastal regions and characterization of benthic communities, with a specific focus on the identification and assessment of construction impacts on seagrass, mangroves, shorebirds, and dune plant communities at Stump Pass and Blind Pass, Florida, and gopher tortoise habitat at Clam Pass and Vanderbilt Beach Parks, Florida. He has been

characterizing benthic communities for more than 30 years. Dr. Thoemke also has extensive experience permitting and mitigating for construction impacts resulting from coastal and upland development, including assessing and monitoring impacts on beach and dune systems, nesting sea turtles, shorebirds, and upland listed species found in the coastal and beach/dune habitats. In addition, he has conducted post-storm analysis of beach and dune systems.

Dr. Thoemke prepared sections of the Environmental Impact Statement for the Terrebonne Basin Barrier Island Shoreline Restoration Project, Louisiana, including the Endangered Species Act and essential fish habitat (EFH) sections, and was the lead author of the West Grande Terre Beach Nourishment and Stabilization Project Environmental Assessment. He was project manager on the Port Everglades Ocean Dredged Material Disposal Site Environmental Assessment, which included Marine Mammals Protection Act listed species. In addition, he has completed Section 7 assessments for listed species under National Marine Fisheries Service jurisdiction for projects in several south Florida locations and coordinated with the U.S. Fish and Wildlife Service to prepare an updated Biological Opinion for swimming sea turtles and shorebirds on Marco Island, Florida. He has provided EFH consultation to several projects and continues to prepare EFH studies for marine and estuarine species as a part of his permitting work.

<b>Name</b>	Michael Giovannozzi, P.E.
<b>Role</b>	Hydrology and Hydraulic / Coastal Engineer
<b>Affiliation</b>	AquaTerra Consulting International

Mr. Giovannozzi is a coastal engineer with more than 20 years of engineering experience in both government and private sectors in the fields of coastal and hydraulic engineering, including deep draft navigation projects, flood risk, hurricane/CSRM, and coastal structures throughout the United States and Caribbean. He worked for 3 years with USACE Philadelphia District, 2 years with USACE Seattle District, and 15 years in private consulting. He is a professional engineer licensed in the states of Florida, Alabama, Georgia, South Carolina, Texas, North Carolina, New Jersey, Rhode Island, Maryland, and Delaware.

Mr. Giovannozzi has performed extensive hydrodynamic and sediment transport modeling, morphologic analysis, and EAs for multiple projects to determine expected water levels, tidal exchange, wave conditions, back bay dynamics, and circulation patterns. While at USACE Philadelphia District, he was the hydraulic engineer for a coastal inlet hydrodynamics study that involved numerical modeling to predict sediment transport potential for several alternative sand borrow-area strategies for a Federal beach fill project near a coastal inlet in Ocean City, New Jersey. For a dredging/environmental restoration project on the Intracoastal Waterway in Palm Beach County, Florida, Mr. Giovannozzi conducted tidal hydraulic modeling, channel optimization, and dredging cost estimates for hydraulic and mechanic dredging to restore tidal connectivity.

Mr. Giovannozzi also has specialized experience in subsurface investigations for channel design, dredged material management, and the design of dredged material placement areas (i.e., open water, ocean disposal, and beneficial use). In addition, he is familiar with standard USACE H&H computer models and has been working with numerical modeling applications for navigation projects for more than 18 years. For example, he used the USACE numerical wave and circulation models, CMS Wave and CMS Flow, respectively, to assess channel realignment scenarios for the Quillayute Navigation Channel Improvement Study in Washington State.

Mr. Giovannozzi is familiar with the application of USACE risk and uncertainty analyses and coastal engineering requirements for feasibility studies. He is experienced in hurricane and flood damage risk analysis and is familiar with USACE risk registers and cost and schedule risk analysis. He has addressed Safety Assurance Review aspects on several USACE projects, including the Neah Bay Entrance Channel Breakwater Repair (Seattle District). He is also familiar with the IWR G2CRM model and has reviewed the model documentation as well as the training videos.

Mr. Giovannozzi is experienced in coastal storm surge and storm wave modeling using coupled ADCIRC models with both SWAN and STWAVE. Specifically, he utilized the coupled ADCIRC/SWAN model for Lake Superior to support coastal floodplain map updates for several counties in Federal Emergency Management Agency (FEMA) Region 5. He also provided the lead technical review for the coupled ADCIRC/SWAN model for the FEMA Region 10 coastal floodplain mapping for Puget Sound in Thurston County, Washington. In addition, he applied a coupled ADCIRC/STWAVE model to support FEMA Letter of Map Revisions for Horry County, South Carolina, for several private condominium associations located along the Atlantic Ocean.

Mr. Giovannozzi is an active member of the American Society of Civil Engineers; the Coasts, Oceans, Ports, and Rivers Institute; the Association of Coastal Engineers, and the Florida Shore and Beach Preservation Association. In addition, he served as the Secretary for the World Association for Waterborne Transport Infrastructure (PIANC) Recreational Committee Work Group on Marina Design and as PIANC YP-Com Vice-Chair of the Americas.

<b>Name</b>	Doug Spaulding, P.E.
<b>Role</b>	Civil/Geotechnical Engineer
<b>Affiliation</b>	Spaulding Consultants

Mr. Spaulding is a Principal and senior level geotechnical/civil engineer in the private sector, with 50 years of experience in the design, evaluation, and inspection of water-retaining structures, and civil and geotechnical engineering in general. He is a professional engineer licensed in the states of Wisconsin, Michigan, and Minnesota. He obtained a MSCE from Purdue University with a major study area in geotechnical engineering and a minor area in geology.

Mr. Spaulding has provided geotechnical design and evaluation services for flood risk management levees, embankments, and hydroelectric projects in a 23-state area. His experience includes 10 years with USACE, where he served as Chief of the Levee and Channel Design Section for the St. Paul District. He managed the design of the Pembina levee project in North Dakota and provided geotechnical/civil design services for local flood protection projects in Wisconsin, Michigan, Illinois, Iowa, Louisiana, and North Dakota. The Pembina project and others included extensive sections of floodwall (both I-wall and T-wall configurations). He also served as the Program Manager for the National Dam Safety Program in Wisconsin and Michigan.

Mr. Spaulding's experience with coastal structures is generally related to projects on the Great Lakes and the Gulf of Mexico. He managed the design of several breakwater and revetment projects on both Lake Superior and Lake Michigan. More recently, he provided peer review services on two reaches of hurricane protection projects in the New Orleans area. He also has served as a geotechnical engineer for the design of docking facilities for a large iron ore dock on Lake Erie. In 2014, he served on the IEPR for the West Shore Lake Pontchartrain Shoreline protection project near New Orleans, Louisiana. The project

encompassed levees (including an 18-mile levee reducing the flood risk to more than 7,000 structures), floodwall and numerous closure structures, and utility crossings.

Over his career, Mr. Spaulding has provided design services, project management, and peer review for flood risk reduction projects located throughout the United States. These projects have included earth levee systems, diversion channels, concrete channels, floodwalls, gate wells, coastal revetments, and pumping stations. The foundation conditions for these projects have ranged from soft lacustrine clay deposits to stratified granular deposits requiring extensive seepage analysis and also relief well design. The majority were located in urban areas, which involved analysis of trade-offs between right-of-way costs and structural costs.

Mr. Spaulding has applied USACE risk-informed approaches to the evaluation of safety issues at USACE navigation, flood control, and hydroelectric projects. From 1988 to 2010, he also provided dam safety training for USACE operations personnel at navigation and flood control projects. Over the last 15 years, he has participated in more than 75 Potential Failure Mode Analysis (PFMA) evaluations of dams and hydroelectric projects. As a facilitator of PFMA evaluations authorized by the Federal Energy Regulatory Commission, he has directed more than 50 evaluations for embankment dams, concrete gravity structures, and arch dam structures.

In addition, Mr. Spaulding has served as a civil/geotechnical member of IEPR review panels dealing with local flood protection projects such as levees, channels and floodwalls, dam remediation, dam replacement, and seepage control system upgrades. He has also provided peer review services on two reaches of hurricane protection projects in the New Orleans area. In 2008, he peer-reviewed the geotechnical design of the New Orleans Group 1 to Group 3 pump stations.

# APPENDIX C

Final Charge for the San Juan Metro Area IEPR

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## Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment

***This is the final Charge to the Panel for the San Juan Metro Area IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on August 18, 2020. The dates and page counts in this document have not been updated to match actual changes made throughout the project.***

### BACKGROUND

The San Juan Metropolitan Area is located along the Northern Coastal areas of Puerto Rico. The study area is located in the back-bay area of San Juan and adjacent municipalities, which is surrounded by a high-density urban residential area, recreation areas, hotels and tourist facilities, and commercial areas. During coastal storms, storm surge, tidal influences, and wave contributions cause extreme flooding. This results in damages to critical infrastructure, residential, and commercial structures; negative environmental and social effects; losses to the regional and national economy; and lack of resilience for affected communities. Additionally, the flooded conditions are hazardous to the community (bringing disease and mold during extended periods); pollute the lagoon with automobile fluids; corrode the underside of vehicles; affect economic development of stores, hotels, and restaurants; and decrease property values. This shoreline contains resources that represent potential National Economic Development benefits for the San Juan area, including large hotels, businesses, and condominiums and other residences of high structure value.

Originally, the study was scoped to assess shoreline erosion along the coastline of only the San Juan Metro Area. A National Environmental Policy Act (NEPA) scoping meeting was held in San Juan on November 8, 2018, where the study team presented the general study scope and requested feedback from communities. During that process, several communities expressed concerns regarding back bay flooding in the Cataño municipality, as well as the Condado Lagoon area within the San Juan municipality. As a result, the feasibility of addressing shoreline erosion as a Federal project along the coastline of the San Juan Metro area was incorporated into another ongoing U.S. Army Corps of Engineers (USACE) study, called the Puerto Rico Coastal Storm Risk Management (CSRМ) Study, to allow this study to focus solely on back bay flooding.

This study assesses back bay flooding risks due to storm surge, which also includes wave contributions and tidal influences, as well as sea level change under the CSRМ mission. Three data sets were overlaid in a Geographic Information System (GIS) to determine the study area extent based on a high risk of storm surge and sea level rise. These three data sets are 1) Flood Risk Zones (FEMA 2018 Advisory: 0.2% VE and AE Flood Zones; 2) Sea Level Rise Forecasts (National Oceanic and Atmospheric Administration [NOAA] sea level viewer at 6 feet above mean higher high water); and 3) Flooding (ADCIRC + SWAN: Cat 5 Maximum of MEOWs (Maximum Envelopes of Water) plus 1 meter of sea level rise. Areas within this initially defined region were separated into six reaches based on their respective watershed basins: Reach 1 - West San Juan Bay, Reach 2 - East San Juan Bay, Reach 3 – Condado Lagoon, Reach 4 - Cano Martin Pena, Reach 5 - Los Corozos and San Jose Lagoon, and Reach 6 - Torrecilla Lagoon. During further investigation, Reaches 1 and 3 were carried forward while Reaches 4

through 6 and Reach 2 were screened from further analysis in this study. The rationale for this descope of the study is described in the following paragraphs.

Reaches 1 through 3 have a single source of back bay flooding influence (the Atlantic Ocean), and the flooding problem within these reaches is driven primarily by storm surge. These areas can be modeled within the existing economic model, Generation 2 Coastal Risk Model (G2CRM), for a direct link to damages and benefits from storm surge versus design alternatives, and the study can be completed within three years. After further analysis of Reaches 4 through 6, the study team determined that those reaches have multiple sources of back bay flooding influences, and the uncertainty in the exchanges of flow between them is too high without performing more extensive hydrologic modeling. The problem in these reaches is a combination of precipitation with storm surge. This type of analysis (involving the inclusion of precipitation as well as an understanding of the complexity of storm surge from multiple points) would necessitate the use of multiple models and complex model interfaces, which would cause the existing study to exceed the scope. The study team acknowledges that flooding problems in Reaches 4 through 6 are likely to result in potential risk to critical infrastructure and socially vulnerable communities from hydrologic-induced flooding (precipitation) in addition to storm surge. These areas are recommended to be evaluated under a separate study in order to adequately address both storm surge and precipitation holistically.

Reach 2 was also screened from further analysis. The majority of the area in Reach 2 is owned, operated, and maintained by the Port of San Juan, with some residential areas around the perimeter area. Modeling of future without-project conditions showed that damages were very low. After further analysis, it was determined that the cost of the alternatives most likely to reduce damages in the area would be higher than the benefits, creating negative net benefits and a benefit-to-cost ratio of less than 1.0. USACE cannot recommend a project with a benefit-to-cost ratio of less than 1.0, per USACE guidance.

The reduced study area includes Reach 1 (the West San Juan Bay reach) and Reach 3 (the Condado Lagoon reach). The combined study area encompasses roughly 9.5 square miles and contains an estimated 20,000 assets (infrastructure and vehicles), with approximately 22 structures identified as critical infrastructure. This area also contains approximately 14 schools and major hurricane and tsunami evacuation routes. The combined value of the study area is \$3.4 billion.

## OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment (hereinafter: San Juan Metro Area FS/EA IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Review Policy for Civil Works* (Engineer Circular [EC] 1165-2-217, dated February 20, 2018), and the Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review* (December 16, 2004). Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to “assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts, and any biological opinions” (EC 1165-2-217; p. 39) for the decision documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) who meet the technical criteria and areas of expertise required for and relevant to the project.

The Panel will be “charged” with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-217 (p. 41), review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

## DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review. The review assignments for the panel members may vary slightly according to discipline.

Review Documents	No. of Review Pages	Subject Matter Experts			
		Plan Formulator/ Economist	Environmental Law Compliance Specialist	H&H/ Coastal Engineer	Civil/ Geotechnical Engineer
Draft Integrated Feasibility Study for San Juan Metro Area Coastal Storm Risk Management Study	175	175	175	175	175
Appendix A Engineering	79			79	79
Appendix B Cost Engineering & Risk Analysis	19	19		19	19
Appendix C Economics	40	40			
Appendix D Geotechnical	74				74
Appendix E Real Estate	43		43		
Appendix F Plan Formulation	40	40	40	40	40
Appendix G Environmental (w/4 attachments: 1. Section 404(b) Evaluation; 2. Coastal Zone Management Consistency 3. Environmental Justice 4. Mitigation Plan	50		50		

Review Documents	No. of Review Pages	Subject Matter Experts			
		Plan Formulator/ Economist	Environmental Law Compliance Specialist	H&H/ Coastal Engineer	Civil/ Geotechnical Engineer
Appendix H Pertinent Correspondence	31		31		
Appendix I Cultural Resources	30		30		
<b>Total Number of Review Pages</b>	<b>581</b>	<b>274</b>	<b>369</b>	<b>313</b>	<b>387</b>
<b>Public Review Comments<sup>a</sup></b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>	<b>200</b>
Supplemental Information					
TSP Milestone Meeting Presentation	34	34	34	34	34
Risk Register	3	3	3	3	3
<b>Total Number of Reference Pages</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>	<b>37</b>

<sup>a</sup> The public comment page count was not included in the overall review pages due to the hours being considered separately and Option 1 being implemented if the number of pages increases. Up to four units of Option 1 may be awarded, depending on the page count.

### Documents for Reference

- Review Policy for Civil Works, (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018; PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)
- ETL 1100-2-1 – Procedures to Evaluate SLR Change Impacts Responses Adaptation
- ER 1100-2-8162 – Incorporating SLR Change in CW Programs.

### SCHEDULE & DELIVERABLES

This schedule is based on the anticipated date the Panel is under subcontract. This schedule may also change due to circumstances out of Battelle's control such as changes to USACE's project schedule and unforeseen changes to panel member and USACE availability. As part of each task, the panel member will prepare deliverables by the dates indicated in the table (or as directed by Battelle). All deliverables will be submitted in an electronic format compatible with Microsoft® Word (Office 2003).

Task	Action	Due Date
<b>Meetings</b>	Battelle sends review documents to panel members	8/25/2020
	Battelle convenes kick-off meeting with panel members	8/25/2020
	Battelle convenes kick-off meeting with USACE and panel members	8/26/2020
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	9/9/2020
<b>Review</b>	Panel members complete their individual reviews	9/16/2020
	Battelle provides talking points for Panel Review Teleconference to panel members	9/18/2020
	Battelle convenes Panel Review Teleconference	9/21/2020
	Battelle provides Final Panel Comment templates and instructions to panel members	9/22/2020
	Panel members provide draft Final Panel Comments to Battelle	9/29/2020
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	9/30/2020 -10/6/2020
	Panel finalizes Final Panel Comments	10/7/2020
<b>Public Comment Review</b>	Battelle receives public comments from USACE	9/2/2020
	Battelle sends public comments to Panel	9/17/2020
	Panel completes its review of public comments	9/22/2020
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	9/23/2020
	Panel drafts Final Panel Comment for public comments, if necessary	10/1/2020
	Panel finalizes Final Panel Comment regarding public comments, if necessary	10/2/2020
<b>Final Report</b>	Battelle provides Final IEPR Report to panel members for review	10/8/2020
	Panel members provide comments on Final IEPR Report	10/9/2020
	*Battelle submits Final IEPR Report to USACE	10/13/2020
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	10/20/2020
<b>Comment Response Process</b>	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	10/22/2020
	Battelle convenes teleconference with Panel to review the Comment Response process	10/22/2020

Task	Action	Due Date
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	11/12/2020
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	11/18/2020
	USACE PCX provides draft PDT Evaluator Responses to Battelle	11/19/2020
	Battelle provides draft PDT Evaluator Responses to panel members	11/23/2020
	Panel members provide draft BackCheck Responses to Battelle	11/30/2020
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	12/1/2020
	Battelle convenes Comment Response Teleconference with panel members and USACE	12/2/2020
	USACE inputs final PDT Evaluator Responses to DrChecks	12/9/2020
	Battelle provides final PDT Evaluator Responses to panel members	12/10/2020
	Panel members provide final BackCheck Responses to Battelle	12/15/2020
	Battelle inputs panel members' final BackCheck Responses to DrChecks	12/16/2020
	*Battelle submits pdf printout of DrChecks project file	12/17/2020
<b>ADM</b>	Agency Decision Milestone (ADM) Meeting	10/30/2020
	Contract End/Delivery Date	9/30/2021

\* Deliverables

\*\* Battelle will provide public comments to panel members after they have completed their individual reviews of the project documents to ensure that the public comment review does not bias the Panel's review of the project documents.

## CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or appendix) are included in the general charge guidance, which is provided below.

### General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the decision documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Some sections have no questions associated with them; however,

you may still comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-217).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Project Manager Lynn McLeod; [mcleod@battelle.org](mailto:mcleod@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod ([mcleod@battelle.org](mailto:mcleod@battelle.org)) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report but will remain anonymous.

Please submit your comments in electronic form to the Project Manager, no later than 10 pm ET by the date listed in the schedule above.

## **Independent External Peer Review of the San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility Study and Environmental Assessment**

### **Charge Questions and Relevant Sections as Supplied by USACE**

The following Review Charge to Reviewers outlines the objectives of the Independent External Peer Review (IEPR) for the subject study and identifies specific items for consideration for the IEPR Panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the Review Charge. The Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the Review Charge. The Panel can use all available information to determine what scientific and technical issues related to the decision document may be important to raise to decision makers. This includes comments received from agencies and the public as part of the public review process.

The Panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on whether a particular alternative should be implemented or present findings that become “directives” in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances, the Panel would have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment.

The Panel is asked to consider the following items as part of its review of the decision document and supporting materials.

#### **Broad Evaluation Charge Questions**

1. Is the need for and intent of the decision document clearly stated?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical information?
3. Given the need for and intent of the decision document, assess the adequacy and acceptability of the project evaluation data used in the study analyses.
4. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, social, and engineering assumptions that underlie the study analyses.
5. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, social, and engineering methodologies, analyses, and projections.

6. Given the need for and intent of the decision document, assess the adequacy and acceptability of the models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives.
7. Given the need for and intent of the decision document, assess the adequacy and acceptability of the methods for integrating risk and uncertainty.
8. Given the need for and intent of the decision document, assess the adequacy and acceptability of the formulation of alternative plans and the range of alternative plans considered.
9. Given the need for and intent of the decision document, assess the adequacy and acceptability of the quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans.
10. Given the need for and intent of the decision document, assess the adequacy and acceptability of the overall assessment of significant environmental impacts, social justice, and any biological analyses.
11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.
13. For the tentatively selected plan, assess whether the models used to assess life safety hazards are appropriate.
14. For the tentatively selected plan, assess whether the assumptions made for the life safety hazards are appropriate.
15. For the tentatively selected plan, assess whether the quality and quantity of the surveys, investigations, and engineering are sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards.
16. For the tentatively selected plan, assess whether the analysis adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project.

## **Battelle Summary Charge Questions to the Panel Members<sup>1</sup>**

### **Summary Questions**

17. Please identify the most critical concerns (up to five) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

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<sup>1</sup> Questions 17 through 19 are Battelle-supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the final Work Plan submitted to USACE.

18. Please provide positive feedback on the project and/or review documents.

**Public Comment Questions**

19. Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?

# APPENDIX D

## Conflict of Interest Form

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David Kaplan  
USACE  
July 27, 2020  
B-2

**Conflicts of Interest Questionnaire**  
**Independent External Peer Review for the**  
**San Juan Metro Area Coastal Storm Risk Management Study, Puerto Rico, Integrated Feasibility**  
**Report and Environmental Assessment**

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: **Battelle Memorial Institute Corporate Operations**  
REPRESENTATIVE'S NAME: **Courtney Brooks**  
TELEPHONE: **614-424-5623**  
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**  
EMAIL ADDRESS: [brooksc1@battelle.org](mailto:brooksc1@battelle.org)

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) **No** Yes (if yes, briefly describe):

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? **No** Yes (if yes, briefly describe):

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? **No** **Yes** (if no, briefly describe the difficulty in identifying outside reviewers):

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? **No** Yes (if yes, briefly describe):

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

**No additional information to report.**

*Courtney M. Brooks*  
\_\_\_\_\_  
Courtney Brooks

July 27, 2020  
\_\_\_\_\_  
Date

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Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal

***BATTELLE***

**It can be done**