DEPARTMENT OF THE ARMY
NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS
FORT HAMILTON MILITARY COMMUNITY
BROOKLYN, NY 11252-6700

CEPCX-CSDR 19 August 2015

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, (CECW-NAD Mr. Raymond Wimbrough), 441 G Street NW, Washington DC 20314-1000

SUBJECT: Transmittal of Final Independent External Peer Review (IEPR) Report for South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study

1. Reference: EC 1165-2-214, Civil Works Review, 15 December 2012.

2. Enclosed please find the subject Final IEPR Report, dated 17 August 2015. Pursuant to Reference 1, the enclosed report is available for posting on the HQUSACE public website.

3. The IEPR was managed by Battelle Memorial Institute. The review panel consisted of 5 panel members with expertise in Economics/Civil Works Planning, Coastal Engineering, Hydrology, Biological Resources and Law Compliance, and Geotechnical Engineering. The review resulted in 15 final panel comments – one comment was rated as having high significance, one comment was rated as medium/high, seven were rated medium, five were rated medium/low and one was rated low. See the enclosed Final IEPR Report Executive Summary for a synopsis of the final panel comments and the main body of the report for details about the IEPR execution and individual final panel comments.

4. For further information, please contact Mr. Larry Cocchieri, Deputy, PCX-CSRM at (347) 370-4571, or Mr. Fred Furney, the CSRM-PCX IEPR Lead for this effort, at 410-962-6136.

Encl

LARRY COCCHIERI
Deputy Director, National Planning Center of Expertise for Coastal Storm Risk Management

CF:
CENAB-PL-P (Fred Furney)
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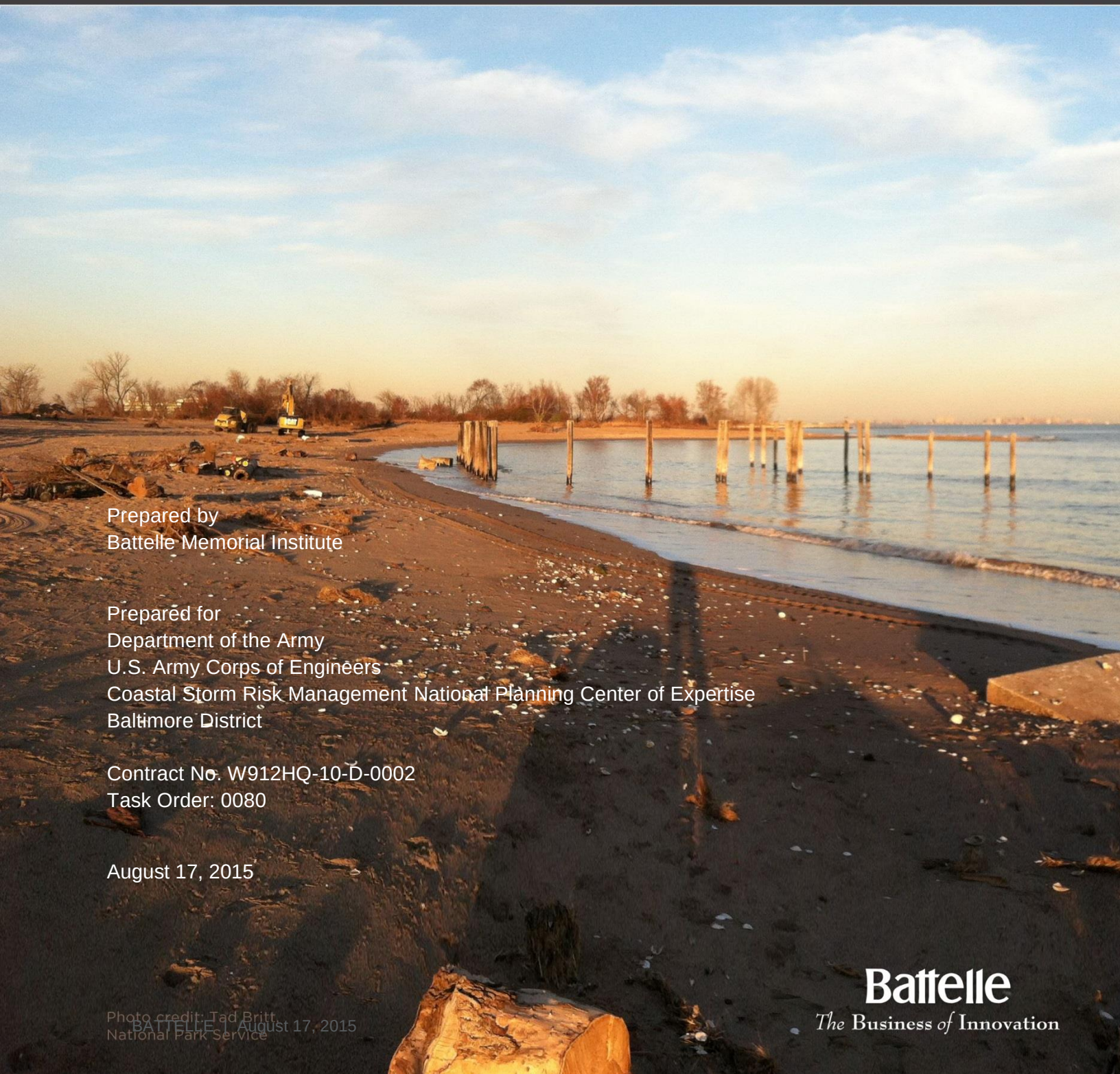
Final Independent External Peer Review Report
South Shore of Staten Island, NY
Coastal Storm Damage Reduction Feasibility Study



Prepared by
Battelle Memorial Institute

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

Contract No. W912HQ-10-D-0002
Task Order: 0080

August 17, 2015

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National Park Service

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CONTRACT NO. W912HQ-15-D-0001
Task Order: 0080

Final Independent External Peer Review Report South Shore of Staten Island, NY

Coastal Storm Damage Reduction Feasibility Study

Prepared by

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Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Risk Management Planning Center of Expertise
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August 17, 2015

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Final Independent External Peer Review Report
South Shore of Staten Island, NY
Coastal Storm Damage Reduction Feasibility Study

Executive Summary

PROJECT BACKGROUND AND PURPOSE

The study area covers about 13 miles of coast on Staten Island, extending along Lower New York Bay and Raritan Bay from Fort Wadsworth to Tottenville at the mouth of Arthur Kill. However, the extent of the tentatively selected plan (TSP) is generally limited to the eastern 6 miles of the shore from Fort Wadsworth to Oakwood Beach (FWOB-Reach 1). FWOB-Reach 1 has a long history of storm damage. The shoreline experienced major erosion and storm damage from the Northeaster of December 1992, the March 1993 storm, and, most recently, Hurricane Sandy in October 2012. These storms caused evacuations in several communities, damage to hundreds of structures from flooding, and loss of over hundreds of structures from erosion. The loss of beachfront now leaves the area increasingly vulnerable to severe damages even from moderate storms.

The development of conceptual plans within this feasibility study consists of looking at different measures at selected locations of the study area from Fort Wadsworth to Oakwood Beach, Reach 1 (Phase 1).

Prior to Sandy, and even more so after the storm, there has been an expressed interest from local government and Congressional representatives to re-evaluate the western 7 miles of shoreline (Reaches 2 and 3) to assess if there are additional areas (hydraulically disconnected from Reach 1) that would be eligible for Federal participation under the existing study authority. In order to address this concern, the U.S. Army Corps of Engineers (USACE) New York District is completing the report on the FWOB area as an initial (interim) report, partially responsive to the Study resolution with the results for Reaches 2 and 3 included in a second report. The New York District does not want to delay Reach 1 by reinvestigating the western 7 miles and addressing this investigation in a single report. This approach offers both flexibility and opportunities for long-term decisions about what works best for each location, as well as the entire study area.

The formulation for the subject project was essentially complete pre-Hurricane Sandy, and a TSP had been identified. The following provides an overview of the re-evaluation of the TSP that was identified prior to Hurricane Sandy. The TSP is being re-evaluated to take into account post-Sandy buyouts, updated Federal Emergency Management Agency (FEMA) stage frequency curves, and updated structure inventory.

The coastal storm damage reduction TSP includes a buried seawall and an interior flood control feature to compensate for the interior runoff on the protected side of the proposed structural protection. The total expected cost of the implementation of the project is approximately $300 million.

The South Shore of Staten Island, NY, Coastal Storm Damage Reduction Feasibility Study Team has conducted the feasibility study following the USACE planning process defined in ER 1105-2-100 (Planning Guidance Notebook) and the USACE SMART Planning initiative, which incorporates risk-informed evaluation with less detailed information to reach decision points more efficiently, and includes

greater Vertical Team coordination throughout the study. The study has been divided into phases, each with key milestones and associated In-Progress Reviews (IPR):

- Alternatives Milestone: The Vertical Team agrees on the proposed way forward on continuing analysis and evaluation on a focused array of alternatives.
- TSP Milestone: The Vertical Team agrees on the Project Delivery Team's (PDT's) recommendation of a TSP and proposed way forward on developing sufficient cost and design information for the final feasibility study report; the Vertical Team gives approval to release draft feasibility report for concurrent Policy, Agency Technical Review (ATR), independent external peer review (IEPR), and Public Review.
- Agency Decision Milestone: The recommended plan and proposed way forward for feasibility-level design is endorsed by a panel of senior USACE leaders.
- Directors Review Board: The Board provides a corporate checkpoint to determine if the final feasibility study report and National Environmental Policy Act (NEPA) document, and the proposed Report of the Chief of Engineers, are ready to be released for State and Agency review.
- Signed Chief's Report.

A risk register and other risk management documentation will accompany the feasibility study decision document. Although one of the objectives of IEPR is to evaluate whether sufficient information was available or technical analyses were completed, the IEPR must be completed within the context of the risk-informed decision-making process.

OBJECTIVES

The objective of this work is to conduct an IEPR of the South Shore of Staten Island, NY, Coastal Storm Damage Reduction Feasibility Study (hereinafter: Staten Island IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, December 15, 2012), 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, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the Staten Island IEPR 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) with extensive experience in economics/plan formulation, biological resources and environmental law compliance, coastal engineering, structural/geotechnical engineering, and hydrology issues relevant to the project. They will also have experience applying their subject matter expertise to coastal storm damage reduction.

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 1165-2-214, Appendix D, 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.

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 IEPR of the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study. As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012a). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Staten Island. The IEPR was external to the agency and conducted following USACE and OMB guidance described in USACE (2012a) 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 Staten Island IEPR review documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: economics/plan formulation, biological resources and environmental law compliance, coastal engineering, structural/geotechnical engineering, and hydrology. 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 final candidates to confirm that they had no COIs, but Battelle made the final selection of the five-person Panel.

The Panel received electronic versions of the Staten Island IEPR review documents (1,552 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2012a) and OMB (2014), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE Project Delivery Team briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to 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. The Panel produced individual comments in response to the charge questions.

IEPR panel members reviewed the Staten Island IEPR documents individually. 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. Overall, 15 Final Panel Comments were identified and documented. Of these, one was identified as having high significance, one was identified as having medium/high significance, seven had a medium significance, five had medium/low significance, and one had 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, 2012a; p. D-4) in the Staten Island IEPR 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.

Based on the Panel's review, the review documents are clearly written and easy to follow. Environmental resources are summarized well and residual risk considered. The Panel, however, did identify elements of the project that require further analysis and evaluation, and sections of the Staten Island DFR and appendices that should be clarified or revised.

Economics/Civil Works Planning: The Panel's most significant finding was that none of the alternative plans considers recreation National Economic Development (NED) effects, potentially affecting the formulation and ranking of alternative plans and selection of the TSP. To address this, USACE can perform a unit day value (UDV) recreation analysis in order to reasonably estimate the recreation benefits of each alternative plan and apply the "50% rule" to determine whether the TSP provides the highest net difference between NED benefits and NED costs. Another concern was that the elevation at which damage begins occurring to a structure cannot be determined because there is no clear description how the finished first flood elevations (FFEs) were collected. USACE can resolve this by describing how FFEs were collected and by explaining what steps were taken to reduce uncertainty in FFE estimation.

Coastal Engineering: The Panel found that the engineering analysis does not consider the storm water levels developed in the USACE North Atlantic Coast Comprehensive Study (NACCS) in the project area, which may affect TSP selection and performance. To address this, USACE can develop comparisons of the FEMA Flood Insurance Study (FIS) storm water levels with the values contained in the USACE NACCS report for locations near the project area and include these comparisons and associated discussion in the Interim Feasibility Study Engineering Appendix and Staten Island Draft Feasibility Report (DFR). In addition, The lack of a quantitative SBEACH validation may affect the accuracy of the storm-induced cross-shore erosion estimates developed by the model and the evaluation of the storm damage results for the alternative plans. USACE should provide additional explanation of the qualitative SBEACH validation for Hurricane Sandy and expand the discussion of the SBEACH simulation for Hurricane Sandy with comparisons to the measured post-storm profiles. The Panel also found that the sediment budget analysis, which is critical to the evaluation of alternatives, is based on several assumptions for which no justification or supporting data/studies have been provided. To address this issue, USACE should describe in detail how the assumptions applied in the sediment budget do (or do not) lead to increased uncertainty in the sediment budget results, which could influence the analysis of alternatives.

Hydrology: The Panel identified two important issues related to the flooding protection provided by the ponds. First, that the lumped-parameter hydrologic model is not sufficient to adequately evaluate the flooding protection provided by the ponds. USACE can resolve this by analyzing the upper watershed hydrology, incorporating effective modeling of two-dimensional details such as flow splits and flow around buildings. In addition, USACE can incorporate detailed topographic data into the model and present the topographic contours in the report and simulate the drainage basins by modeling each drainage basin as a separate basin rather than using a single-stage storage curve. Second, the level of detail in the design of the TSP's Interior Drainage Plan is not sufficient to adequately evaluate the flooding protection provided by the ponds. This can be resolved by USACE by developing engineering plan sheets for the Tentative Selected Interior Drainage Plan to the same design level as that of the engineering plan sheets for the Line of Protection.

Biological Resources and Environmental Law Compliance: The Panel found that the National Ecosystem Restoration (NER) outputs do not appear to have been considered in the evaluation of project alternatives, including the TSP. USACE can address this by showing how ecosystem benefits described

in the Draft Environmental Impact Statement (DEIS) comply with the requirements of Circular No. 1105-2-404 (May 1, 2003) and by including ecosystem benefits in the cost-benefit analysis of the TSP. The Panel also found that the description of potential impacts on cultural resources is incomplete since the cultural resources assessment in the interior drainage areas has not been conducted. USACE should perform a Phase I survey, during the feasibility phase, of areas not surveyed previously and incorporate results of these supplemental studies in the Programmatic Agreement (PA) and in the evaluation of project risks and uncertainties to resolve this issue.

Geotechnical Engineering: Another concern of the Panel was that the foundation option selected during the preliminary design phase for Reach A-3 (pile foundation) is based on widely spaced boring data and a generalized subsurface profile but subsequent design phases based on additional geotechnical subsurface information were not evaluated to provide a more cost-effective and appropriate solution. To address this, USACE can incorporate additional test boring and/or probes in subsequent design phases along the Reach A-3 alignment to better define the subsurface conditions, including the presence and limits of organic soils within the influence zone of the foundation. USACE can also provide further evaluation of foundation alternatives during design development after additional geotechnical design data are developed and prior to final design of the wall foundations. Finally, penetrations through the Line of Protection (LOP) and transitions along the LOP are susceptible to seepage, which could lead to instability and may affect constructability and performance. To address this issue, USACE can discuss conditions within the proposed solution that require specific seepage design considerations and provide general mitigating strategies/measures and complete evaluation and design of seepage mitigating measures during subsequent project design phases.

Table ES-1. Overview of 15 Final Panel Comments Identified by the Staten Island IEPR Panel

No.	Final Panel Comment
Significance – High	
1	None of the alternative plans considers recreation National Economic Development (NED) effects, potentially affecting the formulation and ranking of alternative plans and selection of the TSP.
Significance – Medium/High	
2	The engineering analysis does not consider the storm water levels developed in the USACE North Atlantic Coast Comprehensive Study (NACCS) in the project area, which may affect the TSP selection and performance.
Significance – Medium	
3	The lack of a quantitative SBEACH validation may affect the accuracy of the storm-induced cross-shore erosion estimates developed by the model and the evaluation of the storm damage results for the alternative plans.
4	The sediment budget analysis, which is critical to the evaluation of alternatives, is based on several assumptions for which no justification or supporting data/studies have been provided.
5	The lumped-parameter hydrologic model is not sufficient to adequately evaluate the flooding protection provided by the ponds.
6	The level of detail in the design of the TSP's Interior Drainage Plan is not sufficient to adequately evaluate the flooding protection provided by the ponds.
7	National Ecosystem Restoration (NER) outputs do not appear to have been considered in the evaluation of project alternatives, including the TSP.
8	The description of potential impacts on cultural resources is incomplete since the cultural resources assessment in the interior drainage areas has not been conducted.
9	The elevation at which damage begins occurring to a structure cannot be determined because there is no clear description of how the finished first flood elevations (FFEs) were collected.
Significance – Medium/Low	
10	The types of probability distributions used for study area structures in HEC-FDA simulations are not described, nor are the number of iterations for the simulations identified or why these statistics were selected.
11	The foundation option selected during the preliminary design phase for Reach A-3 (pile foundation) is based on widely spaced boring data and a generalized subsurface profile but subsequent design phases based on additional geotechnical subsurface information were not evaluated to provide a more cost-effective and appropriate solution.
12	Penetrations through the LOP and transitions along the LOP are susceptible to seepage, which could lead to instability and may affect constructability and performance.
13	The Engineering and Design Appendix selects a maximum overtopping threshold; however, the implications of the wave overtopping results exceeding the selected maximum overtopping

Table ES-1. Overview of 15 Final Panel Comments Identified by the Staten Island IEPR Panel (Continued)

No.	Final Panel Comment
	threshold have not been discussed.
14	The recent shoreline change analysis does not include analysis of post-Hurricane Sandy data, which provide an important and relevant data set.
Significance – Low	
15	The hydrology model does not include flowpaths, flow redirections, concentration points, or the detailed explanation needed to support the assumptions behind the flow patterns.

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LIST OF ACRONYMS

ATR	Agency Technical Review
COI	Conflict of Interest
DEIS	Draft Environmental Impact Statement
DFR	Draft Feasibility Report
DrChecks	Design Review and Checking System
EC	Engineer Circular
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
IEPR	Independent External Peer Review
IPR	In-Progress Reviews
LOP	Line of Protection
NACCS	North Atlantic Comprehensive Coastal Study
NED	National Economic Development
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NYCDEP	New York City Department of Environmental Protection
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PA	Programmatic Agreement
PDT	Project Delivery Team
SBEACH	Storm-Induced Beach Change Model
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Services
TSP	tentatively selected plan
UDV	unit day value
WRRDA	Water Resources Reform and Development Act

1. INTRODUCTION

The study area covers about 13 miles of coast on Staten Island, extending along Lower New York Bay and Raritan Bay from Fort Wadsworth to Tottenville at the mouth of Arthur Kill. However, the extent of the tentatively selected plan (TSP) is generally limited to the eastern 6 miles of the shore from Fort Wadsworth to Oakwood Beach (FWOB-Reach 1). FWOB-Reach 1 has a long history of storm damage. The shoreline experienced major erosion and storm damage from the Northeaster of December 1992, the March 1993 storm, and, most recently, Hurricane Sandy in October 2012. These storms caused evacuations in several communities, damage to hundreds of structures from flooding, and loss of over hundreds of structures from erosion. The loss of beachfront now leaves the area increasingly vulnerable to severe damages even from moderate storms.

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feasibility report for concurrent Policy, Agency Technical Review (ATR), independent external peer review (IEPR), and Public Review.

- Agency Decision Milestone: The recommended plan and proposed way forward for feasibility-level design is endorsed by a panel of senior USACE leaders.
- Directors Review Board: The Board provides a corporate checkpoint to determine if the final feasibility study report and National Environmental Policy Act (NEPA) document, and the proposed Report of the Chief of Engineers, are ready to be released for State and Agency review.
- Signed Chief's Report.

A risk register and other risk management documentation will accompany the feasibility study decision document. Although one of the objectives of IEPR is to evaluate whether sufficient information was available or technical analyses were completed, the IEPR must be completed within the context of the risk-informed decision-making process.

OBJECTIVES

The objective of this work is to conduct an IEPR of the South Shore of Staten Island, NY, Coastal Storm Damage Reduction Feasibility Study (hereinafter: Staten Island IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, December 15, 2012), and the Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review* (December 16, 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).

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, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the Staten Island IEPR 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) with extensive experience in economics/plan formulation, biological resources and environmental law compliance, coastal engineering, structural/geotechnical engineering, and hydrology issues relevant to the project. They will also have experience applying their subject matter expertise to coastal storm damage reduction.

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 1165-2-214, Appendix D, 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.

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, hydrology, and plan formulation analyses contained in the Staten Island IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and

conducted. 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 on June 16, 2015. Appendix D presents the organizational conflict of interest form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the Staten Island 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 (ATR), as described in USACE (2012a).

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, hydrology, 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 South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-214). 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. Table 1 presents the major milestones and deliverables of the Staten Island IEPR. Due dates for milestones and deliverables are based on the award/effective date of September 16, 2014. Note that the public comment review, Task 6 activities, the Civil Works Review Board (CWRB) Meeting, and the Agency Decision Milestone (ADM) Meeting will occur after the submission of this report.

Upon receipt of the public comments, the Panel will review the comments and determine if an additional Final Panel Comment is necessary. If a Final Panel Comment results from the review of the Public Comments, an addendum to this report will be prepared, the comment will be entered into USACE's Design Review and Checking System (DrChecks), and a Comment Response process will occur for that comment. At this time, the dates of those activities are unknown and therefore have not been reported here.

Battelle will submit the pdf printout of the DrChecks project file (the final deliverable) after the public comment review has been conducted and comment response process has been finalized. In Table 1 below, the current contract end date is provided; however, the actual date for contract end will depend on the date that all activities for this IEPR, including CWRB preparation and participation, are conducted.

Table 1. Major Milestones and Deliverables of the Staten Island IEPR

Task	Action	Due Date
1	Award/Effective Date	9/16/2014
	Review documents available	6/17/2015
2	Battelle submits list of selected panel members	10/3/2014
	USACE confirms the panel members have no COI	5/5/2015
3	Battelle convenes kick-off meeting with USACE	5/22/2015
	Battelle convenes kick-off meeting with USACE and panel members	6/18/2015
	Agency Decision Milestone (ADM) Meeting	TBD
	Civil Works Review Board (CWRB) Meeting	TBD
4	Panel members complete their individual reviews	7/23/2015
	Panel members provide draft Final Panel Comments to Battelle	8/5/2015
4a[a]	Battelle receives the public comments from USACE	9/16/2015
	Panel completes review of the public comments	
5	Battelle submits Final IEPR Report to USACE	8/17/2015
	USACE PCX provides decision on Final IEPR Report acceptance	8/18/2015
6	Battelle convenes Comment-Response Teleconference with panel members and USACE	9/29/2015
	Battelle submits pdf printout of DrChecks project file[b]	10/19/2015
	Contract End/Delivery Date	4/30/2016

[a] *Due to a revision in the public comment period, Task 4a occurs after the submission of the final report.*
[b] *Task 6 occurs after the submission of the report, dates provided are estimates of the dates for the comment response process associated with the 15 Final Panel Comments reported here. The final deliverable will be held until the Public Comment Review and Comment Response process is completed.*

Battelle identified, screened, and selected five panel members to participate in the IEPR based on their expertise in the following disciplines: project, Battelle identified potential candidates for the Panel in the following key technical areas: economics/plan formulation, biological resources and environmental law compliance, coastal engineering, structural/geotechnical engineering, and hydrology. The Panel reviewed the Staten Island IEPR document and produced 15 Final Panel Comments in response to 19 charge questions provided by USACE for the review. This charge included two overview questions added by Battelle. 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 1165-2-214, Appendix D), 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, 2012a; p. D-4) in the Staten Island IEPR review document. The following summarizes the Panel's findings.

Based on the Panel's review, the review documents are clearly written and easy to follow. Environmental resources are summarized well and residual risk considered. The Panel, however, did identify elements of the project that require further analysis and evaluation, and sections of the Staten Island DFR and appendices that should be clarified or revised.

Economics/Civil Works Planning: The Panel's most significant finding was that none of the alternative plans considers recreation National Economic Development (NED) effects, potentially affecting the formulation and ranking of alternative plans and selection of the TSP. To address this, USACE can perform a unit day value (UDV) recreation analysis in order to reasonably estimate the recreation benefits of each alternative plan and apply the "50% rule" to determine whether the TSP provides the highest net difference between NED benefits and NED costs. Another concern was that the elevation at which damage begins occurring to a structure cannot be determined because there is no clear description how the finished first flood elevations (FFEs) were collected. USACE can resolve this by describing how FFEs were collected and by explaining what steps were taken to reduce uncertainty in FFE estimation.

Coastal Engineering: The Panel found that the engineering analysis does not consider the storm water levels developed in the USACE North Atlantic Coast Comprehensive Study (NACCS) in the project area, which may affect TSP selection and performance. To address this, USACE can develop comparisons of the FEMA Flood Insurance Study (FIS) storm water levels with the values contained in the USACE NACCS report for locations near the project area and include these comparisons and associated discussion in the Interim Feasibility Study Engineering Appendix and Staten Island Draft Feasibility Report (DFR). In addition, The lack of a quantitative SBEACH validation may affect the accuracy of the storm-induced cross-shore erosion estimates developed by the model and the evaluation of the storm damage results for the alternative plans. USACE should provide additional explanation of the qualitative SBEACH validation for Hurricane Sandy and expand the discussion of the SBEACH simulation for Hurricane Sandy with comparisons to the measured post-storm profiles. The Panel also found that the sediment budget analysis, which is critical to the evaluation of alternatives, is based on several assumptions for which no justification or supporting data/studies have been provided. To address this issue, USACE should describe in detail how the assumptions applied in the sediment budget do (or do not) lead to increased uncertainty in the sediment budget results, which could influence the analysis of alternatives.

Hydrology: The Panel identified two important issues related to the flooding protection provided by the ponds. First, that the lumped-parameter hydrologic model is not sufficient to adequately evaluate the flooding protection provided by the ponds. USACE can resolve this by analyzing the upper watershed hydrology, incorporating effective modeling of two-dimensional details such as flow splits and flow around buildings. In addition, USACE can incorporate detailed topographic data into the model and present the topographic contours in the report and simulate the drainage basins by modeling each drainage basin as a separate basin rather than using a single-stage storage curve. Second, the level of detail in the design

of the TSP's Interior Drainage Plan is not sufficient to adequately evaluate the flooding protection provided by the ponds. This can be resolved by USACE by developing engineering plan sheets for the Tentative Selected Interior Drainage Plan to the same design level as that of the engineering plan sheets for the Line of Protection.

Biological Resources and Environmental Law Compliance: The Panel found that the National Ecosystem Restoration (NER) outputs do not appear to have been considered in the evaluation of project alternatives, including the TSP. USACE can address this by showing how ecosystem benefits described in the Draft Environmental Impact Statement (DEIS) comply with the requirements of Circular No. 1105-2-404 (May 1, 2003) and by including ecosystem benefits in the cost-benefit analysis of the TSP. The Panel also found that the description of potential impacts on cultural resources is incomplete since the cultural resources assessment in the interior drainage areas has not been conducted. USACE should perform a Phase I survey, during the feasibility phase, of areas not surveyed previously and incorporate results of these supplemental studies in the Programmatic Agreement (PA) and in the evaluation of project risks and uncertainties to resolve this issue.

Geotechnical Engineering: Another concern of the Panel was that the foundation option selected during the preliminary design phase for Reach A-3 (pile foundation) is based on widely spaced boring data and a generalized subsurface profile but subsequent design phases based on additional geotechnical subsurface information were not evaluated to provide a more cost-effective and appropriate solution. To address this, USACE can incorporate additional test boring and/or probes in subsequent design phases along the Reach A-3 alignment to better define the subsurface conditions, including the presence and limits of organic soils within the influence zone of the foundation. USACE can also provide further evaluation of foundation alternatives during design development after additional geotechnical design data are developed and prior to final design of the wall foundations. Finally, penetrations through the Line of Protection (LOP) and transitions along the LOP are susceptible to seepage, which could lead to instability and may affect constructability and performance. To address this issue, USACE can discuss conditions within the proposed solution that require specific seepage design considerations and provide general mitigating strategies/measures and complete evaluation and design of seepage mitigating measures during subsequent project design phases.

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

None of the alternative plans considers recreation National Economic Development (NED) effects, potentially affecting the formulation and ranking of alternative plans and selection of the TSP.

Basis for Comment

Neither of the legislative authorities cited in the Staten Island Draft Feasibility Report (DFR) preclude the consideration of the potential to generate recreation.

Section 1.1 of the Staten Island DFR cites the U.S. House of Representatives Committee on Public Works and Transportation resolution adopted in 1993 as the primary authority under which this study was conducted (emphasis added):

> "The Secretary of the Army, acting through the Chief of Engineers, is requested to review the report of the Chief of Engineers, on the Staten Island Coast from Fort Wadsworth to Arthur Kill, New York, published as House Document 181, Eighty-ninth Congress, First Session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of beach erosion control, storm damage reduction **and related purposes** on the South Shore of Staten Island, New York, particularly in and adjacent to the communities of New Dorp Beach, Oakwood Beach, and Annadale Beach, New York."

Title II of the Disaster Relief Appropriations Act of 2013 (Public Law 113-2) authorizes a comprehensive study for areas affected by Hurricane Sandy:

> "Provided, That using $19,500,000 of the funds provided herein, the Secretary of the Army shall conduct, at full Federal expense, **a comprehensive study** to address the flood risks of vulnerable coastal populations in areas impacted by Hurricane Sandy within the boundaries of the North Atlantic Division of the United States Army Corps of Engineers…"

Taken together, these two pieces of legislation suggest that a comprehensive study that has flood risk reduction as its primary purpose, but calls for evaluation of related purposes, should consider outputs that are related, but incidental to, the primary purpose of flood risk reduction.

While recreation benefits are considered an incidental benefit of coastal storm damage reduction projects, Engineer Regulation 1105-2-100 (USACE, 2000; p. 3-19) specifically allows them to be considered in plan formulation, pursuant to the limitations of the "50% rule:"

> "The Corps participates in single purpose projects formulated exclusively for hurricane and storm damage reduction, with economic benefits equal to or exceeding the costs, based solely on damage reduction benefits, or a **combination of damage reduction benefits and recreation benefits**. Under current policy, recreation must be incidental in the formulation process and may not be more than fifty percent of the total benefits required for justification. If the criterion for participation is met, then all recreation benefits are included in the benefit to cost analysis. Costs incurred for other than the damage reduction purpose, i.e. to satisfy recreation demand, are a 100 percent non-Federal responsibility."

Section 5.4.2 of the Staten Island DFR states that recreation in the study area is important to both the borough of Staten Island as well as the City of New York. Furthermore, Table 13 (p. 6-19) states that the increased beach areas included in Alternative FO1 have the potential to provide recreation opportunities.

However, there are no recreational benefit analyses with which to determine if any of the alternative plans

Final Panel Comment 1

produce significant recreation benefits for the purposes of plan formulation or project justification.

Significance – High

The lack of recreation benefit analyses could affect how the alternative plans were formulated, how they were ranked, and the selection of the TSP.

Recommendation for Resolution

1. Perform a unit day value (UDV) recreation analysis in order to reasonably estimate the recreation benefits of each alternative plan.
2. Apply the “50% rule” to determine whether the tentatively selected plan (TSP) provides the highest net difference between NED benefits and NED costs.

Literature Cited:

USACE (2000). Planning – Planning Guidance Notebook. Engineer Regulation (ER) 1105-2-100, Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Section 3 and Appendix E.

U.S. House of Representatives Committee on Public Works and Transportation resolution, 1993

Public Law 113–2. Disaster Relief Appropriations. January 29. Available online at: http://gpo.gov/fdsys/pkg/PLAW-113publ2/pdf/PLAW-113publ2.pdf

Final Panel Comment 2

The engineering analysis does not consider the storm water levels developed in the USACE North Atlantic Coast Comprehensive Study (NACCS) in the project area, which may affect the TSP selection and performance.

Basis for Comment

Section 2.0 of the Interim Feasibility Study for Fort Wadsworth to Oakwood Beach Engineering and Design Appendix provides details of the water levels applied for the engineering analysis. The text describes the application of the preliminary Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) water levels, including a statement that the water levels "affect the design of the structures that comprise the Line of Protection (LOP) for this project" (Engineering and Design Appendix, p. 5). Engineering and Design Appendix Table 2-9 (p. 22) and the Staten Island DFR Table 4 (p. 3-6) contain the stillwater elevations for the project area based on the preliminary FEMA FIS data. Notably, in January 2015, USACE released the results of the North Atlantic Coast Comprehensive Study (USACE, 2015), which includes return period water levels in the project area (for return periods similar to the FEMA FIS study). However, the Engineering and Design Appendix does not reference the NACCS Study water levels or compare them to the FEMA FIS levels. These water levels provide critical input data for Storm-Induced Beach Change (SBEACH) modeling, evaluation of the alternative plans, and design of the TSP.

Notably, the FEMA FIS data applied in the Engineering and Design Appendix (p. 21) are identified as preliminary data. In June 2015, New York City submitted to FEMA a formal appeal of FEMA's preliminary FIS maps and levels (City of New York, 2015). This appeal presents a thorough study of the flood levels near New York City, including the project area, and states (p. 3-17) that the FEMA levels are inaccurately high. The outcome of the appeal remains unknown, but the appeal of the preliminary FEMA data provides further reason to compare the preliminary FEMA data to the recently released USACE NACCS storm water elevations.

Significance – Medium/High

The application of the preliminary FEMA FIS data, without comparison to the recently completed NACCS study data, increases the uncertainty associated with a critical input for the engineering analysis and evaluation of project alternatives.

Recommendation for Resolution

1. Develop comparisons of the FEMA FIS storm water levels with the values contained in the USACE NACCS report for locations near the project area. Include these comparisons and associated discussion in the Interim Feasibility Study Engineering Appendix and Staten Island DFR.

Literature Cited:

USACE (2015). North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk. U.S. Army Corps of Engineers, North Atlantic Division. January. Available online at: http://www.nad.usace.army.mil/compstudy

City of New York (2015). Appeal of FEMA's Preliminary Flood Insurance Rate Maps for New York Submitted to FEMA Region II on June 26, 2015 by the City of New York Mayor's Office of Recovery and Resiliency.

Final Panel Comment 3

The lack of a quantitative SBEACH validation may affect the accuracy of the storm-induced cross-shore erosion estimates developed by the model and the evaluation of the storm damage results for the alternative plans.

Basis for Comment

The Interim Feasibility Study for Fort Wadsworth to Oakwood Beach Engineering and Design Appendix (Section 3.2, p. 31) describes the SBEACH model background and methodology. As a storm-induced cross-shore transport and model, SBEACH is a tool to evaluate and predict storm-induced cross-shore erosion. Typical SBEACH model development procedures include a calibration and validation phase to demonstrate the model's ability to reasonably reproduce measured beach profile changes near the project area during historical storms. Section 3.2.1 (p. 32) states that "no suitable data was available in the Project Area to calibrate the model" and "a sensitivity analysis and qualitative model validation was performed for Hurricane Sandy based on the available topographic data." The documentation (qualitative validation) does not convincingly demonstrate the ability of the SBEACH model to reproduce the cross-shore erosion caused by Hurricane Sandy.

Hurricane Sandy represents a recent major storm with data available in the project area to document storm-induced shoreline change. Development of a Hurricane Sandy SBEACH model simulation would increase confidence in the model's ability to accurately reproduce cross-shore erosion during major storm events. The calibrated SBEACH model would provide critical information to ensure accurate analysis of the economic damages caused by major storms.

Notably, Engineering Appendix Section 4.8 (p. 56) includes the statement: "A minimum beach width threshold of 75 feet (measured from MHW) was determined based on analysis of the impact of LOP structures on storm induced beach change using a validated SBEACH model." Main Report Section 9.3.2 (p. 9-6) contains a similar reference to the application of a validated SBEACH model within the study analyses.

The lack of a quantitative calibration and validation proves important because of where the model is applied and the basic assumptions of the model. The discussion of the SBEACH modeling in Engineering Appendix Section 3.2 (p. 31) lists general details of the model background and capabilities. The discussion states, "A basic assumption of SBEACH is that all profile change is produced by cross-shore processes, with no net gain or loss of sediment. This is only true if longshore sediment transport processes are uniform, which is typical (sic) considered a reasonable assumption during storm events on open coasts away from inlets and structures." Engineering Appendix Section 2.1.2 (p. 9) lists shoreline characteristics and states, "Most of the Project Area generally has 250-350 foot wide dune-less beach intersected by several outfall structures/groins. The shoreline is irregular because of the downdrift offsets at groins." This statement aligns with figures in the Engineering Appendix (Figures 1-2 and 2-1) that show irregularity in the shoreline caused by the structures. The prevalence of structures within the project area casts some doubt over the suitability of applying the SBEACH model, which assumes uniform longshore transport processes (typically occurring away from coastal structures such as groins). This further increases the importance of having a robust calibration and validation for the SBEACH model.

Significance – Medium

Without demonstrating the SBEACH model's ability to reproduce Hurricane Sandy effects through a calibration and/or validation exercise, confidence in the SBEACH model's application within the

Final Panel Comment 3

engineering and economic modeling is reduced.

Recommendation for Resolution

1. Provide additional explanation of the qualitative SBEACH validation for Hurricane Sandy, including data sources applied and why the validation could not be considered a quantitative validation.
2. Expand the discussion of the SBEACH simulation for Hurricane Sandy with comparisons to the measured post-storm profiles (Engineering Appendix Figure 3-2, p. 33) and discussion of volume changes.
3. Revise the reference to a validated SBEACH in the Engineering Appendix (p. 56) to ensure agreement with level of validation conducted (relates to response to Recommendation for Resolution 1 and 2).
4. Within the existing discussion of the SBEACH model development and application, provide additional text to explain why structures within the project area would not adversely influence the SBEACH model results or the model's ability to evaluate the project alternatives.

Final Panel Comment 4

The sediment budget analysis, which is critical to the evaluation of alternatives, is based on several assumptions for which no justification or supporting data/studies have been provided.

Basis for Comment

The discussion of the sediment budget analysis in the Engineering Appendix (Section 2.1.2, p. 14) lists several assumptions made within the analysis, which applies beach profile data from 1961 and 2000. The Staten Island DFR does not present any modeling of longshore transport; it states (p.14) that engineering judgment was applied in estimating the sediment transport in the system and the magnitudes of transport for several pathways were assumed. The basis or supporting data/studies for these assumptions are not provided and it is not clear how much uncertainty or risk is associated with applying this judgment, or if the uncertainty and risk were considered by the project team.

The evaluation of project alternatives applies the sediment budget results. For example, Engineering Appendix Section 4.8 (p. 56) states, “Since the long-term sediment budget for the project area indicates that the beach is relatively stable, it is not anticipated over the project period of analysis (50 years) for the beach to erode below the minimum 75-ft threshold. A project cost to maintain the beach was not included for this reason.” Engineering Appendix Section 5.5.1 (p. 65) and Staten Island DFR Section 9.3.2 (p. 9-6) include a similar statement. Important project-related decisions are based on the sediment budget. Therefore, it is important that the basis for the assumptions and the limitations of the sediment budget are understood and clearly stated.

Significance – Medium

The sediment budget results influence the analysis of the alternative plans and selection of the TSP, yet the assumptions applied within the sediment budget are not clearly explained or supported.

Recommendation for Resolution

1. Describe in detail in the Staten Island DFR how the assumptions applied in the sediment budget do (or do not) lead to increased uncertainty in the sediment budget results, which could influence the analysis of alternatives.
2. Include a discussion in the Staten Island DFR explaining why longshore transport modeling was not deemed necessary to develop quantitative inputs for the sediment budget.

Final Panel Comment 5

The lumped-parameter hydrologic model is not sufficient to adequately evaluate the flooding protection provided by the ponds.

Basis for Comment

The lumped-parameter approach to hydrologic modeling is too simple a method for evaluating the flooding protection provided by the ponds. A more appropriate model would be a two-dimensional model that has the ability to incorporate detailed inputs to provide adequate interior drainage analysis.

In the lumped-parameter approach, portions of the drainage areas are lumped into a single area called a subbasin. Single values of parameters are applied at each subbasin, which does not adequately model flow patterns such as flow splits at road intersections and flow around buildings. The project study area includes a highly urbanized watershed area with residential areas, extensive roads, buildings, and storm drain systems that can significantly impact flow patterns. Lumping parameters into a single value for a particular subbasin area ignores these details and could affect the estimates of storm-water runoff volume reaching the natural and excavated ponds. The uncertainty in the estimated inflowing storm-water volume into the ponds can impact the estimates of the extent of flooding in areas adjacent to the ponds.

The lumped-parameter approach also simplifies the flow confluences. For example, the excess portion of the flows from drainage area A is assumed to reach area B, as shown in the schematic presented in Figure 6 of Appendix II (Interior Drainage Appendix). Similarly, the excess portion of the flows from drainage area D reaches area E (see Figure 11 of Appendix II, Interior Drainage Appendix). The flooding extents as presented in the report (p. 8-44 of Appendix II, Interior Drainage Appendix) are distinctly separate flooding extents for each of the drainage areas and do not show these flow confluences. The inability to adequately evaluate such flow confluences due to the use of a simple approach can result in inaccurate estimates of flooding extent.

The lumped-parameter approach also ignores the details provided in the topographic datasets. The lumping approach simplifies the topographic inputs by using a single slope-value for each subbasin. This simplification results in an inability to predict flow patterns at an adequate resolution, which leads to uncertainty in estimates of flow volume and subsequent flooding extent.

In addition, lumping of storage volumes results in a single elevation-storage relationship for all the ponds in the drainage area. For example, drainage area C has seven interconnected ponds. Such interconnections create a complex flow distribution, often resulting in different water surface elevations at each pond. As the modeling used in this study estimates a single water surface elevation for all seven ponds, the adequacy of the storage volume provided at each of the seven ponds is difficult to evaluate accurately.

The lumped-parameter approach also does not include effects of sedimentation that could occur within the pond. Sediment depositions within the ponds will reduce the effective storage volume provided by the ponds, impacting the extent of flooding in adjacent areas.

Significance – Medium

Lumped-parameter hydrologic modeling results in uncertainty in the flow volume entering the ponds and the storm-water storage volume provided by the ponds, which could have significant impact on flooding extents and associated flood damages in the areas adjacent to the natural storage and excavated ponds.

Final Panel Comment 5

Recommendation for Resolution

1. Analyze the upper watershed hydrology, incorporating effective modeling of details such as flow splits and flow around buildings. For example, use of a two-dimensional model will allow the consideration of adequate details to arrive at better hydrologic estimates.
2. Incorporate detailed topographic data into the model and present the topographic contours in the report.
3. Simulate the drainage basins by modeling each drainage basin as a separate basin rather than using a single stage-storage curve. Analyze the potential flow interactions between the drainage basins.
4. Estimate impacts on drainage basin storage capacity due to sedimentation.
5. Analyze impacts due to uncertainty in interior water surface elevation at storage ponds.

Final Panel Comment 6

The level of detail in the design of the TSP's Interior Drainage Plan is not sufficient to adequately evaluate the flooding protection provided by the ponds.

Basis for Comment

The existing ponds are designated as the interior storm-water storage for all the drainage areas considered here. Additional pond excavations have been identified as part of the TSP. Although the engineering plan sheets included in the Staten Island DFR (Plates 1 through 36) provide details on the LOP and the tide gate structures, they do not include engineering plan sheets for the Tentatively Selected Interior Drainage Plan. The report only contains a presentation of the limits of pond excavations, shown approximately in the aerial view for the TSP in Figures 33, 37, and 42 of Appendix II (Interior Drainage Appendix).

Specifically, it is unclear how the elevation-storage relationships are determined for the with-project (including excavation) conditions. The lack of adequate design details for the pond excavations creates uncertainty in the storm-water storage volume provided by the ponds. This, in turn, introduces uncertainty in the extent of flooding possible adjacent to these ponds, further affecting the associated damage estimates and costs.

Significance – Medium

The lack of adequate detail in the design of the Tentatively Selected Interior Drainage Plan can impact the estimate of storm-water storage volume provided by the ponds, as well as the effective performance of outflow structures.

Recommendation for Resolution

1. Develop engineering plan sheets for the Tentative Selected Interior Drainage Plan to the same design level as that of the engineering plan sheets for the LOP.

Final Panel Comment 7

National Ecosystem Restoration (NER) outputs do not appear to have been considered in the evaluation of project alternatives, including the TSP.

Basis for Comment

The proposed project would provide net ecosystem restoration outputs, including enhancement/ restoration of approximately 17 acres of dune habitat and creation of approximately 46 acres of tidal wetlands. In addition, construction of ponds in interior drainages would result in removal of invasive common cane and enhancement of existing freshwater wetlands, as well as conversion of uplands to new freshwater wetland habitat. While the New York City Department of Environmental Protection (NYCDEP) Bluebelt Program could provide for a majority of the interior drainage wetland benefits, the timing of implementation of the TSP and the Bluebelt Program is uncertain, and these outputs could be attributed to the TSP if it were constructed before implementation of the Bluebelt Program.

Although the proposed project was not intended to be developed as a combined NED/NER project, inclusion of the NER outputs in the cost-benefit analysis could demonstrate an increase in project benefits and could increase the cost-benefit ratio for the TSP.

Significance – Medium

Inclusion of a discussion of NER outputs in the assessment of the TSP would provide a more complete analysis of costs and benefits and could provide additional justification for the selection of the TSP.

Recommendation for Resolution

1. Show how ecosystem benefits described in the Draft Environmental Impact Statement (DEIS) comply with the requirements of Circular No. 1105-2-404 (USACE, 2003).
2. Include ecosystem benefits in the cost-benefit analysis of the TSP.

Literature Cited:

USACE (2003). Planning Civil Work Projects under the Environmental Operating Principles. Circular No. 1105-2-404. U. S. Army Corps of Engineers, Washington, D.C. May 1. 6 pp.

Final Panel Comment 8

The description of potential impacts on cultural resources is incomplete since the cultural resources assessment in the interior drainage areas has not been conducted.

Basis for Comment

Extensive cultural resource surveys have been conducted in many areas of the proposed project, especially in those areas where the LOP would be constructed. These studies were conducted by the New York District Corps of Engineers; other studies were performed in conjunction with the NYCDEP Bluebelt Program, which adjoins the Staten Island Project Area and includes some parcels where drainage features and ponding areas are proposed. These earlier investigations resulted in identification of several historic sites and possible prehistoric locations; recommendations were made for additional testing.

The Staten Island DEIS states that Phase I surveys of interior drainage areas would be performed "as the Project proceeds" (p. 3-39). However, the DEIS also acknowledges that there is a moderate probability that additional cultural resource sites will be discovered in the Area of Potential Effect.

A Programmatic Agreement (PA) was coordinated among the cognizant agencies and stakeholders that included a commitment to perform all necessary studies and mitigative measures required to comply with Section 106. However, the absence of at least Phase I shovel test surveys of the interior drainage areas, where ground disturbance would affect approximately 187 acres of land, decreases the level of confidence in the discussion of anticipated impacts on cultural resources.

Costs for anticipated studies have been estimated and are included in overall project costs. The risk of implementation delays is described as "medium," but impacts on project schedules have not been estimated.

Significance – Medium

Providing results of a Phase I cultural resource assessment of the entire project area would strengthen the conclusions in the DEIS and would reduce uncertainties and risk in project implementation.

Recommendation for Resolution

1. Perform a Phase I survey, during the feasibility phase, of areas not surveyed previously.
2. Incorporate results of these supplemental studies in the PA and in the evaluation of project risks and uncertainties.

Final Panel Comment 9

The elevation at which damage begins occurring to a structure cannot be determined because there is no clear description how the finished first flood elevations (FFEs) were collected.

Basis for Comment

FFEs are among the most critical contributors to uncertainty in a risk-based coastal storm damage reduction analysis. How the data describing such factors were collected, how they contribute to uncertainty, and what steps were taken to reduce uncertainty should be clearly documented.

When all or most structures in the study area consist of slab-on-grade construction, ground elevations can serve as a suitable proxy for FFEs. However, in coastal areas such as the South Shore of Staten Island, pile foundations have become increasingly more prevalent as older homes are cleared for newer and larger structures, leading to potentially significant differences between ground elevations and FFEs.

FFEs are the most important factor in estimating the elevation at which inundation damage begins to occur to a structure. The Staten Island DFR explains that ground elevations were collected, but is silent on how FFEs were determined.

Significance – Medium

Without a discussion of how FFEs were collected, it is difficult to understand how uncertainty in those elevations was addressed, potentially increasing the risk to the performance of the TSP.

Recommendation for Resolution

1. Describe how FFEs were collected.
2. Explain what steps were taken to reduce uncertainty in FFE estimation.

Final Panel Comment 10

The types of probability distributions used for study area structures in HEC-FDA simulations are not described, nor are the number of iterations for the simulations identified or why these statistics were selected.

Basis for Comment

The types of underlying probability distributions of the random variables used to describe uncertainty in FFEs, structure values, content values, and depth-damage functions are important in driving the outcomes of Hydrologic Engineering Center Flood Damage Reduction Analysis (HEC-FDA) Monte Carlo simulations.

While it is true that when sampling from a large variety of probability distributions the cumulative distribution tends to approach a normal shape, the skewness of the distributions representing random variables that are highly influential can and often do shift the mean of the cumulative distribution.

The number of iterations selected for the Monte Carlo simulations is also important in the confidence level the analyst has in determining whether the model is sampling the underlying probability distributions in a manner that accurately reflects the cumulative probability distribution the model is intended to represent. The larger the number of iterations, the greater the confidence that the population is reasonably represented by the probability distributions sampled.

The types of probability distributions and the number of iterations are needed to assess the adequacy and/or acceptability of the models and methods used in the analysis.

Significance – Medium/Low

The Panel cannot determine whether the DFR provides the requisite information to assess the models and methods used to conduct the analysis.

Recommendation for Resolution

1. Describe the distributions selected to represent the random variables used in the Monte Carlo simulation performed by HEC-FDA.
2. Identify the number of iterations used in the various simulations and explain why USACE has confidence that the number selected is appropriate.

Final Panel Comment 11

The foundation option selected during the preliminary design phase for Reach A-3 (pile foundation) is based on widely spaced boring data and a generalized subsurface profile but subsequent design phases based on additional geotechnical subsurface information were not evaluated to provide a more cost-effective and appropriate solution.

Basis for Comment

Appendix I, Engineering (Section 4.3.3) indicates a pile foundation was the selected option after evaluating a shallow foundation option. This design decision was based on a limited amount of subsurface design information. It is possible that more detailed geotechnical design information and incorporation of the sheet pile cutoff wall into the sliding and overturning stability assessment could result in other appropriate and cost-effective foundation solutions. The results and documentation of the current and preliminary design process should not exclude the investigation of other foundation options after additional geotechnical subsurface information is generated.

The alignment of the T wall section (47+00 to 65+00) is underlain by variable subsurface conditions. The southwest-facing portion of the alignment (station 47+14 to 58+00) is underlain by primarily cohesionless soil strata with a limited zone of silty clay identified in one boring (Boring SS02-05). The current understanding of subsurface conditions of the southwest-facing wall alignment is based on three borings, two of which are offset to the north, along the approximately 1100 feet of wall alignment.

Additional subsurface explorations are needed prior to final design to better define the subsurface conditions along this portion of the alignment. The frequency of explorations is generally based on the anticipated variability of the soil strata, engineering judgment, and geotechnical standard of practice as described in infrastructure-related guidelines such as the American Association of State Highway and Transportation Officials (AASHTO, 2015), USACE guidance included in Hurricane and Storm Damage Risk Reduction System Design Guidelines (USACE, 2012b), and UFC manuals (DoD, 2005). Based on these design guidance documents, exploration frequency should be on the order of 100 to 200 feet on center.

The selected pile foundation option for support of the subject length of wall will provide adequate support and wall performance; however, this option is relatively costly compared to other potential options. Other less costly options such as a shallow foundation incorporating the sheet pile cutoff wall or ground modification may be appropriate for this application. Appropriateness may be further evaluated during the final subsequent design phases.

Significance – Medium/Low

The final structure option for the TSP will not change as a result of the type of foundation used, although it could affect the cost to implement.

Recommendation for Resolution

1. Complete additional test boring and/or probes along the reach A-3 alignment to better define the subsurface conditions, including the presence and limits of organic soils within the influence zone of the foundation.
2. Provide further evaluation of foundation alternatives during design development after additional geotechnical design data are developed and prior to final design of the wall foundations.

Literature Cited:

AASHTO (2015). AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 7th Edition, with 2015 Interim Revisions. American Association of State and Highway Transportation Officials, Washington, D.C. 1,960 pp.

DoD (2005). Unified Facilities Criteria,(UFC): Soil Mechanics. Manual UFC 3-220-10N. U.S. Department of Defense, June 8. Available online at: http://www.wbdg.org/ccb/DOD/UFC/ufc_3_220_10n.pdf.

USACE (2012b). Hurricane and Storm Damage Risk Reduction System Design Guidelines. Department of the Army, U.S. Army Corps of Engineers, New Orleans District Engineering Division, New Orleans, La. June 12. Available online at: http://www.mvn.usace.army.mil/Portals/56/docs/engineering/HurrGuide/EntireDocument.pdf.

Final Panel Comment 12

Penetrations through the LOP and transitions along the LOP are susceptible to seepage, which could lead to instability and may affect constructability and performance.

Basis for Comment

The reviewed documentation thoroughly discusses and evaluates seepage through and beneath each proposed LOP closure section. However, the Staten Island DFR and appendices do not address the potential condition and mitigating measures required regarding seepage at penetrations due to existing utilities, proposed mechanical flood control structures, and proposed structure-type transitions. Seepage includes preferential pathways that may form around or through existing utilities penetrating the LOP alignment and seepage around or between different structure material types, such as concrete to soil, at structure-type transitions, or control structures. Should seepage occur along these preferential pathways, seepage quantity and structure stability could be impacted.

Mitigating measures applied to the proposed structures may include water stops and cutoff walls, while those applicable to existing utility alignment penetrations may include excavation and installation of seepage prevention collars, which may require temporary works (earth support and dewatering facilities) to construct.

Significance – Medium/Low

The incorporation of typical seepage mitigation tequniques for flood control structures would provide additional protection and performance.

Recommendation for Resolution

1. Discuss conditions within the proposed solution that require specific seepage design considerations and provide general mitigating strategies/measures.
2. Complete evaluation and design of seepage mitigating measures during subsequent project design phases.

Final Panel Comment 13

The Engineering and Design Appendix selects a maximum overtopping threshold; however, the implications of the wave overtopping results exceeding the selected maximum overtopping threshold have not been discussed.

Basis for Comment

Section 5.4 of the Interim Feasibility Study for Fort Wadsworth to Oakwood Beach Engineering and Design Appendix (p. 63) discusses the overtopping analysis applied in the evaluation of project alternatives. The overtopping analysis applies limits of 2 and 50 liters/meter/second (L/m/s) (based on USACE Coastal Engineering Manual guidance) for the earthen levees and vertical walls within the design alternatives (Engineering Appendix Section 5.0).

However, Engineering Appendix Tables 5-5 and 5-6 indicate the overtopping rates exceed 50 L/m/s for three of the four return periods (vertical wall) and overtopping rates exceed 2 L/m/s for two of the four return periods (levee). The documentation does not explain whether exceeding the maximum allowable overtopping thresholds is (or is not) cause for concern, or if alternative designs that decreased the overtopping (for example, higher or wider structures) were considered.

Significance – Medium/Low

Describing the implications of having calculated overtopping rates that exceed the selected maximum allowable threshold for the vertical wall and levee structures would strengthen the Staten Island DFR.

Recommendation for Resolution

1. Include additional discussion within the Staten Island DFR on the implications of having design overtopping rates that exceed the maximum allowable overtopping rate threshold selected for the vertical wall and levee structure types.

Final Panel Comment 14

The recent shoreline change analysis does not include analysis of post-Hurricane Sandy data, which provide an important and relevant data set.

Basis for Comment

Hurricane Sandy represents the storm of record near the project area and post-storm beach survey data exist. The Interim Feasibility Study for Fort Wadsworth to Oakwood Beach Engineering and Design Appendix Section 2.0 (p. 5) states, “Hurricane Sandy was the most devastating coastal storm event on record to impact the south shore of Staten Island.” Engineering and Design Appendix Section 2.1.1 (p. 6) discusses the available topographic survey data for the study with traditional survey data for Oakwood Beach (2000) and Fort Wadsworth to Oakwood Beach (2001) and post-Hurricane Sandy LiDAR (2012) available for the entire project area (Fort Wadsworth to Oakwood Beach). The recent shoreline change (2004 to 2014) analysis in Section 2.1.2 (p. 13) applies a shoreline defined from the wet/dry line from aerial photography with a statement that miscellaneous beach management activities (that include beach scraping and construction of artificial dunes) have occurred during this time. However, the Staten Island DFR does not present analyses or data to demonstrate how Hurricane Sandy altered the shoreline and beach volume throughout the project area.

Significance – Medium/Low

Documenting how Hurricane Sandy, the storm of record near the project area, altered beach profiles and shorelines within the project area would strengthen the Staten Island DFR.

Recommendation for Resolution

1. Complete shoreline and volume change analyses with the post-Hurricane Sandy data and revise the documentation to include discussion of the storm-induced shoreline changes and erosion.
2. Compare the Hurricane Sandy shoreline changes to the maximum change data (feet/year) in Engineering and Design Appendix Table 2-4 (p. 12) for the historical shoreline change.

Final Panel Comment 15

The hydrology model does not include flowpaths, flow redirections, concentration points, or the detailed explanation needed to support the assumptions behind the flow patterns.

Basis for Comment

The Interior Drainage Appendix (Appendix II) does not include a map showing all the hydrologic details in the upper watershed. In response to the additional data the Panel requested, USACE provided a hand-drawn scan drawing. However, the drawing does not include flowpaths, flow splits, and concentration points that need to be present to support the assumptions behind the flow patterns in the model.

Significance – Low

Inadequate details in the presentation of the flow pattern replicated hydrologic modeling may not show the full complexity of the existing flow patterns.

Recommendation for Resolution

1. Provide adequate documentation showing the flow patterns modeled within the watershed.
2. Include topographic contours and potential obstructions to the flow patterns.
3. Include a depiction flows through the storm drain system located inside the watershed.
4. Include additional explanations of the assumptions behind the flow patterns incorporated into the hydrology model.

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APPENDIX A

IEPR Process for the Staten Island IEPR Project

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

Table A-1 presents the schedule followed in executing the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study Independent External Peer Review (hereinafter: Staten Island IEPR). Due dates for milestones and deliverables are based on the award/effective date of September 16, 2015. The review documents were provided by U.S. Army Corps of Engineers (USACE) on June 17, 2015. Note that the public comment review, Task 6 activities, the Agency Decision Milestone (ADM) Meeting and the Civil Works Review Board (CWRB) meeting will occur after the submission of this report. Battelle will enter the 15 Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (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.

Upon receipt of the public comments, the Panel will review the comments and determine if an additional Final Panel Comment is necessary. If a Final Panel Comment results from the review of the Public Comments, an addendum to this report will be prepared, the comment will be entered into DrChecks, and a Comment Response process will occur for that comment. At this time, the dates of those activities are unknown and therefore have not been reported here.

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. This will be provided after completion on the public comment review and comment response. In Table A-1 below, the current contract end date is provided; however, the actual date for contract end will depend on the date that all activities for this IEPR, including CWRB preparation and participation, are conducted.

Table A-1. Staten Island Complete IEPR Schedule

Task	Action	Due Date
1 Workplan to Conduct IEPR	Award/Effective Date	9/16/2014
	Review documents available	6/17/2015
	Public comments available	9/9/2015
	Battelle submits draft Work Plan*	9/23/2014
	USACE provides comments on draft Work Plan	5/14/2015
	Battelle submits final Work Plan*	6/22/2015
2 IEPR Panel	Battelle requests input from USACE on the conflict of interest (COI) questionnaire	9/22/2014
	USACE provides comments on COI questionnaire	5/5/2015
	Battelle submits list of selected panel members*	10/3/2014
	USACE confirms the panel members have no COI	5/5/2015
	Battelle completes subcontracts for panel members	5/28/2015
3 Meetings	Battelle convenes kick-off meeting with USACE	5/22/2015
	Battelle sends review documents to panel members	6/18/2015
	Battelle convenes kick-off meeting with panel members	6/18/2015
	Battelle convenes kick-off meeting with USACE and panel members	6/18/2015

Table A-1. Staten Island Complete IEPR Schedule (Continued)

Task	Action	Due Date
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	7/15/2015
	Agency Decision Milestone (ADM) Meeting	TBD
	Civil Works Review Board (CWRB) Meeting	TBD
4a Conduct IEPR	Panel members complete their individual reviews	7/23/2015
	Battelle provides panel members with talking points for Panel Review Teleconference	7/28/2015
	Battelle convenes Panel Review Teleconference	7/29/2015
	Battelle provides Final Panel Comment templates and instructions to panel members	7/30/2015
	Panel members provide draft Final Panel Comments to Battelle	8/5/2015
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	8/06/2015 - 8/12/2015
	Panel finalizes Final Panel Comments	8/13/2015
4b Review of Public Comments	Battelle receives the public comments from USACE	9/16/2015
	Battelle sends public comments to Panel	9/18/2015
	Panel completes their review of the public comments	9/23/2015
	Battelle and Panel review Panel's responses to public comments	9/24/2015
	Panel drafts Final Panel Comment, if necessary	9/25/2015
	Panel finalizes Final Panel Comment regarding public comments	9/29/2015
	Battelle submits Revised Final IEPR Report or Addendum to USACE*	10/1/2015
5 Prepare Final IEPR Report	Battelle provides Final IEPR Report to panel members for review	8/14/2015
	Panel members provide comments on Final IEPR Report	8/14/2015
	Battelle submits Final IEPR Report to USACE*	**8/17/2015**
	USACE PCX provides decision on Final IEPR Report acceptance	8/18/2015
6 Comment/Response	Battelle inputs Final Panel Comments to the Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	8/27/2015
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	8/27/2015
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	8/27/2015
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE Planning Center of Expertise (PCX) for review	9/11/2015
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	9/17/2015
	USACE PCX provides draft PDT Evaluator Responses to Battelle	9/18/2015
	Battelle provides the panel members the draft PDT Evaluator Responses	9/22/2015
	Panel members provide Battelle with draft BackCheck Responses	9/25/2015
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	9/28/2015
	Battelle convenes Comment-Response Teleconference with panel members and USACE	9/29/2015

Table A-1. Staten Island Complete IEPR Schedule (Continued)

Task	Action	Due Date
	USACE inputs final PDT Evaluator Responses to DrChecks	10/6/2015
	Battelle provides final PDT Evaluator Responses to panel members	10/8/2015
	Panel members provide Battelle with final BackCheck Responses	10/14/2015
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	10/16/2015
	Battelle submits pdf printout of DrChecks project file*	**10/19/2015**

**Deliverable.*
[a] Task 6 occurs after the submission of this report, dates provided are estimates of the dates for the comment response process associated with the 15 Final Panel Comments reported here.The final deliverable will be held until the Public Comment Review and Comment Response process is completed

At the beginning of the Period of Performance for the Staten Island 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., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of seventeen charge questions provided by USACE, two overview questions 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 within twenty-one days of their subcontracts being 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 Staten Island IEPR review documents and reference materials listed below. The documents and files in bold font were provided for review; the other documents were provided for reference or supplemental information only.

- **Staten Island DFR Main Report**
- **Appendix I-Engineering (Hydrology and Hydraulic Engineering)**
- **Appendix II-Interior Drainage**
- **Appendix III-Geotechnical Evaluation**
- **Engineering Plan Sheets**
- **Appendix IV-Project Costs**
- **Appendix V-Benefits Appendix (Economics)**
- **Appendix VI- Draft Environmental Impact Statement (EIS) and Appendices**
- **Appendix VII-Real Estate Plan (includes Appendices VIIa, VIIb and VIIc consisting of maps & figures)**
- **Appendix VIIa-Real Estate Map Base**
- **Appendix VIIb-Real Estate Maps LOP**
- **Appendix VIIc-Real Estate Map Drainage Areas**
- Risk Register
- Decision Log/Decision Management Plan
- Report Synopsis
- USACE guidance, *Civil Works Review* (EC 1165-2-214), December 15, 2012

- Office of Management and Budget, *Final Information Quality Bulletin for Peer Review,* December 16, 2004.

About halfway through the review of the Staten Island IEPR documents, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 15 panel member questions to USACE. USACE was able to provide responses to all the questions during the teleconference or within a few days of the meeting via email and ftp site. In addition, a second call was held with the PDT and the Panel Hydrologist to review the Staten Island Interior drainage modeling as well as the related inputs and assumptions associated with the modeling.

In addition, throughout the review period, USACE provided documents at the request of panel members. These documents were provided to Battelle and then sent to the Panel as additional information only and were not part of the official review. A list of these additional documents requested by the Panel is provided below.

- HEC1 Schematic
- HEC1-SSSI (Discharge Hydrographs)
- Notes for HEC-HMS Runs
- NYC Storm Sewer D Areas
- SBEACH_Without Project
- SSSI1 Drainage B
- USGS Quad Wtshp Map
- Supporting Photos of Project Area

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response table 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 in a preliminary list of 18 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

A.3 IEPR Panel Teleconference

Battelle facilitated a four-hour 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.

At the end of these discussions, the Panel identified 14 comments and discussion points that should be brought forward as Final Panel Comments.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared 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 Staten Island 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 the merged individual comments table, a summary 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 member 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:** Describes a fundamental issue with the project that affects the current recommendation or justification of the project, and which will affect its future success, if the project moves forward without the issue being addressed. Comments rated as high indicate that the Panel determined that the current methods, models, and/or analyses contain a “showstopper” issue.
    2. **Medium/High:** Describes a potential fundamental issue with the project, which has not been evaluated at a level appropriate to this stage in the SMART Planning process. Comments rated as medium/high indicate that the Panel analyzed or assessed the methods, models, and/or analyses available at this stage in the SMART Planning process and has determined that if the issue is not addressed, it could lead to a “showstopper” issue.
    3. **Medium:** Describes an issue with the project, which does not align with the currently assessed level of risk assigned at this stage in the SMART Planning process. Comments rated as medium indicate that, based on the information provided, the Panel identified an issue that would raise the risk level if the issue is not appropriately addressed.

4. **Medium/Low: :** Affects the completeness of the report at this time in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium/low indicate that the Panel does not currently have sufficient information to analyze or assess the methods, models, or analyses.
5. **Low:** Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project. Comments rated as low indicate that the Panel identified information that was mislabeled or incorrect or that certain data or report section(s) were not clearly described or presented.

- 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. An additional Final Panel Comment was submitted for consideration after the panel review teleconference, bringing the total from 14 to 15 Final Panel Comments.At the end of this process, 15 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 Final Panel Comments are presented in the main report.

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APPENDIX B

Identification and Selection of IEPR Panel Members for the Staten Island IEPR Project

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B.1 Panel Identification

The candidates for the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study (hereinafter: Staten Island IEPR) Panel were evaluated based on their technical expertise in the following key areas: Economics/Plan Formulation, Biological Resources and Environmental Law Compliance, Coastal Engineering, Structural/Geotechnical Engineer, and Hydrologist. These areas correspond to the technical content of the Staten Island IEPR review documents and overall scope of the Staten Island IEPR 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 five 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.

The candidates were screened for the following potential exclusion criteria or COIs.[1] These COI questions serve as a means of disclosure and to better characterize a candidate's employment history and background. 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.

- Previous and/or current involvement by you or your firm[2] in the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study.
- Previous and/or current involvement by you or your firm[2] in coastal storm damage reduction studies in the Staten Island, Lower New York Bay region, including the shores from Fort Wadsworth to Oakwood Beach, Crescent Beach and Annandale to Tottenville.
- Previous and/or current involvement by you or your firm[2] in the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study related projects.
- Previous and/or current involvement by you or your firm[2] in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study-related projects.
- Current employment by the U.S. Army Corps of Engineers (USACE).

[1] Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "….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."

[2] Note: Includes any joint ventures in which firm is involved and if firm serves as a prime or as a subcontractor to a prime.

- Previous and/or current involvement with paid or unpaid expert testimony related to South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study**.**
- 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:] New York State Dept. of Environmental Conservation (NYDEC), New York City Dept. of Environmental Protection (NYCDEP), New York City Department of Parks and Recreation (NYCDPR) for pay or pro bono.
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the Staten Island, Lower New York Bay region, including the shores from Fort Wadsworth to Oakwood Beach, Crescent Beach and Annandale to Tottenville.
- 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, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are *specifically* with the New York District.
- Previous or current involvement with the development or testing of models that will be used for, or in support of the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study project.
- Current firm[2] involvement with other USACE projects, *specifically* those projects/contracts that are with the New York District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, [Engineer Research and Development Center [ERDC], etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the New York District. Please explain.
- *Any* previous employment by USACE as a direct employee, *notably* if employment was with the New York District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- *Any* previous employment by USACE as a contractor (either as an individual or through your firm[1]) within the last 10 years, *notably* if those projects/contracts are with the New York District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning coastal storm damage, and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from USACE contracts.
- A significant portion (i.e., greater than 50%) of personal or firm[1] revenues within the last 3 years from contracts with the non-Federal sponsors (New York State Dept. of Environmental Conservation (NYDEC), New York City Dept. of Environmental Protection (NYCDEP), New York City Department of Parks and Recreation (NYCDPR)).

- Any publicly documented statement (including, for example, advocating for or discouraging against) related to South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study.
- Participation in relevant prior and/or current Federal studies relevant to this project and/or South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study.
- Previous and/or current participation in prior non-Federal studies relevant to this project and/or South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study.
- 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.

Other considerations:

- Participation in previous USACE technical review panels
- Other technical review panel experience.

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. The five final reviewers were either affiliated with consulting companies or were independent engineering consultants. 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 presents an overview of the credentials of the final five members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information regarding each panel member and his area of technical expertise is given in Section B.3.

Table B-1. Staten Island IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Luckie	Vittor	Bender	Morgan	Raghavan
Economics/Plan Formulation					
Minimum 15 years demonstrated experience in publics work planning.	X				
Direct experience working with USACE.	X				
Minimum 5 years of experience directly dealing with USACE six-step planning process, governed by ER-1105-2-100, Planning Guidance Notebook.	X				
Familiarity with USACE plan formulation process, procedures, and standards as it relates to hurricane and coastal storm damage risk reduction.	X				
Familiarity with USACE coastal storm damage risk management projects and a minimum of 10 years of experience in coastal economics evaluation and coastal flood risk evaluation.	X				
Experience related to regional economic development, traditional Corps national economic development and Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA).	X				
Ability to evaluate traditional National Economic Development plan benefits associated with hurricane and coastal storm risk management projects.	X				
M.S. degree in a relevant field.	W[1]				
Biological Resources and Environmental Law Compliance					
Minimum 15 years of experience directly related to water resource environmental evaluation or review.		X			
Minimum 15 years of experience directly related to National Environmental Policy Act (NEPA) compliance.		X			
Experience in coastal storm risk management projects, particularly projects in urbanized coastal areas.		X			
Familiarity with the habitat, and fish and wildlife species that may be affected by the project alternatives in the study area.		X			
Familiarity with USFWS Habitat Evaluation Procedure (HEP).		X			
Familiarity with Endangered Species Act (ESA).		X			
Familiarity with essential fish habitat (EFH).		X			
Familiarity with Marine Mammals Protection Act (MMPA).		X			
Minimum M.S. in a related field.		X			
Coastal Engineering					
Minimum 10 years of experience in coastal and hydraulic engineering with an emphasis on large urban coastal storm risk reduction projects			X		
Experience in the design of structural solutions to coastal storm damage			X		

Table B-1. Staten Island IEPR Panel: Technical Criteria and Areas of Expertise (Continued)

Technical Criterion	Luckie	Vittor	Bender	Morgan	Raghavan
reduction such a seawalls and floodwalls.					
Familiarity with USACE coastal, hydrologic and hydraulic computer models.			X		
Familiarity with sea level rise.			X		
Familiarity with geotechnical engineering principles including sediment characterization.			X		
Proficiency with S-Beach modeling.			X		
Proficiency with in cost estimating for coastal storm risk management projects using Micro-Computer Aided Cost Estimating System (MCACES/MII).			X		
Familiarity with risk and uncertainty analyses for coastal storm risk management projects.			X		
Minimum M.S. degree in engineering			X		
Structural/Geotechnical Engineering					
Minimum 15 years of experience in structural and geotechnical engineering and geomorphology.				X	
Demonstrated experience in performing geotechnical evaluation and geo-civil design for seawalls, floodwalls, and closure gates for coastal storm damage reduction projects in the Northeast.				X	
Familiarity with USACE geotechnical practices associated with the construction of large coastal storm projects.				X	
Ability to address USACE Safety Assurance Review (SAR) aspects of all projects.				W[2]	
Minimum M.S. degree in engineering.				X	
Registered professional engineer.				X	
Hydrology					
Minimum 15 years of experience in hydrologic and hydraulic engineering.					X
Familiarity with coastal flooding.					X
Familiarity with hydrologic statistics.					X
Familiarity with risk and uncertainty analysis.					X
Expertise in interior drainage modeling.					X
Expertise in minimum facilities calculations.					X
Proficiency in Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) model.					X
Minimum M.S. degree in engineering.					X

W[1], W[2]: USACE accepted a waiver of this panel member's educational requirements as part of the Task 2 deliverable.

B.3 Panel Member Qualifications

David Luckie

Role: Economics and plan formulation expert.
Affiliation: Independent Consultant

Mr. Luckie is an independent consultant with more than 25 years of professional experience in public works planning with a focus on water resource economics, planning, plan formulation, benefit-cost analysis, and risk-based analysis. He earned his B.S. in economics from the University of South Alabama in 1986 and his professional experience includes working with multidisciplinary teams to provide complex planning studies, including flood control, water supply, water quality, and ecosystem restoration. Mr. Luckie is experienced in working with USACE, having spent 16 years working for USACE as a Regional Economist/project delivery team (PDT) Leader with the Mobile District, Planning and Environmental Division. He has led or worked on numerous multidisciplinary teams to produce complex Federal water resource studies and was involved in various high-profile public works projects. He has prepared, supervised, and reviewed water resource projects studied by USACE in both the public and private sector and has provided the economic analyses and plan formulation services for such studies as the Buffalo Bayou and Lower White Oak Bayou Flood Damage Reduction and Ecosystem Restoration Study, Harris County Flood Control District (HCFCD), Harris County, Texas.

Mr. Luckie is intimately familiar with the USACE Six Step Planning Process governed by ER 1105-2-100. Since 1988, he has served as the project economist and/or PDT leader and as a reviewer on a broad array of water resource studies that include multiple purposes. He has worked in close coordination with multidisciplinary teams to identify, formulate, and evaluate alternatives and to identify cost effective solutions to water resource problems, flood risk management, and ecosystem restoration throughout the Southeast and across the U.S. using the Six-Step Planning Process. He is familiar with USACE plan formulation process, procedures, and standards as they relate to hurricane and coastal storm damage risk reduction. For more than 25 years, Mr. Luckie has worked on coastal storm risk management projects across the country, with projects along the Gulf coast, West coast and East coast. Project and locations include Walton County beaches (Florida), Jackson County (Mississippi), San Clemente beaches (California), Dare County Beaches (Carolina), and Hereford Inlet to Cape May (New Jersey).

Mr. Luckie is familiar with USACE coastal storm damage risk management projects and has experience in coastal economics evaluation and coastal flood risk evaluation. He also has direct experience in inspections and surveys following major storm events. Mr. Luckie has considerable experience in both traditional national economic development (NED) and regional economic development (RED) procedures, especially related to coastal storm damage risk management and the economic impacts associated with projects designed to reduce risk. He has been using or reviewing studies employing Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA) since its deployment in the 1990s. Demonstrable experience includes Buffalo Bayou and Lower White Oak Bayou Flood Damage Reduction and Ecosystem Restoration Study, Texas and Walton County beaches. With project experience in seven states over numerous years, he is highly qualified to review NED plan benefits for hurricane and coastal storm damage risk reduction projects.

Mr. Luckie has served on several USACE IEPR panels as an economist and plan formulation expert for coastal storm damage reduction, flood risk management, and ecosystem restoration studies.

Barry Vittor, Ph.D.

Role: Biological resources and environmental law compliance expert.
Affiliation: Barry A. Vittor & Associates, Inc.

Dr. Vittor is President and Senior Scientist at Vittor & Associates, with more than 40 years of experience in water resource planning and projects including port development, beach renourishment, and dune and barrier island reconstruction. He earned his doctoral degree in ecology from the University of Oregon, and as a Director of the Alabama Coastal Foundation and a member of the Mobile Bay National Estuary Program Management Committee, he has been very active in coastal resource management.

Dr. Vittor has more than 40 years of experience conducting National Environmental Policy Act (NEPA) impact assessments for the USACE, USEPA, and other public sector and private clients. He has conducted wetlands delineation, restoration, and management, and threatened/endangered species evaluations, and has assisted in regulatory agency permitting of hundreds of public and private projects throughout the Southeast. He has prepared Environmental Impact Statements (EISs) and Environmental Assessments (EAs) for government agency and private clients for port developments, beach renourishment, utility installations, aquatic weed control programs, and hurricane-related debris clean-up. Examples include the Peckman River Basin (NJ) flood control and ecosystem restoration feasibility study and the programmatic EIS for New York District navigation projects in Port of New York/New Jersey.

Dr. Vittor is experienced in coastal storm risk management projects, particularly in urbanized coastal areas. He has been involved in environmental assessments related to barrier island reconstruction after Hurricane Katrina; port development impacts on wave run-up during major storm events; and USACE IEPRs for Hereford Inlet to Cape May Inlet, New Jersey Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment Statement, and the Surf City and North Topsail Beach Integrated Feasibility Report and Environmental Impact Statement. He is familiar with the habitat and fish and wildlife species that may be affected by project alternatives in a study area. He has studied ecosystems along the entire U.S. Atlantic coast in regard to fisheries, benthic and demersal fauna, avifauna, and other biological resources, in association with assessments of beach renourishment/sand borrow projects and port and navigation development projects.

Dr. Vittor is familiar with USFWS Habitat Evaluation Procedure (HEP), and has applied HEP and several other habitat functional value indices (e.g., Cover Type, HGM, WET, WRAP) to field assessments of port development projects along the Gulf Coast, navigation channel maintenance dredging/disposal in riverine and embayment projects in the New York District, and numerous private development projects. He has conducted numerous studies and surveys of plants and animals species listed under the Endangered Species Act (ESA), for a wide variety of public and private client projects in the Gulf of Mexico and along the Eastern Seaboard. He has prepared Biological Assessments for terrestrial and aquatic species in accordance with USFWS guidelines and has addressed protected species of plants and animals in reviews of coastal beach and dune reconstruction projects on the U.S. Atlantic coast. He has assessed essential fish habitat (EFH) impacts related to beach renourishment, sand borrow operations, petroleum development, and port/navigation projects along the U.S. Atlantic and Gulf coasts; and has evaluated EFH impacts of storm debris removal operations in the northern Gulf of Mexico.

Dr. Vittor is familiar with the Marine Mammals Protection Act (MMPA) and has assessed potential impacts of offshore oil and gas developments on marine mammals in the Gulf of Mexico, including noise effects, ship collisions, and seismic surveys. He has also participated in peer reviews of impacts of coastal dune and beach reconstruction on marine mammals along the U.S. Atlantic coast, and has coordinated with

NMFS in regard to potential impacts of storm debris clean-up operations on marine mammals (especially bottlenose dolphin) in the northern Gulf.

Dr. Vittor has served on several USACE IEPR panels as a biology, ecology, and NEPA specialist for coastal storm damage reduction, flood risk management, deep draft navigation, and ecosystem restoration studies.

Christopher Bender, P.E., D.CE, Ph.D.

Role: Coastal engineering expert.
Affiliation: Taylor Engineering, Inc.

Dr. Bender, P.E., is a senior engineer in the coastal engineering group at Taylor Engineering, Inc. He earned a Ph.D. in coastal engineering from the University of Florida in 2003, is a registered professional engineer in Florida and Mississippi, and is a Diplomate of Coastal Engineering (D.CE) through the ACOPNE certification program of the American Society of Civil Engineers (ACOPNE). He leads much of Taylor Engineering's simulations and evaluations of hurricane surges, wave mechanics and loading, littoral processes, shoreline stability and protection, beach renourishment, and sediment transport. He also serves as an adjunct professor at the University of North Florida since 2009, teaching coastal engineering and processes classes. His experience includes large urban coastal risk reduction engineering projects and shore protection projects and designs in Florida and coastal storm surge studies in southeast U.S., New York, New Jersey, and the Gulf of Mexico. Studies include the FEMA Region IV Coastal Storm Surge Update Studies in South Carolina, Georgia, Northeast Florida, and East Coast Central Florida and the Nuclear Regulatory Commission Evaluation of Coastal Storm Surge for Nuclear Power Plants. Dr. Bender has also served on USACE IEPR panels as the coastal engineering discipline expert for coastal storm damage reduction studies for the Hereford Inlet to Cape May Inlet, New Jersey Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment Statement, and the Surf City and North Topsail Beach Integrated Feasibility Report and Environmental Impact Statement.

Dr. Bender is familiar with the design principles and theory behind the design of structural solutions to coastal storm damage reduction such a seawalls and floodwalls, and has experience in the evaluation of coastal forcing for storm damage reduction solutions (wave and water level conditions and wave forcing necessary to design the structure and structure protection). He is familiar with USACE coastal, hydrologic and hydraulic computer models, and has extensive experience setting up, executing, and post-processing results in USACE coastal models including SBEACH, Beach-fx, SWANN, ARCIRC, GENESIS, STWAVE, and CEDAS for several projects. He has also worked with model input and output files for USACE coastal model Beach-FX in storm damage and project benefit analysis efforts and has experience working with SWAN and ADCIRC results and model input and control files for recent storm surge studies such as FEMA Region IV's coastal storm surge update studies in South Carolina, Georgia, and Florida and evaluation of storm surge hazards at coastal nuclear power plants for the Nuclear Regulatory Commission. Dr. Bender is also proficient in SBEACH modeling, and has set up and calibrated SBEACH models for such studies as the Ft. Pierce Shore Protection Plan (SPP) in support of general reevaluation report (GRR) and limited reevaluation report (LRR) document development and the Jupiter Carlin Section 934 report.

Dr. Bender is familiar with sea level rise, with past modeling and design work, having included consideration of sea level rise through application of Intergovernmental Panel on Climate Change (IPCC) estimates and USACE Engineer Circulars (EC) 1165-2-211 and 1165-2-212. He has also co-authored a

journal article on effects of sea level rise on coastal storm surge along the Texas coast.[3] Dr. Bender is also familiar with geotechnical engineering principles including sediment characterization. Relevant studies include his work for Ft. Pierce SPP GRR/LRR and Jupiter Carlin Section 934 that involved the study of geotechnical aspects to ensure proper modeling of sediment transport and sufficient sand resources. He was also involved in the beach nourishment design for Dredge Material Management Area (DMMA) on Florida's east coast, which required assessment of sediment compatibility with native material.

Dr. Bender is proficient in cost estimating for coastal storm risk management projects using Micro-Computer Aided Cost Estimating System (MCACES/MII), with relevant past project work including the Ft. Pierce GRR/LRR that required the development of input data and analysis of output data for the MCACES system. He is familiar with risk and uncertainty analyses for coastal storm risk management projects, participating in such studies as the development of GRR and LRR documents for the Ft. Pierce, Florida Shore Protection Project; GRR document for the Panama City Beaches, Florida Shore Protection Project; and Feasibility Study for the Walton County Project. The projects applied USACE models to define damages and benefits and NED aspects of project alternatives. Efforts on the various projects included storm damage modeling, alternative development, alternative analysis, and NED plan selection. He also worked with a team of experts to develop risk-based methodology to calculate revised coastal storm surge and wave estimates for the Joint USACE/FEMA Coastal Storm Surge Studies along the Louisiana and Texas coasts. He also participated in projects to develop revised coastal storm surge and wave estimates for FEMA Coastal Storm Surge Studies along the South Carolina, Georgia, and east Florida coasts.

Dr. Bender is capable of addressing the USACE Safety Assurance Review (SAR) requirements and has conducted SAR review in support of such studies as the Shore Protection Projects (SPP) in Martin County and St. Lucie County, Florida. He has also authored or co-authored numerous publications on nearshore wave transformation, coastal processes, and simulation of nearshore waves. His involvement on the Fort Pierce, Florida Limited Reevaluation Report (LRR) and General Reevaluation Report (GRR) projects, the Nassau County, Florida GRR, and the Panama City Beaches, Florida GRR project included working with the USACE application of risk and uncertainty analyses in coastal storm damage reduction studies. He is also familiar with the Generalized Risk and Uncertainty Coastal Plan (GRANDUC model) and has successfully applied these models to many locations from Florida to Texas.

Russell Morgan, P.E.

Role: Marine structural and geotechnical engineering expert.
Affiliation: GZA GeoEnvironmental, Inc.

Mr. Morgan is a Senior Principal with GZA GeoEnvironmental, Inc., practicing as a geotechnical and marine engineer. He is a registered professional engineer in Rhode Island, Connecticut, and Massachusetts. He earned his M.S. in civil engineering from the University of Rhode Island and has more than 30 years of experience in marine geotechnical engineering and geomorphology in the Northeast/New England United States. His extensive experience includes inspection, rehabilitation, analysis, design, and construction monitoring of marine structures and he specializes in structural and geotechnical engineering as applied to the marine environment with design experience related to pile-

[3] [1] Atkinson, J., Smith, J., and Bender, C.J. 2013. Sea-Level Rise Effects on Storm Surge and Nearshore Waves on the Texas Coast: Influence of Landscape and Storm Characteristics. Journal of Waterway, Port, Coastal, and Ocean Engineering. ASCE. 139. 98 – 117

support structures, relieving platforms, bulkheads, retaining walls, cofferdams, ship berthing, and mooring systems.

Mr. Morgan has demonstrable experience in performing geotechnical evaluation and geo-civil design for seawalls, floodwalls, and closure gates for coastal storm damage reduction projects in the Northeast. Relevant studies include the Waterfront Facilities Evaluation, Newport, Rhode Island; Village at Mount Hope Bay, Tiverton, Rhode Island; Pequot Ave Revetment, New London, Connecticut; repair of historic seawall storm damage in Newport Rhode Island, and Richmond Square, Providence, Rhode Island. He was also deployed as a member of an Urban Search and Rescue team to assess damage to coastal structures and observed structural failures due to moving flood waters in support of the Hurricane Katrina Disaster Relief Deployment, Waveland & Bay St. Louis Mississippi.

Mr. Morgan is familiar with USACE geotechnical practices associated with the construction of large coastal storm projects. Examples include his involvement with such studies as Pequot Ave Revetment, New London, Connecticut where he completed reengineering to damages associated with Hurricane Sandy and provided protection to pump stations in the City of New London, Connecticut. He designed environmental loading that included wave impacts to provide a basis of design for the revetment. Another study was for the Village at Mount Hope Bay, Tiverton, Rhode Island waterfront development located at the site of a former waterfront petroleum tank farm that included the design of stone revetment and seawall for shoreline protection. Mr. Morgan also recently completed a repair of a portion of the historic "Cliff Walk" in Newport, Rhode Island. A portion of the stone masonry seawall sustained damage during recent severe storms. The work included repair design and construction oversight of failed portions of the seawall and rip rap toe protection. Mr. Morgan recently completed the design and construction document preparation for a large stone seawall rehabilitation project providing flood and erosion protection of a nuclear power plant located on Lake Ontario.

Mr. Morgan is familiar with many of the approaches and quality control procedures for addressing USACE Safety Assurance Review (SAR) aspects of projects as identified in ER 1110-2-1150 and has followed many of them when completing flood evaluations and assessed assumptions made in hazard models as they are related to existing shore protection structures and shore conditions. He has also reviewed the results of coastal modeling hazards and has had to assess uncertainty and potential impacts.

Mr. Morgan has co-authored several reviewed publications related to structural/geotechnical engineering and geomorphology. [4,5]

Hari Raghavan, P.E., C.F.M., Ph.D.

Role: Hydrology expert.
Affiliation: Atkins North America, Inc.

Dr. Raghavan is a hydraulic and hydrologic engineer at Atkins North America, Inc. He earned his Ph.D. in Ocean Engineering from the University of Hawaii, is a registered professional engineer in California and Arizona, and is a Certified Floodplain Manager. He has more than 24 years of combined technical and academic experience in the areas of hydrology, hydraulics, sediment transport, and coastal engineering, specializing in the development of numerical models and their application to a variety of large Civil Works

[4] Morgan, R.J., Carchedi, D.R., "Geotechnical Considerations in Port Design", PORTS Conference, 1989.

[5] Morgan, R, Pizzimenti, P, Walsh, K, and Margenson, G "Pile Capacity Setup in Fine Grained Glacial Deposits at the South Brooklyn Marine Terminal" Ports 2013.

projects. He is experienced in hydrodynamics, wave mechanics, multidimensional computational fluid dynamics, and sediment transport.

Dr. Raghavan's hydraulic experience includes coastal engineering and flood-related studies and since earning his Ph.D.in ocean engineering, he has participated significantly in flood-related studies. He was the project engineer for several floodplain delineation studies involving large urban areas such as the Highline-Western Canal floodplain delineation study and the dam inundation study of Wide Canyon and Tahchevah Dam, Riverside County, California. He was also the project engineer in several large-scale drainage master plan studies such as the Sun Valley Area Drainage master plan and Lower Hassayampa River watercourse master plan, both in Arizona.

Dr. Raghavan is familiar with coastal flooding and has supported flood studies during the course of his career. He has employed the HEC-HMS model to support the completion of flood studies and has extensive experience using the HEC-1 software, the predecessor to the HEC-HMS model. Recently, Dr. Raghavan completed a study as a technical expert for the Flood Control District of Maricopa County, reviewing and evaluating HEC-HMS software results to determine compliance with the County's hydrology procedures and develop recommendations to HEC for possible modifications and improvements to the software. During the project, he interfaced directly with HEC-HMS software developers, discussing software internal workings and possible software modifications.

Dr. Raghavan is experienced in the application of statistical methods in hydrology such as the flood frequency analysis and was a key part of the technical team that developed the recent update to the Arizona Department of transportation (ADOT) hydrology manual, which included several chapters involving statistical methods in hydrology. He has made use of historical gage data records to perform several continuous numerical simulations for projects such as the Va Shly'ay Akimel – Salt River Ecosystem restoration project and Lower Hassayampa watercourse master plan. Dr. Raghavan has also analyzed synthetic floods with different event frequencies in several projects such as the Piedmont Flood Hazard Assessment Manual (PFHAM) Refinement of Methodology—Alluvial Fan Hazard Identification and Mitigation Methods, FCDMC, Maricopa County, Arizona. He is also fully knowledgeable in flood flow frequency analysis as presented in USGS Bulletin 17B "Guidelines for Determining Flood Flow Frequency" (1982).

Dr. Raghavan is also knowledgeable in interior drainage hydrology and the application of the minimum facilities calculations as presented in USACE Technical Letter ETL 110-2-367. Dr. Raghavan was a project engineer for applicable studies involving flood control levees such as Pre-construction, Engineering, and Design (PED) Hydraulics Design of Tres Rios North Levee, Pre-final Project Analysis, USACE, Maricopa County, Arizona; and Willow Creek Floodplain Delineation Study and Levee Assessment, City of Prescott, Arizona. His experience in hazard mitigation and flood damage assessment includes development of a computer tool to analyze and estimate exposure to risk and potential damage assessment. This tool developed by Dr. Raghavan has been used to evaluate hazard exposure and loss of property and life due to various hazards such as flooding, wildfire etc. This tool uses GIS coverages of asset inventories, hazard rating delineations, and population distribution from HAZUS to develop hazard exposure summaries of population and asset loss. He is also familiar with the use of HEC-FDA software for flood damage assessment, as well as the application of risk and uncertainty to flood damage reduction as presented in EM 1110-2-1619. Relevant studies include the Mohave Valley Risk MAP, Mohave County, Arizona, and Piedmont Flood Hazard Assessment Manual (PFHAM) Refinement of Methodology Alluvial Fan Hazard Identification and Mitigation Methods, FCDMC.

Dr. Raghavan is familiar with the safety assurance review (SAR) aspects of projects in accordance with ER 1110-2-1150, including the quality and quantity of the surveys; conceptual design; models use for

hazard assessment; assessment of hazard assumptions; and the uncertainty/ consequences associated with the potential for loss of life. A representative study incorporating these aspects includes the Piedmont Flood Hazard Assessment Manual (PFHAM) – Alluvial Fan Hazard Identification & Mitigation Methods for Flood Control District of Maricopa County, Arizona. He has experience conducting technical peer reviews including the USACE Berryessa Creek IEPR; FEMA submittal review, 2007 to 2010 and 2014; and Sand Gravel Mining Review for Flood Control District of Maricopa County, 2013.

APPENDIX C

Final Charge to the IEPR Submitted to USACE on June 18, 2015 for the Staten Island IEPR Project

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CHARGE QUESTIONS AND GUIDANCE TO THE PANEL MEMBERS FOR THE IEPR OF THE SOUTH SHORE OF STATEN ISLAND, NY COASTAL STORM DAMAGE REDUCTION FEASIBILITY STUDY

BACKGROUND

The study area covers about 13 miles of coast on Staten Island, extending along Lower New York Bay and Raritan Bay from Fort Wadsworth to Tottenville at the mouth of Arthur Kill (Figure 1). However, the extent of the Tentatively Selected Plan (TSP) is generally limited to the eastern 6 miles of the shore from Fort Wadsworth to Oakwood Beach (FWOB-Reach 1) (Figure 2). FWOB-Reach 1 has a long history of storm damage. The shoreline experienced major erosion and storm damage from the Northeaster of December 1992, the March 1993 storm, and most recently, Hurricane Sandy in October 2012. These storms caused evacuations in several communities, damage to hundreds of structures from flooding, and loss of over hundreds of structures from erosion. The loss of beachfront now leaves the area increasingly vulnerable to severe damages even from moderate storms.

The development of conceptual plans within this feasibility study consists of looking at different measures at selected locations of the study area from Ft. Wadsworth to Oakwood Beach, Reach 1 (Phase 1).

Prior to Sandy, and even more so after the storm, there has been an expressed interest from local government and Congressional representatives to re-evaluate the western 7 miles of shoreline (Reach 2 and 3) to assess if there are additional areas (hydraulically disconnected from Reach 1) that would be eligible for Federal participation under the existing study authority. In order to address this concern, the District is completing the report on the FWOB area as an initial (interim) report, partially responsive to the Study resolution with the results for Reach 2 and 3 included in a second report. The District does not want to delay Reach 1 by reinvestigating the western 7 miles and addressing this investigation in a single report. This approach offers both flexibility and opportunities for long-term decisions about what works best for each location, as well as the entire study area.

The formulation for the subject project was essentially complete pre-Hurricane Sandy, and a TSP had been identified. The following provides an overview of the re-evaluation of the TSP that was identified prior to Hurricane Sandy. The TSP is being re-evaluated to take into account Post Sandy buyouts, updated Federal Emergency Management Agency (FEMA) stage frequency curves, and updated structure inventory.

The coastal storm damage reduction TSP includes a buried seawall and an interior flood control feature to compensate the interior runoff on the protected side of the proposed structural protection. The total expected cost of the implementation of the project is approximately $300 million.

The South Shore of Staten Island, NY, Coastal Storm Damage Reduction Feasibility Study Team has conducted the feasibility study following the U.S. Army Corps of Engineers (USACE) Planning process defined in ER 1105-2-100 (Planning Guidance Notebook) and the USACE SMART Planning initiative, which incorporates risk-informed evaluation with less detailed information to reach decision points more efficiently, and includes greater Vertical Team coordination throughout the study. The study has been divided into phases each with key milestones and associated In-Progress Reviews (IPR):

- Alternatives Milestone: The Vertical Team agrees on the proposed way forward on continuing analysis and evaluation on a focused array of alternatives.
- TSP Milestone: Vertical Team agrees on the Project Delivery Team's (PDT's) recommendation of a TSP and proposed way forward on developing sufficient cost and design information for the final feasibility study report and Vertical Team approval to release draft feasibility report for concurrent Policy, Agency Technical Review (ATR), IEPR, and Public Review.
- Agency Decision Milestone: The recommended plan and proposed way forward for feasibility-level design is endorsed by a panel of senior USACE leaders.
- Directors Review Board: Corporate checkpoint to determine if the final feasibility study report and National Environmental Policy Act (NEPA) document, and the proposed Report of the Chief of Engineers, are ready to be released for State and Agency review.
- Signed Chief's Report.

A risk register and other risk management documentation will accompany the feasibility study decision document. Although one of the objectives of IEPR is to evaluate whether sufficient information was available or technical analyses were completed, the IEPR must be completed within the context of the risk-informed decision-making process.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the South Shore of Staten Island, New York, Coastal Storm Damage Reduction Feasibility Study (hereinafter: Staten Island IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, dated December 15, 2012), and the Office of Management and Budget'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, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the Staten Island IEPR 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) with extensive experience in economics/plan formulation, biological resources and environmental law compliance, coastal engineering, structural/geotechnical engineering, and hydrology issues relevant to the project. They will also have experience applying their subject matter expertise to coastal storm damage reduction.

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 1165-2-214, Appendix D, 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.

Documents for Review

Table C-1. Review and Supplemental Documents

Title	No.of Pages
Review Documents	
Staten Island DFR Main Report	220
Appendix I-Engineering (Hydrology and Hydraulic Engineering)	89
Appendix II-Interior Drainage	127
Appendix III-Geotechnical Evaluation	120
Engineering Plan Sheets	37
Appendix IV-Project Costs	16
Appendix V-Benefits Appendix (Economics)	45
Appendix VI- Draft Environmental Impact Statement (EIS) and Appendices	752
Appendix VII-Real Estate Plan (includes Appendices VIIa, VIIb and VIIc consisting of maps & figures)	96
Appendix VIIa-Real Estate Map Base	-
Appendix VIIb-Real Estate Maps LOP	-
Appendix VIIc-Real Estate Map Drainage Areas	-
Public comments	50
Total Pages	**1552**

Documents for Reference

- USACE guidance, *Civil Works Review* (EC 1165-2-214), December 15, 2012
- Office of Management and Budget, *Final Information Quality Bulletin for Peer Review*, December 16, 2004.
- Foundations of SMART Planning
- SMART Planning Bulletin (PB 2013-03)
- SMART – Planning Overview
- Planning Modernization Fact Sheet.

SCHEDULE

Table C-2, the final schedule, is based on the June 15, 2015 receipt of the final review documents.

Table C-2. Final Review Schedule

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to panel members	6/18/2015
	Battelle convenes kick-off meeting with panel members	6/18/2015
	Battelle convenes kick-off meeting with USACE and panel members	6/18/2015
	Battelle convenes site visit for panel members to view project specific locations	
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	7/15/2015
	Panel members complete their individual reviews	7/23/2015
Prepare Final Panel Comments and Final IEPR Report	Battelle provides panel members with talking points for Panel Review Teleconference	7/28/2015
	Battelle convenes Panel Review Teleconference	7/29/2015
	Battelle provides Final Panel Comment templates and instructions to panel members	7/30/2015
	Panel members provide draft Final Panel Comments to Battelle	8/5/2015
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	8/06/2015 - 8/12/2015
	Panel finalizes Final Panel Comments	8/13/2015
	Battelle provides Final IEPR Report to panel members for review	8/14/2015
	Panel members provide comments on Final IEPR Report	8/14/2015
	Battelle submits Final IEPR Report to USACE*	8/17/2015
	USACE PCX Provides Decision on Final IEPR Report Acceptance	8/18/2015

Table C-2. Final Review Schedule (continued)

Task	Action	Due Date
Comment/ Response Process	Battelle inputs Final Panel Comments to the Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	8/27/2015
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	8/27/2015
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE Planning Center of Expertise (PCX) for review	9/11/2015
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	9/17/2015
	USACE PCX provides draft PDT Evaluator Responses to Battelle	9/18/2015
	Battelle provides the panel members the draft PDT Evaluator Responses	9/22/2015
	Panel members provide Battelle with draft BackCheck Responses	9/25/2015
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	9/28/2015
	Battelle convenes Comment-Response Teleconference with panel members and USACE	9/29/2015
	USACE inputs final PDT Evaluator Responses to DrChecks	10/6/2015
	Battelle provides final PDT Evaluator Responses to panel members	10/8/2015
	Panel members provide Battelle with final BackCheck Responses	10/14/2015
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	10/16/2015
	Battelle submits pdf printout of DrChecks project file*	10/19/2015
Civil Works Review Board (CWRB)	Panel prepares and/or reviews slides for DRB	TBD
	Civil Works Review Board (CWRB) Meeting	TBD

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Staten Island IEPR 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 Staten Island IEPR documents. Please focus your review on the review materials assigned to your

discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot 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 the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-214; Appendix D).

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 (Dick Uhler, uhlerr@battelle.org) or Program Manager (Karen Johnson-Young (johnson-youngk@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnson-youngk@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 Dick Uhler, uhlerr@battelle.org, no later than July 23, 2015.

IEPR of the South Shore of Staten Island, NY Coastal Storm Damage Reduction Feasibility Study

CHARGE QUESTIONS AND RELEVANT SECTIONS AS SUPPLIED BY USACE

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?

Decision Documents

3. Assess the adequacy and acceptability of the project evaluation data used in the study analyses.
4. Assess the adequacy and acceptability of the economic, environmental, and engineering assumptions that underlie the study analyses.
5. Assess the adequacy and acceptability of the economic, environmental, and engineering methodologies, analyses, and projections.
6. Assess the adequacy and acceptability of the applications of models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives. This includes model inputs and outputs.
7. Assess the adequacy and acceptability of the methods for integrating risk and uncertainty.
8. Assess the adequacy and acceptability of the formulation of alternative plans and the range of alternative plans considered.
9. Assess the adequacy and acceptability of the quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans.
10. Assess the adequacy and acceptability of the overall assessment of significant environmental impacts 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.

Tentatively Selected Plan (TSP)

13. For the TSP, assess whether the models used to assess life safety hazards are appropriate.
14. For the TSP, assess whether the assumptions made for the life safety hazards are appropriate.

15. For the TSP, 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 TSP, 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.

Overview Questions

17. Please identify the most critical concerns (up to five) you have with the project and/or review documents.

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

Public Comment Questions (provided to the Panel separately for their review of the public comments)

19. Does information or concerns raised in the public raise any additional discipline-specific technical concerns with regard to the overall report?

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APPENDIX D

Conflict of Interest Form

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Conflicts of Interest Questionnaire

[Independent External Peer Review]

[Staten Island Storm Damage Reduction Feasibility]

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**
REPRESENTATIVE'S NAME: **Gina M. Crabtree**
TELEPHONE: **614-424-5097**
ADDRESS: **505 King Avenue, Columbus, OH 43201**
EMAIL ADDRESS: crabtreeg@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 X 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 X 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 X (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 X 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.

Gina Crabtree

YOUR SIGNATURE

8/20/14

DATE

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