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Final Independent External Peer Review Report Hereford Inlet to Cape May Inlet, New Jersey Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment

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
Balitmore District

Contract No. W912HQ-10-D-0002
Task Order: 0032

Final Independent External Peer Review Report

Hereford Inlet to Cape May Inlet, New Jersey
Hurricane and Coastal Storm Damage Risk Reduction Project
Draft Feasibility Report and Environmental Assessment

by

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for

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

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EXECUTIVE SUMMARY

Project Background and Purpose

The Hereford Inlet to Cape May Inlet project is located in Cape May County, New Jersey. The project consists of the Towns of North Wildwood, Wildwood, Wildwood Crest, and a small unincorporated section of Lower Township that contains U.S. Fish and Wildlife Service (USFWS) property at its southern border. The island is approximately 7 miles long and contains beaches, a few dunes, and low, expansive beaches that leave sections of the project area vulnerable to wave, flood, and erosion damage.

The north end of the barrier island contains the municipality of North Wildwood. Extensive erosion over the past decade has decreased the size of its beaches and dune system. Further south, in Wildwood and Wildwood Crest, the beaches have grown to the extent that they clog outfall structures; these structures must regularly be unclogged to promote stormwater flow. The concept for the feasibility study is to transfer sand from Wildwood and Wildwood Crest to North Wildwood in order to restore the beaches at the northern end and establish a beach in Wildwood and Wildwood Crest that is manageable and meets the needs of the municipality. The Tentatively Selected Plan (TSP) is to hydraulically backpass sand from the southern beach to the northern beaches using a land-based mobile hydraulic backpass system. The beach template will feature a dune of +16 NAVD 88 and a berm of +6.5 NAVD 88 that extends 75 feet from the dune toe. The initial construction is approximately 1.4 million cubic yards, and the nourishment cycle will be every four years. The dune will be planted with cape American beach grass and seaside panicum.

The non-Federal sponsor is the New Jersey Department of Environmental Protection (NJDEP). NJDEP has cost-shared over 14 projects with the U.S. Army Corps of Engineers (USACE) Philadelphia District along the New Jersey shoreline.

Independent External Peer Review Process

USACE is conducting an Independent External Peer Review (IEPR) of the Hereford Inlet to Cape May Inlet, New Jersey, Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment (hereinafter Hereford Inlet to Cape May Inlet IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Hereford Inlet to Cape May Inlet. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the

agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

Based on the technical content of the Hereford Inlet to Cape May Inlet IEPR review documents and the overall scope of the project, Battelle identified candidates for the Panel in the following key technical areas: economics, Civil Works planning, coastal engineering, biology/ecology, and geotechnical/construction engineering. Four panel members were selected for the IEPR. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel[1].

The Panel received an electronic version of the 1,210 pages of the Hereford Inlet to Cape May Inlet IEPR documents, along with a charge that solicited comments on specific sections of the documents to be reviewed. USACE prepared the charge questions following guidance provided in USACE (2012) and OMB (2004), which were included in the draft and final Work Plans.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference 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 Hereford Inlet to Cape May Inlet documents individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, 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, four were identified as having high significance, one had medium/high significance, five had medium significance, three had medium/low significance, and two had low significance.

Results of the Independent External Peer Review

The panel members agreed between each other on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Hereford Inlet to Cape May Inlet 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 Appendix A of this report. The following summarizes the Panel's findings.

[1] For this IEPR, Battelle identified a candidate who served in a combined role in the disciplines of economics/Civil Works planning.

Coastal and Geotechnical Engineering

The objective of the Tentatively Selected Plan (TSP) – to backpass sand along the project beach from an excessively accretional shoreline to the adjacent, highly erosional shoreline – is fundamentally sound and constructible, reasonable, and well-documented. However, the Panel is not convinced that there is a thorough understanding of the coastal processes necessary to predict the probable performance of the TSP.

One of the Panel's primary concerns regards the rate at which backpassed sand placed in two areas will erode relative to predictions. The two areas are (1) along a protruding seawall in close proximity to Hereford Inlet, and (2) immediately adjacent to the borrow area shoreline. If the observed rate of erosion at the project site is sustained, costs would increase due to the need to renourish more frequently and with higher volumes of material than proposed, and benefits would decrease through decreased shore protection. Thus, the performance of the TSP and benefit-to-cost ratio could be reduced. These erosion issues could be addressed by applying at least one calibrated model to improve the understanding of the project's probable erosion and renourishment rates relative to recent observerd beach erosion, and by considering structural measures (e.g., groins) in conjunction with the sand backpassing.

Another primary issue identified by the Panel is that the plan formulation does not consider using a groin or groin field with the sand backpassing plan. Groin structures would reduce the rate of losses from the fill area to the inlet (to the north) and to the borrow area (to the south), increase project longevity, and decrease renourishment requirements. This issue can be resolved by (1) developing conceptual alternatives that include site-specific, functional groins in conjunction with the sand backpassing and beach/dune construction plan, and (2) evaluating the project performance with and without the groins to determine the net benefit of including groins in the plan formulation relative to the TSP. Designing groins of modest dimensions appropriate to the site and optimized for the project would present a reasonably high likelihood of improving project performance with the least overall cost.

The Panel also noted that relatively basic models instead of more robust and traditionally applicable models were used to predict longshore transport, project erosion rates, and the renourishment volume and interval. The use of SEDTRAN and the Planform Evolution Model (PEM), and the limited description of how Hereford Inlet dynamics will affect project performance, greatly reduces confidence in the renourishment interval and quantities predicted for the TSP and, therefore, the entire TSP economics. Project alternatives and associated renourishment requirements can be better simulated by applying a calibrated and validated GENESIS model to document performance.

Civil Works/Economics

The Civil Works planning and economic evaluations were thorough and complied with current USACE guidance. The Six-Step Planning Process was followed well, but the Panel felt that the sand backpassing component of the TSP warrants further analysis (both with and without groin structures), as discussed in the engineering section above.

Environmental

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment (Hereford Inlet DFR/EA) contains a thorough and well-written description of existing environmental resources in the project area and anticipated impacts on these resources. However, the Panel did note that neither the potential for sea turtle nesting nor the presence/absence of critical habitat for protected species in the project area is addressed.

Table ES-1. Overview of 15 Final Panel Comments Identified by the Hereford Inlet to Cape May Inlet IEPR Panel

No.	Final Panel Comment
Significance – High	
1	A complete understanding of the processes that drive erosion and accretion in the project area, specifically near Hereford Inlet, is not sufficiently demonstrated; therefore, the recommended plan may underestimate future renourishment quantities.
2	The magnitude of observed beach volume changes along the fill and borrow areas, including recent beach fill activities, are not explicitly stated for recent conditions and may impact the project's predicted performance and economic benefits.
3	Project alternatives that include a groin or groin field with the sand backpassing plan may provide additional project benefits and performance, but such alternatives are not quantitatively assessed.
4	The model used to predict the renourishment quantity does not provide sufficient information to fully understand its development, application, and impact on the project's performance.
Significance – Medium/High	
5	The application of SEDTRAN instead of a more robust tool, such as GENESIS, to estimate longshore transport limits the ability to demonstrate an understanding of existing conditions and reliably predict project performance.
Significance – Medium	
6	The SBEACH model results were not compared to observed erosion as a result of Hurricane Sandy; therefore, confidence in the model's application within the storm damage modeling and its estimated outputs is limited.
7	The sediment grain size for the proposed beach fill construction may indicate that the beach fill template slope is too steep, thus increasing the risk that the project will not perform as intended or expected.
8	Factors contributing to risk are not described, and the uncertainty associated with the Hereford Inlet effects on the project performance is not fully developed or stated.
9	The ratios used to establish content-to-structure values are low and could underestimate both future without-project condition damages and benefits attributable to the project.

Table ES-1. Overview of 15 Final Panel Comments Identified by the Hereford Inlet to Cape May Inlet IEPR Panel (continued)

No.	Final Panel Comment
10	The economic analyses and calculations use various price levels and discount rates, which makes it difficult to compare values and confirm the validity of the analyses.
Significance – Medium/Low	
11	The granulometric data necessary to demonstrate the compatibility and overfill value of the proposed borrow area and native beach sediments are not presented, so the adequacy of the dredge and fill volume cannot be assessed.
12	The dangers to beach users associated with the potential effects of the beachface dredging operations are not presented.
13	Although closure of Turtle Gut Inlet was cited as a major cause of sand accretion at Wildwood and Wildwood Crest beaches, the feasibility of reopening the Gut was not considered.
Significance – Low	
14	Neither the potential for sea turtle nesting nor the presence/absence of critical habitat for protected species in the project area is addressed.
15	The recreation benefits analysis does not provide detail on how recreational users' willingness to pay for recreation opportunities was established.

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LIST OF ACRONYMS

ATR	Agency Technical Review
COI	Conflict of Interest
CSVR	Content-to-Structure Value Ratio
CVS	Contingent Value Survey
DFR/EA	Draft Feasibility Report and Environmental Assessment
DrChecks	Design Review and Checking System
EA	Environmental Assessment
EC	Engineer Circular
EIS	Environmental Impact Statement
ERDC	Engineer Research and Development Center
ESA	Endangered Species Act
FY	Fiscal Year
GSD	Grain Size Distribution
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
IEPR	Independent External Peer Review
NED	National Economic Development
NEPA	National Environmental Policy Act
NJDEP	New Jersey Department of Environmental Protection
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PEM	Planform Evolution Model
PDT	Project Delivery Team
SAR	Safety Assurance Review
SMART	Specific, Measurable, Attainable, Risk Informed, Timely
TSP	Tentatively Selected Plan
UDV	Unit Day Value
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1. INTRODUCTION

The Hereford Inlet to Cape May Inlet project is located in Cape May County, New Jersey. The project consists of the Towns of North Wildwood, Wildwood, Wildwood Crest, and a small unincorporated section of Lower Township that contains U.S. Fish and Wildlife Service (USFWS) property at its southern border. The island is approximately 7 miles long and contains beaches, a few dunes, and low, expansive beaches that leave sections of the project area vulnerable to wave, flood, and erosion damage.

The north end of the barrier island contains the municipality of North Wildwood. Extensive erosion over the past decade has decreased the size of its beaches and dune system. Further south, in Wildwood and Wildwood Crest, the beaches have grown to the extent that they clog outfall structures; these structures must regularly be unclogged to promote stormwater flow. The concept for the feasibility study is to transfer sand from Wildwood and Wildwood Crest to North Wildwood in order to restore the beaches at the northern end and establish a beach in Wildwood and Wildwood Crest that is manageable and meets the needs of the municipality. The Tentatively Selected Plan (TSP) is to hydraulically backpass sand from the southern beach to the northern beaches using a land-based mobile hydraulic backpass system. The beach template will feature a dune of +16 NAVD 88 and a berm of +6.5 NAVD 88 that extends 75 feet from the dune toe. The initial construction is approximately 1.4 million cubic yards, and the nourishment cycle will be every four years. The dune will be planted with cape American beach grass and seaside panicum.

The non-Federal sponsor is the New Jersey Department of Environmental Protection (NJDEP). NJDEP has cost-shared over 14 projects with the U.S. Army Corps of Engineers (USACE) Philadelphia District along the New Jersey shoreline.

The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Hereford Inlet to Cape May Inlet, New Jersey, Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment (hereinafter Hereford Inlet to Cape May Inlet IEPR) in accordance with procedures described in the Department of the Army, USACE Engineer Circular (EC) *Civil Works Review Policy* (EC 1165-2-214) (USACE, 2012) and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel on the existing environmental, economic, and engineering analyses contained in the Hereford Inlet to Cape May Inlet IEPR. The full text of the Final Panel Comments is presented in Appendix A.

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 (2012).

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 economic, engineering, and environmental analysis 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 Hereford Inlet to Cape May Inlet was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC No. 1165-2-214). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS

This section describes the method followed in selecting the members for the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (2012) and in accordance with OMB (2004) guidance. 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).

3.1 Planning and Schedule

At the beginning of the Period of Performance, 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. In addition, 53 charge questions were provided by USACE and included in the draft and final Work Plans. Of these charge questions, two were added by Battelle that sought summary information. USACE approved these additional charge questions in the draft and final Work Plans. The final charge also included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

Table 1 presents the schedule followed in executing the IEPR. The award/effective date for this project was September 28, 2012 but due to a one year delay in the submission of review documents, it was necessary to execute two time extensions; the first on March 19, 2013 and the second on October 21, 2013. The project period of performance was extended through September 30, 2014 with milestones and deliverables based on the date of September 18, 2013 receipt of review documents from USACE. Note that the work items listed in Task 6 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. 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.

Table 1. Hereford Inlet to Cape May Inlet IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date	9/28/2012
	Review documents available	9/18/2013
	Battelle submits draft Work Plan[a]	9/23/2013
	USACE provides comments on draft Work Plan	9/25/2013
	Battelle submits final Work Plan[a]	9/27/2013
2	Battelle requests input from USACE on the COI questionnaire	10/5/2012
	USACE provides comments on COI questionnaire	10/10/2012
	Battelle submits list of selected panel members[a]	12/20/2012
	USACE confirms the panel members have no COI	1/3/2013
	Battelle completes subcontracts for panel members	3/29/2013
3	Battelle convenes kick-off meeting with USACE	9/20/2013
	Battelle sends review documents to panel members	9/30/2013
	Battelle convenes kick-off meeting with panel members	9/30/2013
	Battelle convenes kick-off meeting with USACE and panel members	9/30/2013
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	10/18/2013
	Civil Works Review Board	April 2014
4	Panel members complete their individual reviews	10/24/2013
	Battelle provides panel members with talking points for Panel Review Teleconference	10/31/2013
	Battelle convenes Panel Review Teleconference	11/1/2013
	Battelle provides Final Panel Comment templates and instructions to panel members	11/4/2013
	Panel members provide draft Final Panel Comments to Battelle	11/12/2013
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	11/12/2013-11/20/2013
	Battelle finalizes Final Panel Comments	11/20/2013
5	Battelle provides Final IEPR Report to panel members for review	11/25/2013
	Panel members provide comments on Final IEPR Report	11/26/2013
	Battelle submits Final IEPR Report to USACE[a]	**12/2/2013**

Table 2. Hereford Inlet to Cape May Inlet IEPR Schedule (continued)

Task	Action	Due Date
6[b]	Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE	12/3/2013
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	12/3/2013
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	12/3/2013
	USACE provides draft Project Delivery Team (PDT) Evaluator Responses to Battelle	12/11/2013
	Battelle provides the panel members the draft PDT Evaluator Responses	12/13/2013
	Panel members provide Battelle with draft BackCheck Responses	12/18/2013
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	12/19/2013
	Battelle convenes Comment-Response Teleconference with panel members and USACE	12/20/2013
	USACE inputs final PDT Evaluator Responses to DrChecks	12/27/2013
	Battelle provides final PDT Evaluator Responses to panel members	12/31/2013
	Panel members provide Battelle with final BackCheck Responses	1/6/2014
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	1/8/2014
	Battelle submits pdf printout of DrChecks project file[a]	1/9/2014
	Contract End/Delivery Date	9/30/2014

a Deliverable.

b Task 6 occurs after the submission of this report.

3.2 Identification and Selection of IEPR Panel Members

The candidates for the Panel were evaluated based on their technical expertise in the following key areas: economics, Civil Works planning, coastal engineering, biology/ecology, geotechnical/construction engineering . These areas correspond to the technical content of the Hereford Inlet to Cape May Inlet IEPR review documents and the overall scope of the Hereford Inlet to Cape May Inlet 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 COIs. Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected four experts for the final Panel. One panel member fulfilled a dual role as the expert on economics and Civil Works planning.

The four selected reviewers constituted 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.[2] These COI questions were intended to 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[3] in the Hereford Inlet to Cape May Inlet, New Jersey, Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment (hereinafter Hereford Inlet to Cape May Inlet DFS/EA) and/or technical appendices.
- Previous and/or current involvement by you or your firm[3] in flood risk management projects in the greater Wildwood, New Jersey region.
- Previous and/or current involvement (conceptual or actual design, construction, or operations and maintenance) by you or your firm[3] in projects related to the Hereford Inlet to Cape May Inlet Project.
- Current employment by USACE.
- Previous and/or current involvement with paid or unpaid expert testimony related to the Hereford Inlet to Cape May Inlet Project.
- Previous and/or current employment or affiliation with members of the cooperating agencies or local sponsors: the NJDEP or the New Jersey Field Office of the USFWS (for pay or pro bono).
- Past, current, or future interests or involvements (financial or otherwise) by you, your spouse or children related to the greater Wildwood, New Jersey, area.
- Current personal involvement with other USACE projects, including authorship of any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please

[2] 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."

[3] Includes any joint ventures in which a panel member's firm is involved and if the firm serves as a prime or as a subcontractor to a prime.

highlight and discuss in greater detail any projects that are specifically with the Philadelphia District.

- Previous or current involvement with the development or testing of models that will be used for or in support of the Hereford Inlet to Cape May Inlet Project DFS/EA, including but not limited to the Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) modeling program, Marshall and Swift Cost Estimator, COSTDAM, SBEACH, and GENESIS.
- Current firm[3] involvement with other USACE projects, specifically those projects/contracts that are with the Philadelphia District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Philadelphia District. Please explain.
- Any previous employment by USACE as a direct employee or contractor (either as an individual or through your firm[3]) within the last 10 years, notably if those projects/contracts are with the Philadelphia 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 reduction and include the client/agency and duration of review (approximate dates).
- Pending, current, or future financial interests in the Hereford Inlet to Cape May Inlet Project-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[3] revenues within the last 3 years from USACE contracts.
- A significant portion (i.e., greater than 50%) of personal or firm[3] revenues within the last 3 years from contracts with the non-Federal sponsor (NJDEP).
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Hereford Inlet to Cape May Inlet Project.
- Participation in prior Federal studies relevant to the Hereford Inlet to Cape May Inlet Project and/or the Hereford Inlet to Cape May Inlet Project DFS/EA.
- Previous and/or current participation in prior non-Federal studies relevant to the Hereford Inlet to Cape May Inlet Project and/or the Hereford Inlet to Cape May Inlet Project DFS/EA.
- 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.

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. The four final reviewers were either affiliated with consulting companies or were independent 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 made the final selection of the Panel. Section 4 of this report provides names and biographical information on the panel members.

3.3 Conduct of the IEPR

Prior to beginning their review and after their subcontracts were finalized, all 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 Hereford Inlet to Cape May Inlet 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.

- **Volume 1: New Jersey Shore Protection Study Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment**
- **Volume 2:**
    - **Appendix A: Engineering Technical Appendix**
- **Volume 3: Appendices**
    - **Appendix B: Economic Analysis**
    - **Appendix C: Environmental Analysis**
    - **Appendix D: U.S. Fish and Wildlife Service Coordination**
    - **Appendix E: Cultural Resources**
    - **Appendix F: Real Estate Plan**
    - **Appendix G: Pertinent Correspondence**
    - **Appendix H: Public Access Plan**
- **Risk Register and Decision Log**
- USACE guidance Civil Works Review Policy, (EC 1165-2-214) dated 15 December 2012
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

In addition, throughout the review period, USACE provided documents at the request of panel members. These documents were provided to Battelle and then disseminated 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.

- Wildwood Aerial Dated.avi
- Enclosure A: Beach Design Template Profiles

- Enclosure B: Model Comparison and Stage Frequency Information
- Enclosure C: SBEACH Calibration Plots
- Enclosure D: Kure Beach North Carolina Beach Nourishment Project: Plan Formulation Using Wilmington District's Coastal Storm Damage Assessment Model
- Enclosure E: Periodic Nourishment
- Enclosure F:1955, 2003, 20121 Volume Comparison at selected project profiles

About half-way through the review of the Hereford Inlet to Cape May Inlet IEPR review 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 22 panel member questions to USACE. USACE was able to provide responses to some of the questions during the teleconference; the remaining panel member questions that required additional coordination within USACE were addressed by USACE by October 23, 2013.

3.4 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. As a result of the review, Battelle summarized the individual comments into a preliminary list of 17 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

3.5 IEPR Panel Teleconference

Battelle facilitated a 3-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 would 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 high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

At the end of these discussions, the Panel identified 16 comments and discussion points that should be brought forward as Final Panel Comments.

3.6 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 Hereford Inlet to Cape May Inlet 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 members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
    1. Comment Statement (succinct summary statement of concern)
    2. Basis for Comment (details regarding the concern)
    3. Significance (high, medium, 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 problem with the project that affects the current recommendation or justification of the project and which will affect the success of the project in the future, if moved forward without 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 problem with the project which has not been evaluated at a level appropriate to this stage in the SMART Planning process (Specific, Measurable, Attainable, Risk Informed, Timely) 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 not addressed, it could lead to a "showstopper" issue.
    3. Medium: Describes a problem 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 the based on the information provided, the Panel identified an issue that would raise the risk level if 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 there were data or report section(s) not clearly described or presented.

- Guidance 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).

During the Final Panel Comment development process, the Panel determined that one of the Final Panel Comments could be dropped; therefore, the total Final Panel Comment count was reduced to 15. Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 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 Appendix A of this report.

4. PANEL DESCRIPTION

Candidates for the Panel were identified using Battelle's Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and referrals. Battelle prepared a draft list of primary and backup candidate panel members (who were screened for availability, technical background, and COIs), and provided it to USACE for feedback. Battelle made the final selection of panel members.

An overview of the credentials of the final four members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and his area of technical expertise is presented in the text that follows the table.

Table 2. Hereford Inlet to Cape May Inlet IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Luckie	Bender	Vittor	Bodge
Economics				
Minimum 10 years of demonstrated experience in public works planning	X			
Minimum 5 years of experience related to the use of HEC-FDA software	X			
Familiarity with the Marshall and Swift estimator	X			
Familiarity with COSTDAM software	X			
Minimum 2 years of experience reviewing Federal water resource economic documents justifying construction efforts	X			
Experience related to regional economic development	X			
Capable of evaluating traditional National Economic Development (NED) plan benefits associated with hurricane and coastal storm damage risk reduction projects	X			
Minimum M.S. degree in economics	W[a]			
Civil Works Planning				
Minimum 10 years of demonstrated experience in public works planning	X			
Direct experience working directly for or with USACE	X			
Familiar with USACE plan formulation process, procedures, and standards as they relate to hurricane and coastal storm damage risk reduction	X			
Minimum 5 years of experience dealing directly with the USACE six-step planning process governed by ER 1105-2-100, Planning Guidance Notebook (USACE, 2000)	X			
Minimum M.S. degree in a relevant field	W[a]			

Table 2. Hereford Inlet to Cape May Inlet IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Luckie	Bender	Vittor	Bodge
Coastal Engineering				
Minimum 10 years of experience in coastal and hydraulic engineering with an emphasis on large beach nourishment projects		X		
Familiar with USACE application of risk and uncertainty analyses in hurricane and coastal storm damage risk reduction projects		X		
Familiar with standard USACE coastal, hydrologic, and hydraulic computer models		X		
Familiar with the SBEACH and GENESIS computer applications/model		X		
Capable of addressing the USACE Safety Assurance Review (SAR) requirements		X		
Registered professional engineer		X		
Minimum M.S. degree in engineering		X		
Biology/Ecology				
Minimum 10 years of demonstrated experience in evaluation and conducting National Environmental Policy Act (NEPA) impact assessments, including cumulative effects analyses			X	
Familiar with all NEPA EA requirements			X	
Experience with the Endangered Species Act (ESA)			X	
Experience with essential fish habitat			X	
Experience with the Marine Mammals Protection Act			X	
Particular knowledge of construction impacts on marine and terrestrial ecology of coastal regions of the mid-Atlantic coast of North America			X	
Minimum M.S. degree in an appropriate field of study			X	
Geotechnical/Construction Engineering				
Minimum 10 years of experience in geotechnical engineering				X

Table 2. Hereford Inlet to Cape May Inlet IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Luckie	Bender	Vittor	Bodge
Demonstrated experience in performing dune and berm restoration/construction associated with hurricane and coastal storm damage risk reduction, or related projects				X
Familiarity with practices used in flood/coastal storm damage risk reduction in the mid-Atlantic cost of North America				X
Experience related to cost engineering/construction management for hurricane and coastal storm damage risk reduction				X
Capable of addressing the USACE SAR requirements				X
Registered professional engineer				X
Minimum M.S. degree in engineering				X

[a] *Waiver statement presented as part of Task 2 deliverable and approved by USACE*

David Luckie

Role: Economics and Civil Work Planning expertise.
Affiliation: Independent Consultant

Mr. Luckie is an independent consultant with 24 years of professional experience in 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. His professional experience includes Federal feasibility studies, flood risk management studies, flood damage reduction studies, ecosystem restoration projects, beach and shoreline protection projects, and recreation studies. His technical capabilities include such applications as HEC-FDA, Marshall and Swift Cost Estimator software, and USACE, Wilmington District's Coastal Storm Damage Assessment Model (COSTDAM). During his 17-year career with USACE, Mr. Luckie led or worked on numerous multi-disciplinary teams to produce complex Federal water resource studies and was involved in various high-profile public works projects. He provided the economic analyses and plan formulation services for the Village Creek Watershed Study (Birmingham, Alabama). This study included extensive use of HEC-FDA; careful coordination with the study team's hydrology and hydraulic engineers; and flood risk reduction, recreation, and ecosystem restoration outputs. Mr. Luckie has prepared or reviewed studies with significant Regional Economic Development outputs, including Continuing Authorities Program studies under Sections 22 and 211(f), and large General Investigations studies. Mr. Luckie assisted in developing the without-project condition and provided economic analyses and plan formulation expertise to develop alternative plans with multiple high-priority outputs. He also is experienced in evaluating traditional National Economic Development (NED) plan benefits. Mr. Luckie is very familiar with the USACE six-step planning process governed by ER 1105-2-100, Planning Guidance Notebook

(USACE, 2000). This experience includes close coordination with multi-disciplinary teams to identify, formulate, and evaluate alternatives using the six-step planning process. Mr. Luckie has extensive experience with hurricane and coastal storm damage reduction projects, including work on the Panama City Beaches, South Walton County Beaches, and the Mississippi Coastal Improvements projects. Mr. Luckie has additional experience in identifying environmental impacts and evaluating the effects of structural flood and coastal storm damage reduction projects. In both the Village Creek Watershed and Mississippi Coastal Improvements projects, ecosystem resources were enhanced where possible and adverse impacts minimized to the greatest extent possible.

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

Role: Coastal Engineering expertise.
Affiliation: Taylor Engineering

Dr. Bender is a senior engineer in the coastal engineering group at Taylor Engineering, where he leads much of the firm's simulation and evaluation of hurricane surge, wave mechanics and loading, littoral processes, shoreline stability and protection, and sediment transport. He earned a Ph.D. in civil and coastal engineering from the University of Florida in 2003. Dr. Bender has experience with coastal engineering projects, including shore protection projects and designs in Florida and coastal storm surge studies in Florida, Louisiana, Texas, and South Carolina. His involvement on the Fort Pierce, (Florida) Limited Reevaluation Report 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. His background in coastal processes and practice consists of project work throughout the southeast United States, New York, and the Gulf of Mexico, including a project with USACE and the Federal Emergency Management Agency for Texas coastal storm surge modeling. As project manager, he developed the model setup and executed model testing and validation for additional wave studies stemming from the Louisiana coastal storm surge modeling effort. He is also familiar with the Generalized Risk and Uncertainty Coastal Plan (GRANDUC model). Dr. Bender's coastal hydrologic and hydraulic engineering experience includes assessment tools and models such as STWAVE, Beach-fx, GENESIS, SBEACH, CEDAS, SWAN, and ADCIRC, among other techniques. He has successfully applied these models to many locations from Florida to Texas. Recently, Dr. Bender has taught coastal engineering courses at the University of North Florida as an adjunct professor. He has authored or co-authored numerous publications on nearshore wave transformation, coastal processes, and simulation of nearshore waves. Dr. Bender's expertise in addressing USACE Safety Assurance Review (SAR) requirements is reflected in studies such as the Shore Protection Projects (SPP) Panama City Beaches, Florida, and St. Lucie County, Florida. He is a registered Professional Engineer in Florida and Mississippi.

Barry Vittor, Ph.D.

Role: Biology/Ecology expertise.
Affiliation: Vittor & Associates

Dr. Vittor is President and Senior Scientist at Vittor & Associates with has 42 years of experience in the studies of benthic ecology and coastal wetlands. He earned his Ph.D. from the

University of Oregon. 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 is experienced in conducting National Environmental Policy Act (NEPA) impact assessments for the USACE, U.S. Environmental Protection Agency, and other public sector and private clients. Specifically, he has prepared environmental impact statements (EISs) and environmental assessments (EAs) for navigation and industrial developments, post-hurricane reconstruction projects, beach renourishment, and commercial developments. Dr. Vittor has maintained and updated USACE protocols for NEPA compliance, including guidance for EA and EIS preparation. In particular, has addressed NEPA criteria for alternatives analysis, cumulative impacts, and coordination with other agencies. Dr. Vittor is experienced with the Endangered Species Act (ESA); he has been involved in numerous cases of formal consultation with USFWS and National Marine Fisheries Service, and presently carries a Federal permit for handling certain species in the Southeast. He has evaluated coastal and offshore impacts on essential fish habitat for many types of studies, including beach renourishment and sand borrow projects. Dr. Vittor is also experienced with the Marine Mammal Protection Act, including documentation and compliance. Additionally, he has assessed potential impacts on marine mammals from ship traffic (collisions) and noise, for oil and gas developments in the Gulf of Mexico. Dr. Vittor has conducted ecological studies of potential sand borrow areas and dredging impacts off the Mid-Atlantic coastal area, and has assessed navigation improvements and construction impacts in several port areas from Virginia to New York. Additionally, he has studied coastal resources that could be affected by beach renourishment in New Jersey.

Kevin Bodge, Ph.D., P.E

Role: Geotechnical/Construction Engineering expertise.
Affiliation: Olsen Associates

Dr. Bodge is a senior engineer for Olsen Associates, Inc. with 28 years of experience in applied coastal engineering. Dr. Bodge has been the project engineer/designer for dozens of large scale beach nourishment projects in the coastal marine environment throughout the United States and internationally. He has demonstrated experience in the measurement, design, construction, review, and monitoring of stabilizing dunes in ocean wave environments. This experience includes monitoring surveys and analysis of beach and dune changes; storm damage protection; flooding and dune erosion predictions; post-storm reparations to dunes by sand placement from upland and offshore sand sources; dredging; beach scraping; vegetation and sand fencing; and the preparation of designs, plans, and specifications. Dr. Bodge has experience in the analysis and design of dunes and bluffs in response to erosion from storm waves, currents, and water levels. Specific experience includes steep bluff erosion and reparation in southern Brevard County, Florida, after Hurricanes Frances and Jeannie (2004) and Elbow Cay, Bahamas, after Hurricanes Floyd and Michelle (1999-2005). As project engineer/engineer of record, Dr. Bodge has developed cost estimates and performed construction management, supervision, and construction review for dozens of beach and dune restoration projects throughout the southeastern United States and the Caribbean. He has significant experience in the development of construction projects (e.g., plans, specifications, solicitations), regulatory permitting, construction review, and post-project physical monitoring for beach nourishment, coastal erosion, and littoral transport projects. Dr. Bodge is familiar with geotechnical practices used in the Mid-Atlantic, specifically with regard to dune, bluff, and beach erosion and related sedimentary processes. His experience in this area includes project-specific experience in Bald Head Island and Bogue Banks, North Carolina; he also has served as Project Engineer for inlet and beach projects in Virginia. He is also familiar with the theory and application of the USACE Generalized Risk and Uncertainty suite of storm damage and economic analysis tools associated with coastal storm damage risk reduction along the Mid-Atlantic coast of North America and is experienced in addressing USACE SAR requirements. Dr. Bodge is a registered Professional Engineer in Florida, Hawaii, and Virginia.

5. SUMMARY OF FINAL PANEL COMMENTS

The panel members agreed between each other on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Hereford Inlet to Cape May Inlet IEPR review documents. Table 3 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summarizes the Panel's findings.

Coastal and Geotechnical Engineering
The objective of the Tentatively Selected Plan (TSP) – to backpass sand along the project beach from an excessively accretional shoreline to the adjacent, highly erosional shoreline – is fundamentally sound and constructible, reasonable, and well-documented. However, the Panel is not convinced that there is a thorough understanding of the coastal processes necessary to predict the probable performance of the TSP.

One of the Panel's primary concerns regards the rate at which backpassed sand placed in two areas will erode relative to predictions. The two areas are (1) along a protruding seawall in close proximity to Hereford Inlet, (2) immediately adjacent to the borrow area shoreline. If the observed rate of erosion at the project site is sustained, costs would increase due to the need to renourish more frequently and with higher volumes of material than proposed, and benefits would decrease through decreased shore protection. Thus, the performance of the TSP and benefit-to-cost ratio could be reduced. These erosion issues could be addressed by applying at least one calibrated model to improve the understanding of the project's probable erosion and renourishment rates relative to recent observerd beach erosion, and by considering structural measures (e.g., groins) in conjunction with the sand backpassing.

Another primary issue identified by the Panel is that the plan formulation does not consider using a groin or groin field with the sand backpassing plan. Groin structures would reduce the rate of losses from the fill area to the inlet (to the north) and to the borrow area (to the south), increase project longevity, and decrease renourishment requirements. This issue can be resolved by (1) developing conceptual alternatives that include site-specific, functional groins in conjunction with the sand backpassing and beach/dune construction plan, and (2) evaluating the project performance with and without the groins to determine the net benefit of including groins in the plan formulation relative to the TSP. Designing groins of modest dimensions appropriate to the site and optimized for the project would present a reasonably high likelihood of improving project performance with the least overall cost.

The Panel also noted that relatively basic models instead of more robust and traditionally applicable models were used to predict longshore transport, project erosion rates, and the renourishment volume and interval. The use of SEDTRAN and the Planform Evolution Model (PEM), and the limited description of how Hereford Inlet dynamics will affect project performance, greatly reduces confidence in the renourishment interval and quantities predicted for the TSP and, therefore, the entire TSP economics. Project alternatives and associated renourishment requirements can be better simulated by applying a calibrated and validated GENESIS model to document performance.

Civil Works / Economics
The Civil Works planning and economic evaluations were thorough and complied with current USACE guidance. The Six-Step Planning Process was followed well, but the Panel felt that the sand backpassing component of the TSP warrants further analysis (both with and without groin structures), as discussed in the engineering section above.

Environmental
The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment (Hereford Inlet DFR/EA) contains a thorough and well-written description of existing environmental resources in the project area and anticipated impacts on these resources. However, the Panel did note that neither the potential for sea turtle nesting nor the presence/absence of critical habitat for protected species in the project area is addressed.

Table 3. Overview of 15 Final Panel Comments Identified by the Hereford Inlet to Cape May Inlet IEPR Panel

No.	Final Panel Comment
Significance – High	
1	A complete understanding of the processes that drive erosion and accretion in the project area, specifically near Hereford Inlet, is not sufficiently demonstrated; therefore, the recommended plan may underestimate future renourishment quantities.
2	The magnitude of observed beach volume changes along the fill and borrow areas, including recent beach fill activities, are not explicitly stated for recent conditions and may impact the project's predicted performance and economic benefits.
3	Project alternatives that include a groin or groin field with the sand backpassing plan may provide additional project benefits and performance, but such alternatives are not quantitatively assessed.
4	The model used to predict the renourishment quantity does not provide sufficient information to fully understand its development, application, and impact on the project's performance of the Tentatively Selected Plan.
Significance – Medium/High	
5	The application of SEDTRAN instead of a more robust tool, such as GENESIS, to estimate longshore transport limits the ability to demonstrate an understanding of existing conditions and reliably predict project performance.

Table 3. Overview of 15 Final Panel Comments Identified by the Hereford Inlet to Cape May Inlet IEPR Panel

No.	Final Panel Comment
	Significance – Medium
6	The SBEACH model results were not compared to observed erosion as a result of Hurricane Sandy; therefore, confidence in the model's application within the storm damage modeling and its estimated outputs is limited.
7	The sediment grain size for the proposed beach fill construction may indicate that the beach fill template slope is too steep, thus increasing the risk that the project will not perform as intended or expected.
8	Factors contributing to risk are not described, and the uncertainty associated with the Hereford Inlet effects on the project performance is not fully developed or stated.
9	The ratios used to establish content-to-structure values are low and could underestimate both future without-project condition damages and benefits attributable to the project.
10	The economic analyses and calculations use various price levels and discount rates, which makes it difficult to compare values and confirm the validity of the analyses.
	Significance – Medium/Low
11	The granulometric data necessary to demonstrate the compatibility and overfill value of the proposed borrow area and native beach sediments are not presented, so the adequacy of the dredge and fill volume cannot be assessed.
12	The dangers to beach users associated with the potential effects of the beachface dredging operations are not presented.
13	Although closure of Turtle Gut Inlet was cited as a major cause of sand accretion at Wildwood and Wildwood Crest beaches, the feasibility of reopening the Gut was not considered.
	Significance – Low
14	Neither the potential for sea turtle nesting nor the presence/absence of critical habitat for protected species in the project area is addressed.
15	The recreation benefits analysis does not provide detail on how recreational users' willingness to pay for recreation opportunities was established.

6. REFERENCES

Creed, C.G., Bodge, K.R., and Suter, C.L. (2000). Construction Slopes for Beach Nourishment Projects. J. Waterway, Port, Coastal and Ocean Eng., 126(1): 57-62. Jan/Feb 2000.

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

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

USACE (2000). Planning Guidance Notebook. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) 1105-2-100. April.

USACE (2012). Water Resources Policies and Authorities: Civil Works Review. Department of the Army, US Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-214. December 15.

USACE (2013). Memorandum for Planning Community of Practice. Economic Guidance Memorandum, 13-03, Unit Day Values for Recreation for Fiscal Year 2013. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. February 13, 2013.

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APPENDIX A

Final Panel Comments

on the

Hereford Inlet to Cape May Inlet

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Final Panel Comment 1

A complete understanding of the processes that drive erosion and accretion in the project area, specifically near Hereford Inlet, is not sufficiently demonstrated; therefore, the recommended plan may underestimate future renourishment quantities.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment (Hereford Inlet DFR/EA) mentions that the dynamics of Hereford Inlet affect the coastal processes and morphology change near the project area (Section 2.7.1, Prior Shoreline Change Studies; Section 2.8, Shoreline Change Analysis; Section 2.8.4, Sediment Budget Balancing; Section 2.9, Bathymetry). However, other than recognizing these effects, the report does not discuss or analyze how the inlet processes, or how a limited understanding of the inlet processes, could influence the Tentatively Selected Plan (TSP).

An understanding of the inlet processes proves critical to understanding the extent to which past and present shoreline change rates are viable when predicting future shoreline change rates. The Hereford Inlet DFR/EA (Section 2.8.2) describes the shoreline change analysis procedure based on analyses conducted from 1986 to 2003. However, the assumption that the last 20 to 30 years provides a good predictive tool for the next 20 to 30 years is not well supported by the widely varying shoreline change rates in the project area (Tables 34 through 37). For example, the North Wildwood shoreline shows average accretion over the 60-year period from 1943 to 2003. Certainly, Hereford Inlet processes and inlet changes have influenced these shoreline change rates. The Hereford Inlet DFR/EA does not adequately discuss or describe the inlet processes to indicate a reasonable understanding of the inlet processes that influence shoreline changes in the project area.

Section 2.8.3 (Sediment Budget Uncertainty) of the Hereford Inlet DFR/EA includes assigned uncertainty percentages for various sediment budget input parameters. Table 38 assigns the highest uncertainty to *Longshore Sediment Transport from Inlets* (75%). Assignment of high uncertainty to this parameter does recognize the limited understanding of how the inlet will alter longshore transport rates. These transport rates directly influence the recommended plan project performance and renourishment intervals. The document does not adequately explain why the 75% value was selected or how this high uncertainty could influence the analysis of the project alternatives.

Section 2.6.10 (Inlet Sediment Bypassing) of the Hereford Inlet DFR/EA discusses in general terms the natural processes that define sediment bypassing at natural inlets (Figure 55). The section states that Hereford Inlet undergoes similar bypassing processes, with sediment moving through the inlet to downdrift shorelines. The section concludes with a statement recognizing that inlet sediment bypassing is *theorized* to act as a large sand source in the project area. While recognizing the inlet as a sediment source, the documentation contains no clear indication of how this large sand source has influenced recent shoreline changes or will influence the recommended project performance or renourishment interval.

The historical shoreline and longshore transport rate analyses are critical components to the development of the recommended plan and proposed renourishment intervals. The degree to which these analyses are influenced by the dynamics of Hereford Inlet is not sufficiently discussed or analyzed in the documentation, other than the mention that inlet dynamics influence shoreline behavior.

Significance – High

The coastal processes near Hereford Inlet will influence erosion rates, which influence the economics and justify the TSP.

Recommendations for Resolution

1. Include additional description of how data analysis, numerical models, or prior experience provide reasonable certainty that erosion and accretion rates applied to develop the TSP adequately account for the influence of Hereford Inlet.

Final Panel Comment 2

The magnitude of observed beach volume changes along the fill and borrow areas, including recent beach fill activities, are not explicitly stated for recent conditions and may impact the project's predicted performance and economic benefits.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA) describes observed shoreline changes along the project area for various time periods in Tables 34 through 37 and Figures 68 through 73 (pp. 168-177). However, it does not draw conclusions in values that are relevant to the project or formulation of preferred alternatives (i.e., in representative shoreline or volume change rates for the project's fill and borrow area shorelines under recent or future conditions).

Table 34 (p. 174) describes the average recent shoreline erosion rate along the North Wildwood fill area, from 1998 to 2003, as 60 feet/year. Along this 6,840-foot shore, and nominally assuming 1.0 cubic yard/foot per foot of shoreline change (per Bruun Rule), this equates to a loss rate of over -410,000 cubic yards/year. The 60-foot/year erosion rate from 1998 to 2003 is consistent with Figures 68 and 69 (pp. 168-169), which depict shoreline changes.

Likewise, for the same period, Tables 35 through 37 (pp. 175-177) describe the average shoreline accretion rate along three segments: Wildwood (18 feet/year), Wildwood Crest (26 feet/year), and Lower Township (11 feet/year). Along this 24,800-foot shore, and assuming 1.0 cubic yard/foot per foot of shoreline change, this equates to an accretion rate of about +472,000 cubic yards/year.

The apparent balance of observed recent erosion and accretion rates of between about 400,000 and 470,000 cubic yards/year along the fill area shoreline and downdrift shoreline (including the borrow area shoreline) is striking, but it is not specifically described. The magnitude of these values is germane to both the formulation of the project and the prediction of the project's performance and probable renourishment requirements.

Pages 180-185 describe a shoreline sediment budget, but the shoreline behavior is not described in a manner relevant to the project formulation or predicted performance. For example, the sediment budget cell describing North Wildwood (Figure 75, p. 183) indicates a net overall loss of essentially 0 cubic yards. This would incorrectly suggest that no project remediation is necessary along North Wildwood. However, estimated losses from the shoreline within this cell total 257,000+11,000 = 268,000 cubic yards/year. This value is based upon 1986-2003 shoreline changes, matching values shown in Table 34.

In sum, the report does not inform the reader that the recent, deduced beach volume losses along the North Wildwood project fill area range between 268,000 cubic yards/year (described in the 1986-2003 sediment budget) and 410,000 cubic yards/year (equivalently deduced from the 1998-2003 shoreline change values).

Instead, estimates of beach volume change from 1955 to 2012 are presented in Table 32 (p. 166); however, these estimates do not necessarily reflect current or future (project-relevant) conditions. In Table 32, the values for North Wildwood (profiles WW1 – WW3) range from -664 cubic yards/foot to +632 cubic yards/foot and suggest that this shoreline, overall, is net stable to accretional. This, again, would imply that no project remediation is required along North Wildwood in the long term. Such a conclusion is not consistent with contemporary conditions or with reasonably anticipated future conditions, nor is it consistent with the project's justification.

No description is presented of recent beach nourishment or backpassing projects, nor of the performance of these projects. Furthermore, no description is presented of approximate beach volume changes associated with Hurricane Sandy along the proposed fill area or borrow area.

The volume assumed for the one-time major replacement requirement is not contrasted with the volume losses observed during Hurricane Sandy. Per the description of water levels and storm severity presented in Table 26 (p. 129), it can be presumed that Hurricane Sandy is more or less representative of a one-time event during the 50-year project life (i.e., a 25- to 35-year event).

Overall, the apparent observed, recent changes in beach volume along the proposed fill area and borrow area (on the order of 268,000 to 410,000 cubic yards/year, as stated above) are 3.5 to 5 times greater than the predicted renourishment requirement for the project (estimated as 76,250 cubic yards/year). However, it is likely that actual project loss rates will be greater than the observed prototype rates for the following reasons:

(1) The project represents an additional sand source and physical perturbation to the existing sediment-starved shoreline.
(2) The fill area is immediately updrift of the excavated borrow area and adjacent to an inlet with no jetty.
(3) The beach fill sediment is slightly finer than the native beach sediment according to the predicted overfill factor.

The Hereford Inlet DFR/EA does not contrast the project's predicted loss rates and renourishment requirements relative to any conclusive estimate of the actual, recent shoreline behavior.

Significance – High

The project's potential under-prediction of actual erosion rates and renourishment requirements, relative to observed rates, will result in an overestimate of project performance and benefits and an underestimate of costs, and will affect the project's plan formulation and benefit/cost ratio.

Recommendations for Resolution
1. Describe the relevant, recent volumetric changes along the project shoreline's specific fill area and borrow area. 2. Justify the project's predicted erosion rates and renourishment requirements relative to recently observed and deduced rates.

Final Panel Comment 3

Project alternatives that include a groin or groin field with the sand backpassing plan may provide additional project benefits and performance, but such alternatives are not quantitatively assessed.

Basis for Comment

The management measure of a groin field was excluded from the final alternatives analysis on the assumption that "it might have only marginal impacts on project benefits while having large impacts on costs." (Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment [Hereford Inlet DFR/EA, p. 251]). No modeling or analysis was conducted to justify this assumption. The management measures considered did not include a combination of sand backpassing and a groin field, nor did the measures consider a terminal groin at the north end of the fill area at Hereford Inlet.

The recognized performance of a groin field is consistent with the project objectives: to retain sediment along the updrift (erosional) beach while retarding accretion of the downdrift (accretional) beach. The Panel acknowledges that construction of a groin field alone between the erosional beach of North Wildwood and the accretional beaches of Wildwood may not optimally satisfy the project objectives; however, it is plausible that such a groin field, constructed in conjunction with sand backpassing, could optimally improve project performance by decreasing the rate at which the backpassed sand is eroded from the fill area and deposited to the borrow area.

Likewise, it is plausible that a proper terminal structure at the north end of the seawall, along the fill area, could optimally improve project performance by decreasing the rate at which the backpassed sand is eroded from the fill area and lost to Hereford Inlet. The presence of one or more existing small (apparently non-functioning) groins near the north end of the seawall is not described in the Hereford Inlet DFR/EA. In fact, it is probable that the fill placed along the seawall, at the north end of the fill area, will rapidly erode into Hereford Inlet in the absence of a terminal structure, at loss rates much greater than those predicted for the project. For example, analogous repeated experience at the St. Johns County, Florida, Shore Protection Project has demonstrated these extremely rapid losses of beach fill along a similarly situated seawall near St. Augustine Inlet.

Additional information provided by the U.S. Army Corps of Engineers (USACE) stated that a groin field would likely require three groins, each of between 1,000 and 2,000 feet length, to span the nearshore beach widths at a cost of $27 million to $90 million. This information implied that this approach would be not cost-effective. However, the widths of the active, equilibrated design (fill) beach and borrow area beach (presented in Figures 108 through 113 [pp. 272-276]) and the historical rates of shoreline change (pp. 167-177) suggest that the probable requisite lengths of one or more groins between the project's fill and borrow areas may be on the order of only 300 to 500 feet in order to achieve functional, beneficial results. Alternatively, based upon widely recognized performance of groin structures along the U.S. coastline, a single, semi-permeable groin is likely to achieve the objective of retaining updrift fill with a tapered, erosional response of the downdrift beach. Such structures, specifically designed to the project area and its predicted performance in conjunction with sand backpassing described in the Tentatively Selected Plan (TSP) present a reasonably high likelihood of improving project performance with the least overall cost. Likewise, a terminal groin at the north end of the fill area, also in conjunction with sand backpassing, presents a reasonably high likelihood of decreasing fill loss rates into the inlet and renourishment requirements, with the least overall cost. These management measures were not evaluated in the alternatives analysis.

Significance – High

An appropriately designed terminal groin at the north end of the project area, and/or a functional groin or groin field between the beach fill and borrow areas, in conjunction with sand backpassing and beach/dune construction, may result in a project alternative with superior economic benefits over the TSP.

Recommendations for Resolution

1. Develop conceptual alternatives that include a site-specific, functional groin or groin field between the beach fill and borrow area shorelines, in conjunction with sand backpassing and beach/dune construction, to retard the rate of sediment loss along the fill area and accretion along the borrow area.

2. Develop conceptual alternatives that include a site-specific, functional terminal groin at the north end of the beach fill, to retard the rate of sediment loss from the fill area into the inlet.

3. Develop, calibrate, and employ a model to evaluate the performance (shoreline response) of the project with and without groins.

4. Evaluate the project performance (renourishment requirements) with the conceptual groin alternatives, and the probable cost of the groin structures, to determine the net economic benefit of including groins in the plan formulation, particularly relative to the TSP.

Final Panel Comment 4

The model used to predict the renourishment quantity does not provide sufficient information to fully understand its development, application and impact on the project's performance.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA) states that a periodic renourishment quantity of 305,000 cubic yards (every 4 years) was estimated by modeling the selected plan using the Planform Evolution Model (PEM). This model incorporates background erosion, alongshore spreading losses (diffusion), and overfill factor (p. 271). No additional details are presented in regard to the prescribed background erosion rate or diffusion coefficients (wave height, angle, etc.).

The predicted renourishment quantity equates to 76,250 cubic yards/year. This quantity is much lower than the predicted potential net longshore transport rate (420,000 cubic yards/year) and gross longshore transport rate (1,020,000 cubic yards/year) along the North Wildwood fill area (also described on p. 271). While the predicted longshore transport rates are "potential" values, it is noted that these rates are consistent with the observed rates of recent beach loss along the fill area implied from shoreline change values. That is, the apparent recent erosion rate along the 6,840-foot-long North Wildwood project fill area is on the order of 410,000 cubic yards/year, deduced from reported shoreline change rates of 60 feet/year between 1998 and 2003 (see p. 174), or at least 268,000 cubic yards/year between 1986 and 2003 (from the sediment budget on p. 183).

In this instance, consideration of both the net and gross transport rates is of particular importance when determining the loss and renourishment rates of the beach fill, because the fill area is subject to transport losses both to the south (typically associated with net transport rates) and to the inlet to the north (typically associated with gross transport rates). The degree to which these probable losses were considered in the PEM and the assumed values of the background erosion rate and diffusion coefficients is critical to understanding the PEM predictions of the project loss rates and renourishment requirements.

Furthermore, the Hereford Inlet DFR/EA does not describe whether the PEM considered that the beach fill placement area is immediately adjacent to the downdrift, excavated borrow area.

Based upon the available information, it appears that the project's renourishment rate computed through the PEM may be underpredicted by a factor of 3 to 5 relative to other observed erosion and predicted sediment transport values described in the Hereford Inlet DFR/EA. The assumptions fundamental to the PEM application, leading to the predicted value of the renourishment rate, are not described.

Significance – High

The predicted renourishment requirements are central to the project's performance, costs, and economic benefits.

Recommendations for Resolution

1. Describe the background erosion rate, diffusion coefficients (wave height, angle), overfill ratio, and other input parameters used in the application of the PEM to estimate the project's renourishment requirements.

2. Describe the extent to which the PEM considered the proximity of the fill area to the adjacent downdrift borrow area and to the adjacent inlet.

3. Correlate the predictions of the PEM, and renourishment requirements, with observed beach loss rates and predicted sediment transport rates.

Final Panel Comment 5

The application of SEDTRAN instead of a more robust tool, such as GENESIS, to estimate longshore transport limits the ability to demonstrate an understanding of existing conditions and reliably predict project performance.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA) describes the application of SEDTRAN to evaluate wave-driven transport in the project area (Section 2.6.7, Longshore Sediment Transport). Table 28 provides the longshore transport rates from the SEDTRAN model as described in Section 2.6.7. These "potential" longshore transport rates provide the basis for later sediment budget analyses (Section 2.8.2). Contrary to standard practice, a GENESIS-type shoreline response model was not calibrated, verified, and evaluated for the proposed project. This is unusual given that the proposed project involves:

(1) fill along the updrift shoreline,
(2) borrow material along the adjacent downdrift shoreline,
(3) probable inlet-end losses, and
(4) the potential for beneficial project performance from a terminal structure and/or beach groins to ameliorate fill losses relative to adjacent beach/inlet shoaling.

The Hereford Inlet DFR/EA states that the proposed project shoreline and surrounding area is influenced by the dynamic Hereford Inlet (Section 2.9, Bathymetry; Section 2.8, Shoreline Change Analysis; Section 2.8.4, Sediment Budget Balancing). Application of a calibrated and validated GENESIS model is an accepted means to demonstrate reasonable understanding of project area dynamics and would provide a predictive tool to evaluate project performance. In conjunction with the GENESIS modeling, development of a two-dimensional (2-D) spectral wave model could have identified inlet influence on wave conditions in the project area and the resulting influence on longshore sediment transport. Because a GENESIS model was not developed and applied for the project shoreline, the analysis of longshore transport relies on historical data and experience to evaluate past and future shoreline changes.

In addition, because the SEDTRAN model was used, longshore transport rates developed from a simple model were applied in a known dynamic environment with complicated coastal processes. As discussed in Section 2.6.7, instead of developing and applying 2-D wave modeling that accounts for inlet bathymetry features, SEDTRAN used data from a Wave Information Study Phase III transformation. As a result, longshore transport estimates were based on a greatly simplified representation of inlet conditions and wave/sediment dynamics.

Significance – Medium/High

Application of a basic tool such as SEDTRAN, instead of more complex models, to evaluate longshore transport calls into question the applied transport rates, project design, and associated renourishment volumes and intervals.

Recommendations for Resolution
1. Develop and apply a validated GENESIS model within the project area (and including Hereford Inlet effects) to demonstrate a more robust understanding of project performance and a reasonable predictive capability. 2. Develop and apply a 2-D spectral wave model to further demonstrate understanding of inlet wave and sediment transport dynamics.

Final Panel Comment 6

The SBEACH model results were not compared to observed erosion as a result of Hurricane Sandy; therefore, confidence in the model's application within the storm damage modeling and its estimated outputs is limited.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA) (Sections 3.1.4 and 3.1.5) describe the SBEACH model methodology and calibration procedure. As a storm-induced cross-shore transport model, SBEACH is a tool to evaluate and predict storm-induced erosion. However, despite having pre-storm and post-Sandy data, the documentation does not demonstrate the ability of the calibrated SBEACH model to reproduce the erosion caused by Hurricane Sandy.

Supplemental information provided by the U.S. Army Corps of Engineers (USACE) not contained in the Hereford Inlet DFR/EA provides details of the SBEACH model calibration procedure, values, and comparisons to measured data. This additional material discusses the model calibration to a storm in December 1992. However, the documentation does not indicate that any validation runs were completed. This further increases the need to apply SBEACH for Hurricane Sandy input conditions to demonstrate the reasonableness of model results in the project area. Notably, the main Feasibility Report should include this supplemental information on the SBEACH model calibration.

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 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.

Significance – Medium

Without demonstrating the calibrated SBEACH model's capability to reproduce Hurricane Sandy effects, confidence in the SBEACH model's application within the economic modeling is reduced.

Recommendations for Resolution

1. Develop an SBEACH simulation for Hurricane Sandy with comparisons to the measured post-storm profiles (wading) to demonstrate the model's ability to reproduce storm erosion from a recent major storm, and update the Hereford Inlet DFR/EA to include a discussion of SBEACH-modeled versus Hurricane Sandy-measured profiles.

2. Include the supplemental information provided by USACE on the SBEACH model

calibration as a new Hereford Inlet DFR/EA section or appendix report.

Final Panel Comment 7

The sediment grain size for the proposed beach fill construction may indicate that the beach fill template slope is too steep, thus increasing the risk that the project will not perform as intended or expected.

Basis for Comment

The beach fill construction slope is specified as 1(v):10(h) in Figure ES-2 (p. 9) and Figure 108 (p. 272) of the Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA). A slope this steep cannot be typically supported by the beach fill sediment grain size (approximately 0.19 to 0.21 millimeter mean value, as described in Table 15 (p. 112) and Appendix A, Section 4). Based on the sediment grain size, the beach fill construction slope will likely be difficult to achieve because it will be too steep and will be prone to escarpments.

Based upon prior experience and empirical guidance for hydraulically placed beach fill, the probable achievable construction slope at/below the wave zone is about 1(v):24(h), or 0.041, for the project's anticipated mean grain size (Creed et al., 2000).

The method for specifying the beach fill construction slope relative to the sediment grain size is not described in the Hereford Inlet DFR/EA. A construction slope that is too steep to be physically supported by the sediment grain size increases the risk that the project will not perform as expected or described. The contractor may not be able to achieve the slope without significant manipulation, large overruns of fill outside the template, and/or increased costs. Waves cause an overly steep slope to abruptly repose (equilibrate) to a gentler, stable slope, which results in substantial vertical escarpments and rapid, unanticipated loss of berm width. These potential construction difficulties, increased escarpment heights, and accelerated berm losses can be mitigated by stipulating a gentler beach fill construction slope.

Significance – Medium

If the construction slope is not designed correctly, the project may not perform as planned.

Recommendations for Resolution

1. Revise the specified beach fill construction slope to a lesser slope (for example, 1:20) that is consistent with the sediment grain size.

Literature Cited

Creed, C.G., Bodge, K.R., and Suter, C.L. (2000). Construction Slopes for Beach Nourishment Projects. J. Waterway, Port, Coastal and Ocean Eng., 126(1): 57-62. Jan/Feb 2000.

Final Panel Comment 8

Factors contributing to risk are not described, and the uncertainty associated with the Hereford Inlet effects on the project performance is not fully developed or stated.

Basis for Comment

Risk and uncertainty are intrinsic to water resource planning and design. Current U.S. Army Corps of Engineers (USACE) standard planning practice calls for the identification of variables that are subject to uncertainty. These can include economic as well as engineering variables (for example, first-floor elevations, content-to-structure value ratios, depth-damage functions, stage-frequency, return intervals, and any number of other key variables that might affect project performance).

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA) does not provide a comprehensive discussion of the variables that are subject to high risk. While the sensitivity analysis presented in the Economics Appendix examines the influence of certain variables, the analysis does not discuss which of these variables have the greatest influence on uncertainty, or describe what steps were taken to reduce uncertainty.

Furthermore, the sensitivity analysis addresses only economic variables. There is no discussion of how hydrologic, hydraulic, or geotechnical variables contribute to uncertainty or to the risk of unacceptable project performance.

A key example is the influence of Hereford Inlet and the seawall structure immediately downshore. Experience has shown that when such hard structures are adjacent to inlets, it is very difficult to design and maintain a beach and dune system that will be resilient and perform as expected, yet the review documents do not discuss the factors contributing to the risk that the project may not perform as designed or expected.

Significance – Medium

Without a comprehensive discussion of the variables subject to high risk, it is difficult to understand how the Tentatively Selected Plan (TSP) will perform.

Recommendations for Resolution

1. Describe the variables that contribute to uncertainty, and identify the variables with the greatest effect on uncertainty.

2. Explain what steps were taken to reduce uncertainty in those variables.

3. Discuss how the seawall structure affects the risk that the project may not perform as expected.

Final Panel Comment 9

The ratios used to establish content-to-structure values are low and could underestimate both future without-project condition damages and benefits attributable to the project.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA) argument for using the "conservative" estimate of 25% for residential content-to-structure value ratios (CSVRs) is unconvincing. The Economics Appendix states that empirical data were used to establish a 40% ratio of contents-to-structure value. However, the source of the empirical data is not identified, nor is there a discussion on how those data were evaluated in terms of their reliability or applicability in the Wildwood area.

Studies in other areas of the country examining coastal storm damage reduction have used actual survey data to establish that the CSVRs were closer to 50%, even in study areas where homeowners insured the contents for much less.

CSVRs are an important part of the total damage calculated in any significant event and. accordingly, are an important part of both future without-project condition damages and benefits attributable to a project that reduces those damages. CSVRs that are too low could significantly underestimate total future without-project condition damages and project condition benefits attributable to the TSP.

Significance – Medium

While project justification and ranking of alternatives are unlikely to be affected by a change in the CSVRs used in the damage calculations, the understanding of the Hereford Inlet DFR/EA conclusions regarding total project benefits is affected.

Recommendations for Resolution

1. Provide greater detail on the data used to establish CSVRs.
2. Assess and discuss the reliability and applicability of the empirical data referenced in the Economics Appendix.

Final Panel Comment 10

The economic analyses and calculations use various price levels and discount rates, which makes it difficult to compare values and confirm the validity of the analyses.

Basis for Comment

Values in the Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment (Hereford Inlet DFR/EA) and its appendices are expressed using different price levels, fiscal year (FY) dollars, and discount rates.

For example, the estimate of Local Costs Forgone benefits could be interpreted as having been double-counted, since the difference between the two discount rates used in FY2011 and FY2013 to discount Tentatively Selected Plan benefits is close enough to account for the LCF benefit estimate.

Also in Section 5.4, p. 308, the claimed value of $682,000 for annual recreation benefits does not match the value of $580,000 on p. 33 of Appendix B. It is unclear whether price levels, dollar values, or Unit Day Value (UDV) values account for the difference in these two benefit estimates.

Finally, it is difficult to relate the benefit values described in the worksheets of Appendix B (pp. 25-35) with the summary values listed in Table B-38 and in Section 5.4 (p. 308) of the Hereford Inlet DFR/EA.

The use of differing price levels and discount rates makes it difficult to confidently compare values in the Hereford Inlet DFR/EA, interpret the results, or determine whether (1) benefits or costs are double-counted or (2) significant and applicable benefits or costs were omitted.

Significance – Medium

Inconsistent use of price levels, discount rates, and UDV dollar values affect the understanding of the review documents and the ability to interpret the results of the analyses.

Recommendations for Resolution

1. Use the FY2013 federal discount rate of 3.75% throughout the report.
2. Update all tables and discussions of costs and benefits using 2013 dollars.
3. Ensure that the UDV values used represent Economic Guidance Memorandum 13-03 (USACE, 2013).

Literature Cited

USACE (2013). Memorandum for Planning Community of Practice. Economic Guidance Memorandum, 13-03, Unit Day Values for Recreation for Fiscal Year 2013. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. February 13, 2013.

Final Panel Comment 11

The granulometric data necessary to demonstrate the compatibility and overfill value of the proposed borrow area and native beach sediments are not presented, so the adequacy of the dredge and fill volume cannot be assessed.

Basis for Comment

It is standard practice to include plots of the cumulative grain size distribution (GSD) of the borrow area and native beach sediments, but these are not presented in the Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment (Hereford Inlet DFR/EA). These plots are useful to better understand and visually appreciate the compatibility of the borrow and native sediments. Tables in the Hereford Inlet DFR/EA (such as Tables 13 through 18, pp. 106-114) summarize the mean, standard deviation, and computed overfill factors of the sediments; but without plots of the complete granulometric data that describe the sediments, the Panel cannot independently assess the probable physical compatibility of the sediments or the adequacy of the computed overfill factors. Tables in Appendix A, Section 4, list additional information about the granulometric statistics of sediments in the study area, but they do not include details for the native beach and borrow area in the Tentatively Selected Plan (TSP), and there is no description of the variation in grain size among discrete samples as a function of beach elevation. Instead, only mean and standard deviation values are presented for composite sampling elevations. Many of the tables are populated with spreadsheet equations instead of numeric values. These tables do not replace the utility of traditional plots that contrast the grain size distributions of the native and borrow area sediments in the TSP for purposes of assessing compatibility and overfill requirements.

It is commonly acknowledged that the sediment grain size generally becomes increasingly finer with depth across the beach profile, such that the sediment excavated from the submerged portions of the beach may be finer than that of the overall native beach. This outcome is generally reflected in the predicted overfill factor of 1.25 for the TSP, as presented in Table 15 (p. 112). The importance of considering these granulometric differences when bypassing or backpassing sand from one portion of the beach to another is exemplified by experience at the Canaveral Harbor, Florida, Federal Sand Bypass project. In that instance, initial under-appreciation of the fine-grained nature of the sediment borrowed from the beachface, relative to that of the overall native beach to which the sediment was to be placed (bypassed), resulted in significant underprediction of the overfill factor: that is, overestimate of sediment compatibility and overprediction of the ultimate project performance.

The Hereford Inlet DFR/EA describes the use of an older method to compute overfill factor (pp. 109-111), which the Panel considers to be acceptable; however, without the GSD plots of the discrete and computed-composite sediment samples, it is not possible to assess the practical or probable accuracy of the overfill factor ultimately concluded in the report.

Significance – Medium/Low

Based upon the information provided, the Panel does not have sufficient information to analyze the conclusions drawn regarding the predicted overfill factor of the borrow and native beach sediments, and the degree to which the predicted overfill factor may affect the requisite project construction volumes and resultant project performance.

Recommendations for Resolution

1. Graphically present (plot) the cumulative GSD of the borrow area and fill area beach sediments, identified by depth (elevation).

2. Graphically present (plot) and contrast the computed composite distribution of the borrow area and fill area beach sediments, where the former is weighted by the approximate volume of the borrow area sediment to be excavated as a function of depth (elevation).

Final Panel Comment 12

The dangers to beach users associated with the potential effects of the beachface dredging operations are not presented.

Basis for Comment

Beachface dredging, as described in the Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment (Hereford Inlet DFR/EA), is a viable means by which to borrow and backpass sediment along the beach. However, it can also produce pits or a box-cut that overly steepens the beach, potentially resulting in dangerous conditions for beach users during the weeks before the beach profile equilibrates. The possibility of this outcome, and the need to minimize it during final design and construction, are not acknowledged.

Ideally, the After-Dredge beach profile would be immediately graded (restored) to a profile slope that emulates natural beach conditions. An alternative approach contouring a specified, quasi-uniform post-construction slope immediately after dredging each acceptance section of the work (or similar specified distance) would limit trenching, pitting, and box-cutting of the beach. Public safety and project performance would be better ensured, or improved, by identifying and addressing this issue from the outset.

Significance – Medium/Low

Without a description of the project's potential dredging impact to public safety, the Panel cannot discern whether this potential impact has been identified and will be addressed through final project design.

Recommendations for Resolution

1. Acknowledge in the Hereford Inlet DFR/EA that pitting, trenching, or over-steepening of the borrow area beach face after dredging may impact public safety.

2. Describe how this potential impact will be avoided (e.g., through appropriate requirements or limitations of dredging to be specified in the construction contract).

Final Panel Comment 13

Although closure of Turtle Gut Inlet was cited as a major cause of sand accretion at Wildwood and Wildwood Crest beaches, the feasibility of reopening the Gut was not considered.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment (Hereford Inlet DFR/EA) (Section 2.6.12) cited the closure of Turtle Gut Inlet as one of the two main causes of excess beach accretion in Wildwood and Wildwood Crest. However, the discussion of alternatives does not address the feasibility of reopening the Gut. In response to Panel questions discussed during the mid-review teleconference involving the U.S. Army Corps of Engineers (USACE) Project Delivery Team (PDT), the Panel, and Battelle (the facilitator), the PDT stated that this measure would not be practicable due to extensive development of the land formed where the Gut had been located. However, there is no indication that potential mechanisms for avoiding or displacing developed properties were considered in plan formulation. Under the Tentatively Selected Plan (TSP), project area beaches may require perpetual maintenance. The omission of any discussion regarding the feasibility of reopening the Gut precludes a full understanding of alternatives to such potentially perpetual maintenance.

Significance – Medium/Low

While reopening the Gut may prove to be impracticable, the Hereford Inlet DFR/EA does not evaluate this measure, with regard to cost/benefit or environmental impact, resulting in an alternatives analysis that is incomplete.

Recommendations for Resolution

1. Discuss the feasibility of acquiring right-of-way, or other methods, that could allow Turtle Gut Inlet to be reopened or relocated.
2. Discuss the potential costs associated with right-of-way acquisition and Gut reopening, versus the costs of the TSP.
3. If it is determined that reopening the Gut would be practicable, discuss the environmental impacts of this alternative.

Final Panel Comment 14

Neither the potential for sea turtle nesting nor the presence/absence of critical habitat for protected species in the project area is addressed.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment (Hereford Inlet DFR/EA) (Section 2.2.19 and Appendix D) provides a good description of Federally and state protected species that could occur in the project area. While sea turtles are acknowledged as being present, the document does not state whether any of the species found there use the beaches for nesting. In addition, there is no mention of the presence/absence of critical habitat designations for this area.

In response to Panel questions discussed during the mid-review teleconference involving the U.S. Army Corps of Engineers (USACE) Project Delivery Team (PDT), the Panel, and Battelle (the facilitator), the PDT provided clarification on these issues. These details are important because they address the regulatory status and feasibility of beach habitat alteration as well as mitigative measures that might be required to compensate for unavoidable impacts.

Significance – Low

This information will provide a better understanding of the potential impacts of proposed beach sand relocation and recontouring on protected species.

Recommendations for Resolution

1. Include a statement that sea turtles, although present in the project aea, are not known to nest on project area beaches.

2. Include a statement that the U.S. Fish and Wildlife Service has not designated any habitats in the project area as Critical Habitat for any protected species.

Final Panel Comment 15

The recreation benefits analysis does not provide detail on how recreational users' willingness to pay for recreation opportunities was established.

Basis for Comment

The Hereford Inlet to Cape May Inlet Draft Feasibility Report and Environmental Assessment acknowledges that recreation is a crucial engine to the regional and local economy. However, the recreation benefits analysis appears to be cursory and more suited to a reconnaissance level of investigation rather than a feasibility level study.

The Panel recognizes that the Project Delivery Team used a site-specific Contingent Value Survey (CVS) analysis rather than the less sophisticated Unit Day Value (UDV) method. However, the Economics Appendix provides few details on how the CVS study was conducted and whether its assumptions, methods, and conclusions are appropriate for inclusion in this analysis.

Significance – Low

A clear, complete description of the CVS study is required for the technical completeness of the review documents.

Recommendations for Resolution

1. Provide details on how the CVS study used in the recreation analysis was conducted.

2. Describe how the CVS is applicable to the Hereford Inlet to Cape May Inlet.

APPENDIX B

Final Charge to the Independent External Peer Review Panel as Submitted to USACE on September 30, 2013

on the

Hereford Inlet to Cape May Inlet

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review of the Hereford Inlet to Cape May Inlet

BACKGROUND

The Hereford Inlet to Cape May inlet project is located in Cape May County, New Jersey. The project consists of the Towns of North Wildwood, Wildwood, Wildwood Crest and a small unincorporated section of Lower Township that contains USFW property at its southern border. The length of the island is approximately seven miles and contains beaches few dunes and low and expansive beaches that leave sections of the project area vulnerable to wave, flood and erosion damage.

The north end of the barrier island contains the municipality of North Wildwood. Extensive erosion over the past decade has decreased the size of its beaches and dune system. Further south, in Wildwood and Wildwood Crest, the beaches have grown to the extent that they clog outfall structures and these structures must regularly be unclogged to promote storm water flow. The concept for this feasibility study is to transfer the sand from Wildwood and Wildwood Crest to North Wildwood in order to restore the beaches at the northern end and establish a beach in Wildwood and Wildwood Crest that is manageable and meets the needs of the municipality. The tentatively selected plan is to hydraulically back pass sand from the southern beach to the northern beaches using a land based mobile hydraulic back-pass system. The beach template will feature a dune of +16 NAVD 88 and a berm of +6.5 NAVD 88 that extends 75 feet from the dune toe. The initial construction is approximately 1,400,000 cubic yards and the nourishment cycle will be every four years. The dune will be planted with cape American beach grass and seaside panicum.

The non-Federal Sponsor is the New Jersey Department of Environmental Protection (NJDEP). NJDEP has cost shared over 14 projects with the U.S. Army Corps of Engineers (USACE), Philadelphia District along the New Jersey shoreline.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of Hereford Inlet to Cape May Inlet, New Jersey, Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment (hereinafter: Hereford Inlet IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' Civil Works Review (EC 1165-2-209, dated January 31, 2012 and 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 1165-2-209 & EC 1165-2-214; p. D-4) for the Hereford Inlet 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, coastal engineering, biology/ecology, Civil Works planning, geotechnical/construction engineering issues relevant to the project. They will also have experience applying their subject matter expertise to flood risk management.

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 1165-2-209, Change 1 and 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 documents are to be reviewed by designated discipline:

Title	Page Count	Required Disciplines
Volume 1: New Jersey Shore Protection Study Hereford Inlet to Cape May Inlet Draft Feasibility Report and Integrated Environmental Assessment	349	All Disciplines
Risk Register and Decision Log	9	All Disciplines
Volume 2: Appendix A: Engineering Technical Appendix	538	Coastal & Geotechnical/Construction Engineering
Volume 3: Appendices	314	
Appendix B: Economic Analysis		Economics/Civil Works Planning
Appendix C: Environmental Analysis		Biology/Ecology
Appendix D: U.S. Fish and Wildlife Service Coordination		Biology/Ecology
Appendix E: Cultural Resources		Economics/Civil Works Planning
Appendix F: Real Estate Plan		Economics/Civil Works Planning
Appendix G: Pertinent Correspondence		All Disciplines
Appendix H: Public Access Plan		All Disciplines
Total Page Count:	**1210**	

Documents for Reference

- USACE guidance *Civil Works Review Policy*, Change 1 (EC 1165-2-209) dated January 31, 2012
- USACE guidance Civil Works Review, (EC 1165-2-214) dated 15 December 2012
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review released December 16, 2004.

SCHEDULE

This final schedule is based on the September 18, 2013 receipt of the final review documents. The schedule will be revised upon receipt of final review documents.

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to panel members	9/30/2013
	Battelle convenes kick-off meeting with panel members	9/30/2013
	Battelle convenes kick-off meeting with USACE and panel members	9/30/2013
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	10/18/2013
	Panel members complete their individual reviews	10/24/2013
Prepare Final Panel Comments and Final IEPR Report	Battelle provides panel members with talking points for Panel Review Teleconference	10/31/2013
	Battelle convenes Panel Review Teleconference	10/31/2013
	Battelle provides Final Panel Comment templates and instructions to panel members	11/1/2013
	Panel members provide draft Final Panel Comments to Battelle	11/8/2013
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	11/8/2013 - 11/20/2013
	Battelle finalizes Final Panel Comments	11/20/2013
	Battelle provides Final IEPR Report to panel members for review	11/22/2013
	Panel members provide comments on Final IEPR Report	11/25/2013
	*Battelle submits Final IEPR Report to USACE	12/2/2013
Comment/Response Process	Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE	12/3/2013
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process (if necessary)	12/3/2013
	USACE provides draft PDT Evaluator Responses to Battelle	12/11/2013
	Battelle provides the panel members the draft PDT Evaluator Responses	12/13/2013
	Panel members provide Battelle with draft BackCheck Responses	12/18/2013

Task	Action	Due Date
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	12/19/2013
	Battelle convenes Comment-Response Teleconference with panel members and USACE	12/20/2013
	USACE inputs final PDT Evaluator Responses to DrChecks	12/27/2013
	Battelle provides final PDT Evaluator Responses to panel members	12/31/2013
	Panel members provide Battelle with final BackCheck Responses	1/6/2014
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	1/8/2014
	*Battelle submits pdf printout of DrChecks project file	1/9/2014
Civil Works Review Board (CWRB)	Panel prepares and/or reviews slides for CWRB	April 2014
	CWRB	April 2014

**Deliverable*

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Hereford Inlet documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, 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 Hereford Inlet 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 (Richard 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 Richard Uhler, uhlerr@battelle.org, no later than October 24, 2013, 10 pm ET.

Independent External Peer Review of the

Hereford Inlet to Cape May Inlet, New Jersey Hurricane and Coastal Storm Damage Risk Reduction Project Draft Feasibility Report and Environmental Assessment Charge Questions and Relevant Sections as Supplied by USACE

General Questions

1. To what extent has it been shown that the project is technically sound?
2. Are the assumptions that underlie the engineering and environmental analyses sound?
3. Are the engineering and environmental methods, models and analyses used adequate and acceptable?
4. Were all models used in the analyses used in an appropriate manner with assumptions appropriately documented and explained?
5. Were risk and uncertainty sufficiently considered?
6. Were adequate considerations given to significant environmental resources by the project?

SAFETY ASSURANCE REVIEW QUESTIONS

7. Were the methods used to evaluate the condition of the structure adequate and appropriate given the circumstances?
8. Are the quality and quantity of the surveys, investigations, and engineering sufficient to assess expected risk reduction?
9. Have the hazards that affect the structures been adequately documented and described?
10. Is there sufficient information presented to identify, explain, and comment on the assumptions that underlie the engineering analyses?
11. Does the physical data and observed data provide adequate information to characterize the structures and their performance?
12. Have all characteristics, conditions, and scenarios leading to potential failure, along with the potential impacts and consequences, been clearly identified and described?
13. Have all pertinent factors, including but not limited to population-at-risk been considered?

SPECIFIC QUESTIONS

Alternatives

14. Are future Operation, Maintenance, Repair, Replacement, and Rehabilitation efforts adequately described and are the estimated cost of those efforts reasonable for each alternative?

15. Are there any unmitigated environmental impacts not identified and if so could they impact project designs?

16. Are residual risks adequately described and is there a sufficient plan for communicating the residual risk to affected populations?

17. Have the impacts to the existing infrastructure been adequately addressed?

Affect Environment

18. Is the description of the climate in the study area sufficiently detailed and accurate?

19. Is the description of wetland resources in the project area complete and accurate?

20. Is the description of aquatic resources in the project area complete and accurate?

21. Is the description of threatened and endangered species resources in the study area complete and accurate?

22. Is the description of the historical and existing recreational resources in the study area complete and accurate?

23. Is the description of the cultural resources in the study area complete and accurate?

24. Is the description of the historical and existing socioeconomic resources in the study area complete and accurate? Were specific socioeconomic issues not addressed?

Environmental Consequences

25. Have impacts to significant resources been adequately and clearly described?

26. To what extent have the potential impacts of the alternatives on significant resources been addressed and supported?

27. Are the scope and detail of the potential adverse effects that may arise as a result of project implementation sufficiently described and supported?

28. Have impacts from borrow areas been adequately and clearly described?

Cumulative Impacts

29. Are cumulative impacts adequately described and discussed? If not, please explain.

Mitigation

30. Are mitigation measures adequately described and discussed? If not, please explain.

Geotechnical Engineering

31. Is the description of the geomorphic and physiographic setting of the proposed project area accurate and comprehensive?

32. Were the geotechnical analyses adequate and appropriate for the current level of design as presented in the report documentation?

Design

33. Have the design and engineering considerations presented been clearly outlined and will they achieve the project objectives?

34. Do you agree with the method by which plausible storms and predefined profiles were computed?

35. Was the storm set discussion sufficient to characterize current baseline conditions and to allow for evaluation of how forecasted conditions (with and without proposed actions) are likely to affect shoreline conditions?

36. Were the data surveys conducted to evaluate the existing environmental and natural resources adequate? If not, what types of surveys should have been conducted?

37. Was the GENESIS and SBEACH models and used in an appropriate manner? If not, explain.

38. Are any additional design assumptions necessary to validate the preliminary design of the primary project components?

Real Estate Plan

39. Does the Real Estate Plan adequately address all real estate interests (public and private)?

Hazardous, Toxic, and Radioactive Waste

40. Comment on the extent to which impacts of the alternatives may have on hazardous, toxic, and radioactive waste issues?

Economics

41. Comment on the extent to which assumptions and data sources used in the economics analyses are clearly identified and the assumptions are justified and reasonable.

42. Were the benefit categories used in the economic analysis adequate to calculate a benefit-to-cost ratio for each of the project alternatives?

43. Comment on the adequacy of the sources of recreational benefits methodology.

44. Are the assumptions used for the recreational benefits methodology explicit and justified? If not, explain.

45. Was the discussion of recreational resources sufficient to characterize current baseline conditions and to allow for evaluation of forecasted conditions (with and without proposed actions)?

46. Was the methodology used to determine the characteristics and corresponding value of the structure inventory for the study area adequate?

47. Were the methods used to develop the content-to-structure value ratios appropriate and were the generated results applicable to the study area?

48. Were the methods to develop the depth-damage relationships appropriate ad were the generated results applicable to the study area?

49. Has the economic analyses addressed the issue of repetitive flood damages and the subsequent extent of rebuild/repair by property owners as it relates to annual damage estimation?

50. Were risk and uncertainty sufficiently considered in relation to the future development process?

FINAL OVERVIEW QUESTION

51. What is the most important concern you have with the document or its appendices that was not covered in your answers to the questions above?

Summary Questions

52. Please identify the most critical concerns (up to 5) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

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