



DEPARTMENT OF THE ARMY  
CHIEF OF ENGINEERS  
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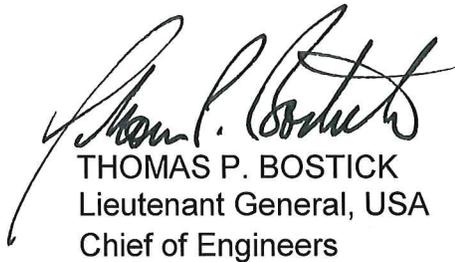
23 DEC 2014

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)  
108 ARMY PENTAGON, WASHINGTON, DC 20310-0108

SUBJECT: Bogue Banks, Carteret County, North Carolina – Final USACE Response to Independent External Peer Review

1. Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, EC 1165-2-214, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004).
2. The IEPR was conducted by Battelle Memorial Institute. The IEPR panel consisted of three members with technical expertise in Civil Works planning, economics, biology/ecology, and coastal engineering.
3. The final written responses to the IEPR are hereby approved. The enclosed document contains the final written responses of the Chief of Engineers to the issues raised and the recommendations contained in the IEPR. The IEPR Report and the USACE responses have been coordinated with the vertical team and will be posted on the Internet, as required in EC 1165-2-214.
4. If you have any questions on this matter, please contact me or have a member of your staff contact Ms. Stacey Brown, Deputy Chief, South Atlantic Division Regional Integration Team, at 202-761-4106.

Encl

  
THOMAS P. BOSTICK  
Lieutenant General, USA  
Chief of Engineers

**Bogue Banks  
Carteret County, North Carolina  
Integrated Feasibility Report and  
Draft Environmental Impact Statement  
U.S. Army Corps of Engineers Response to  
Independent External Peer Review  
March 2014**

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of WRDA 2007, EC 1165-2-214 and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review (2004)*.

The goal of the U.S. Army Corps of Engineers (USACE) Civil Works program is to always provide the most scientifically sound, sustainable water resource solutions for the nation. The USACE review processes are essential to ensuring project safety and quality of the products USACE provides to the American people. Battelle Memorial Institute (Battelle), a non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to conduct the IEPR of the Bogue Banks, Carteret County, NC Integrated Feasibility Report and Draft Environmental Impact Statement (EIS)

The IEPR panel reviewed the integrated feasibility report and draft environmental impact statement (IFR/DEIS), as well as supporting documentation. The Final IEPR Battelle Report was issued on 4 December 2013. Overall, nine comments were identified and documented; three were identified as having high significance, five were identified as having medium significance, and one was identified as having low significance. The following discussions present the USACE Final Response to the nine comments.

**1. Comment – *High Significance*: Limiting the Beach-fx storm population to those storms that have historically affected the area is not consistent with contemporary methods, and by excluding plausible storm events potential failure of the beach and related consequences may not have been fully evaluated.**

This comment included five recommendations; all were adopted as discussed below. The comment expresses the concern that by excluding storms from Beach-fx that are plausible but which have not historically affected the area, the analysis may not have fully evaluated all potential consequences from future storms.

**USACE Response: Adopted**

**Action Taken:** The IEPR panel recommended (1) that the report discuss and justify the adequacy of the historical storm sample to represent all plausible future events, and discuss in terms of uncertainty added, the impact of omitting plausible non-historical storms on the Beach-fx results. In response, this discussion was added to the Coastal Engineering Appendix (Appendix A), Section 3.1.5. The IEPR panel recommended (2) that the report discuss and explain the suitability of the historical time periods used to inform the storm set selection. In response, this discussion was added to Section 3.1.5 of Appendix A. The IEPR panel recommended (3) that the report

discuss the physical criteria used to select the subset of tropical and extratropical storms selected. In response, Section 3.1.5 was modified to indicate that storms were identified based on a minimum 2 foot wave height and 12 hour duration. The IEPR panel recommended (5) that the report provide more details on selection of storms within a Beach-fx lifecycle, and to specifically address whether Beach-fx allows for selection of multiple storms within a season (e.g., back-to-back events). The Beach-fx parameters which dictate storm selection within a lifecycle were already included in Table 4 of Section 2.1.5 of the Coastal Engineering Appendix. Multiple storms within a season are allowed within Beach-fx, and the minimum time between tropical events was set at 5 days for the June-August storm season, based on the historical record. In response to this recommendation, reference to this discussion was added to Section 6.09.7 of the main report. The IEPR panel recommended (5) that the report discuss how the number of lifecycle realizations was optimized. In response, discussion and a figure was added to Section 2.2 of the Coastal Appendix illustrating that the number of lifecycles needed was based on the observed convergence of the moving average of total damages from the “without project” runs. Convergence was found at approximately 275 iterations of the model; however, 300 iterations were used in for the final analysis in order to be slightly more conservative.

**2. Comment – *High Significance*: The uncertainties in the coastal engineering numerical modeling inputs and outputs are not presented and do not appear to have been considered in the economic analyses and carried through to the benefit-to-cost ratio.**

This comment included two recommendations; one was adopted and one was not adopted, as discussed below. The comment expresses a concern regarding the manner in which the uncertainties in the modeling inputs and outputs are/are not presented and considered in the report.

**USACE Response: Adopted**

**Action Taken:** The IEPR panel recommended (1) that the report provide clarification as to whether engineering numerical uncertainty was quantified. In response, discussion was added to Section 2.1.7 of the Coastal Appendix that clarified how uncertainty is accounted for within Beach-fx through the use of damage functions assigned to each structure within the structure database.

**USACE Response: Not Adopted**

The IEPR panel recommended (2) that the report discuss the uncertainty (i.e., error) in the coastal engineering numerical modeled estimates of surges, waves, storm erosion, and beach-fill evolution in the context of impacts on alternative selection and project justification. Although uncertainty is not directly quantified or addressed through the coastal engineering models used in the analysis, such quantification was not necessary since economic uncertainty in the analysis is addressed within the Beach-fx model through the use of damage functions and Monte Carlo simulations. The structure of the coastal engineering model (SBEACH) used to model profile evolution does not have the capability to quantify model uncertainties. Additionally, the economic model Beach-fx also does not allow for direct input of uncertainty values for the engineering input. However, uncertainty is captured within Beach-fx through the use of damage functions and in the variability of economic and structural values (content value, structure value, structure elevation,

and rebuild times). The damage functions are comprised of three curves representing minimum expected losses, most likely expected losses and maximum expected losses. Beach-fx draws a triangular distribution across these curves and randomly samples within that distribution to obtain the estimated fractional loss. Since the analysis is a Monte Carlo analysis, the uncertainty is reflected in the width of the distribution of the results and if there is no bias in the uncertainty it should not significantly affect the average of the results.

**3. Comment – *High Significance*: The Planform Evolution Model used to predict beach-fill evolution and renourishment interval does not appear to have been validated for use in the study area.**

This comment included two recommendations; both were adopted as discussed below. The comment expresses a concern that if the Planform Evolution Model was not properly evaluated then the renourishment interval of the project may not be correctly estimated.

**USACE Response: Adopted**

**Action Taken:** The IEPR panel recommended (1) that the report provide references for the Planform Evolution Model that demonstrates that the model: (a) is an appropriate choice for renourishment interval estimation, and; (b) is vetted by the coastal engineering community. In response, the reference for the Plan Form Evolution model (PFE) was added to the references section of the Coastal Engineering Appendix (Appendix A). However, the Planform Evolution Model (PFE) was used only to estimate losses within the transition zones of the proposed project and was not used to determine the project renourishment interval. The project renourishment interval was determined through multiple runs of the selected project at different renourishment cycle lengths to select the cycle that produced maximum net benefits. Discussion was added to Section 4.1.1 of the Coastal Engineering Appendix (Appendix A), clarifying why the PFE model, as opposed to other beach fill dispersion models (i.e. Genesis) was used for this study. The IEPR panel recommended (2) that the report present model validation/calibration information to demonstrate model accuracy for this study. Beach-fx model calibration and SBeach model calibration were already discussed in Section 2.2 and 3.2.6, respectively, of the Coastal Appendix (Appendix A). In response to this recommendation, reference to this existing discussion was added to Section 4.03 of the main report.

**4. Comment – *Medium Significance*: The screening of non-structural alternatives from the areas of highest economic damage has not been presented and it is unknown if the full array of non-structural alternatives was considered.**

This comment included four recommendations, all were adopted as discussed below. This comment expresses a concern that the adequacy and acceptability of the non-structural screening process could not be assessed based on the level of information provided in the report.

**USACE Response: Adopted**

**Action Taken:** The IEPR Panel recommended (1) that the report describe the affected structures in reaches 15, 70, 78, 87, 89, 92, 93, 106, 114, and 116 along with the nature of the damages to support the disproportionately high without-project damages. In response, this information was added as an Attachment 4 to the Economics Appendix (Appendix B) and then referenced in Section 4.01.5 of Appendix B and Section 4.04 of the Main Report. The IEPR panel recommended (2) USACE provide the analysis to support the assertion that non-structural alternatives only for reaches 78, 89, 93, 106, and 114 create engineering unsustainability and (4) provide the analysis used to determine that non-structural alternatives would create unsustainable gaps in the project. In response, information was added to Section 6.03 of Appendix B and 5.07.3 of the Main Report. The IEPR Panel recommended (3) that the report specify if other non-structural measures were considered and screened out and if so, the rationale for this decision be included in the report. Section 5.05.2 of the main report already discusses additional non-structural measures and why they were screened out from further analysis. In response to the recommendation, reference to this existing discussion was also added to Section 5.07.3 of the main report and Section 6.03 of Appendix B.

**5. Comment – *Medium Significance*: The assumption that non-Federal nourishment would not occur under future with-out project conditions contradicts historical activities and adds uncertainty to the economic analysis**

This comment included two recommendations, one was adopted and one was not adopted as discussed below. The comment expresses concerns that the future-without project condition has been incorrectly described and hence the project costs may have been overestimated.

**USACE Response: Adopted**

**Action Taken:** The IEPR panel recommended (1) that the report provide a history of nourishment efforts for Bogue Banks. A history of the nourishment actions on Bogue Banks was already provided in section 1.09 of the main report and was illustrated in Figure 1.2. In response to this recommendation, reference to this figure was added to Section 4.01 of the main report.

**USACE Response: Not Adopted**

The IEPR panel recommended (2) that project cost be revised to reflect any change in the interpretation of the future without-project condition, if necessary. The future without project analysis in this study assumed no new placement of nourishment material by the non-Federal sponsor, because at this time the non-Federal sponsor has no definitive plan or schedule for implementing any nourishment activities on their own. This is a conservative assumption since any non-project related beach fill placements that occur in the future would reduce the cost of the Federal project by reducing required nourishment volumes. While the future damages prevented by the Federal project would also be reduced in such a case, the loss of these benefits would be at least partially offset by the gain in benefits from local costs foregone that could be claimed. Hence, these assumptions would not affect the economic viability of the project.

**6. Comment – *Medium Significance*: The economic impact on recreational benefits resulting from damage to the first three rows of residential and commercial structures that could occur under modeled storm conditions has not been quantified.**

This comment contained one recommendation which was not adopted. The comment expresses the concern that the benefits associated with recreation may not be representative of post-storm conditions.

**USACE Response: Not Adopted**

The IEPR panel recommended (1) that the report provide a discussion and quantify the effects of residual risks on project related recreational benefits. Since the recommended plan was selected and economically justified solely based on coastal storm damage reduction benefits, quantifying residual risks to recreation was not deemed necessary for this study. However, language to clarify that the estimated recreation benefits are predicated on user utility has been added to section 1.0 of Attachment 1 (Recreation Analysis) of the Economics Appendix (Appendix B).

**7. Comment – *Medium Significance*: Off Road Vehicle use within the project area has not been factored into the analysis of impacts on protected species.**

This comment included one recommendation, which was adopted as discussed below. This comment expresses the Panel's concern that the US Fish and Wildlife Service (USFWS) may not be aware of the extent of off road vehicle use on Bogue Banks.

**USACE Response: Adopted**

**Action Taken:** The IEPR panel recommended (1) that the report include language in the IFR/DEIS clarifying that USACE has discussed the potential impacts of off road vehicle (ORV) use on listed species occurring in Bogue Banks with USFWS, and that these impacts do not affect USFWS's decision not to issue a new Biological Opinion. In response, USACE confirmed with USFWS that the USFWS had knowledge of off road vehicle use on Bogue Banks and the associated issues and impacts. USFWS indicated ORV would be factored into their analysis of project impacts. Additionally, language was added in Section 7.03.2 of the main report discussing ORV use and anticipated impacts on Bogue Banks.

**8. Comment – *Medium Significance*: It is not clear whether public and governmental agency concerns have been identified and described or if project benefits and impacts have been communicated to the public.**

This comment included two recommendations; both were adopted as discussed below. The comment expresses the concern that assessment of project benefits and impacts could be incomplete if input from the public and resource agencies were not reflected in the report.

**USACE Response: Adopted**

**Action Taken:** The IEPR panel recommended (1) that the report incorporate public and governmental agency comments into the IRF/DEIS and the report be revised as necessary. In response, Section 10 of the Main Report entitled ‘Summary of Agency and Public Involvement’ was modified to document the receipt of the Final Coordination Act Report dated March 10, 2014, and to indicate the receipt of 69 public and agency comments on the Draft EIS. Additionally, Appendix L (Project Correspondence) and M (Public and Agency Review – Comment and Response) were added to the report package. All comments received to date are included in Appendix L and USACE responses to the comments are provided in Appendix M. The IEPR Panel recommended (2) that the report discuss whether the designation of Bogue Banks beaches as critical habitat for nesting loggerhead turtles could generate a new or revised Biological Opinion from USFWS concerning the impacts of the Tentatively Selected Plan (TSP) on this species. In response, Section 2.07.3, discussing Loggerhead Critical Habitat, was added to the main report. Additionally, an assessment of project effects on Loggerhead Critical Habitat was added to Section 7.04 of the main report. The designation of Bogue Banks beaches as critical habitat for nesting loggerhead turtles was included in the USFWS's September 12, 2013 consultation letter (included in Appendix L). In this letter, the USFWS states, "The proposed project may modify, but is not likely to adversely modify, proposed critical habitat of the loggerhead in the project area."

**9. Comment – *Low Significance*: The IFR/DEIS does not include a discussion of how the TSP will provide increased accessibility for low-income segments of the population, as discussed in ER-1105-2-100 and to be fully compliant with Executive Order 12898.**

The comment included two recommendations, both of which were adopted, as discussed below. The comment expresses the concern that the report is not fully compliant with Executive Order 12898.

**USACE Response: Adopted**

**Action Taken:** The IEPR panel recommended (1) that the report provide additional explanation of how the TSP has addressed low-income populations relative to ER 1105-2-100 and (2) that the report provide additional explanation of how the TSP will be in compliance with EO 12898 once the NEPA process is complete, and if any changes will result in modification of or special conditions to the TSP. In response, Section 2.11 of the main report was expanded to include discussion of minorities and low-income population statistics; information was added to Section 7.06.1 of the main report regarding subsistence fishing and commercial fishing; Section 9.15 was added to the main report to specifically address compliance with EO 12898; and two figures, Figure 9.1 (2010 Census Data – Below Poverty Line) and Figure 9.2 (2010 Census Data Percent Non-White) were added to Section 9 of the main report.