

# **Surf City and North Topsail Beach North Carolina, Coastal Storm Damage Reduction; Integrated Feasibility Report and Environmental Impact Statement**

## **FINAL USACE Response to Independent External Peer Review December 2010**

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of WRDA 2007, EC 1165-2-209, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (2004).

The goal of the USACE Civil Works program is always to 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, 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 Surf City and North Topsail Beach draft feasibility report and EIS.

The Battelle IEPR panel reviewed the draft Surf City and North Topsail Beach North Carolina Coastal Storm Damage Reduction Integrated Feasibility Report and Environmental Impact Statement. The Final Report from IEPR was issued 16 April 2010.

Overall, 16 final comments were identified and documented. Of the 16 comments, eight were identified as having high significance, five were identified as having medium significance, and three were identified as having low significance. The following discussions present the USACE Final Response to the 16 IEPR comments.

**1. IEPR Comment – High Significance: Based on the information provided in Appendix D (Coastal Engineering) and the Main Report, the study documentation does not adequately describe the development and application of the coastal engineering models, including model calibration, input data, and explanation of results.**

### **USACE Response: Adopted.**

**Action Taken:** USACE concurs that additional documentation to describe model inputs and results is needed. Additional information has been added to Appendix D (Coastal Engineering) regarding the SBEACH and GENESIS coastal models, as well as the calculation of closure depth, as follows:

The appendix has been modified to include discussion on and a table of SBEACH input parameters. There is no historical beach profile data available to allow calibration of SBEACH. The SBEACH standard coefficients that have been used in most other SBEACH analyses in the

Wilmington District where historical beach data was scarce were used. Volumetric values, when converted to a horizontal distance and compared with the frequency curves of the erosion indicators show that the SBEACH input values were not over-predicting erosion and therefore were not over-predicting damages.

GENESIS was used in a portion of an adjacent beach project on Topsail Island south of Surf City where a terminal groin was being evaluated. Data from these GENESIS model results were initially presented in Appendix D. However, SAW has experienced difficulty in calibrating GENESIS for this project. Additional details have been added to the appendix showing a previous sediment budget analysis, preliminary results from an ongoing regional sediment transport study and additional input values for the planform evolution modeling effort. The Planform Evolution Model of the USACE Beach Fill Module was used to simulate the shoreline retreat due to background erosion and spreading out losses.

**2. IEPR Comment - High Significance: To justify the scale of the recommended project, additional explanation is needed regarding the formulation of the project's initial and periodic renourishment volume requirements, the predicted response of the project to discrete storm events, and the comparative size and response of corollary projects along this coastline.**

### **USACE Response: Adopted**

**Action taken:** USACE concurs that some additional information about project performance should be included in the report. An additional SBEACH Output Parameter Plot, similar to what was already contained in figure D-19 of Appendix D (Coastal Engineering) but showing the same profile and storm event in a without project condition, was added to Appendix D.

Initial fill requirements and nourishment requirements were calculated based on construction of a design template that erodes and is periodically restored/renourished. Overfill ratios and pumping losses are applied in the initial fill computation. The GRANDUC model proceeds through a life cycle simulation of events, considering renourishment interval, storm histories, SBEACH response parameters, and annual erosion to calculate an average renourishment volume.

The report fully explains that the coastal storm damage reduction project is not designed to protect the shoreline against a certain return interval event "i.e, 10-year, 100-year, etc.", and therefore analysis was not conducted on this basis but uses a life cycle analysis that estimates damages prevented based on a suite of probable storms and associated conditions.

Appendix D has been modified to include additional information on the size of these nearby projects. Also, Figure 7.8 has been added to the main report. The figure shows pictures of damages sustained in areas in North Carolina hit by a hurricane, with and without a coastal storm damage reduction project in place. There have been no significant prior federal beach erosion control activities along the project shoreline. A more detailed comparison with non adjacent shorelines projects would not be fruitful due to a myriad of differences in development and coastal storm response.

**3. IEPR Comment - High Significance: The Selected Plan may not be implementable based on the engineering, construction, and fiscal resources information provided in the FR/EIS.**

**USACE Response: Not Adopted**

**Action taken: This portion of the comment is not adopted as** USACE does not concur that the project may not be implementable due to engineering concerns. USACE has considered the borrow area availability issue, and has concluded it has been appropriately addressed in the project's risk management plan through the identification of additional borrow sites with similar borrow cost and volume to mitigate uncertainty. Specifically Section 7.10.3 of the main report has been greatly expanded to discuss project risk as it relates to borrow volumes, as well as the availability of contingency material. For purposes of the study, the currently identified borrow areas was limited to a 5.5 mile offshore boundary. USACE understands that existing data indicates a high likelihood that additional sand resources exist beyond the 5.5 mile area investigated, due to the depth of sand found along the seaward boundary of the borrow area; therefore the risk to the project due to potentially not having enough suitable material in the currently defined borrow areas is considered to be minimal. If the scenario begins to develop later in the project life that additional borrow material needs to be identified, a Limited Reevaluation Report (LRR) on borrow sources would be initiated to identify additional suitable borrow sources. The benefit-cost ratio of the project is high enough that going to an additional borrow area several miles further offshore should not affect the economic feasibility of the plan.

This portion of the comment is adopted as USACE concurs that additional information needs to be provided in the report with regards to the issue of project constructability. Historic dredging production of Wilmington District projects and review of Corps of Engineers Dredge Estimating Program (CEDEP) files demonstrates adequate capability of available dredging equipment to construct the project as planned and fully documented in the report. Project costs were fully evaluated as described in the report and a cost risk assessment that was certified by the USACE Cost Engineering Center of Expertise. The cost estimates include a contingency value that is part of the total project cost. A risk assessment has now been added to Appendix N (Cost) in the final iteration of the report.

This portion of the comment is adopted as USACE concurs the additional information needs to be provided in the report with regards to the question of financial capability. The non-federal sponsor is required to submit a self certification of financial capability, indicating their ability to pay their required cost-share. Signed certification letters from Surf City and North Topsail beach have been included in Appendix H (Correspondence) of the final report.

**4. IEPR Comment – High Significance: Estimates of property values are potentially incorrect for measuring the economic value of coastal locations.**

**USACE Response: Adopted**

**No action taken:** USACE concurs that a different method for estimating property values could be used to determine property values, however USACE policy requires that replacement cost minus depreciation, rather than an alternate method, such as assessed value, is used to determine damages. The rationale is given in ER-1105-2-100 (Planning Guidance Notebook), which states - "Damages are expressed as a percentage of structure value. When depth-damage curves are used, the correct measure of structure value, consistent with cost-benefit concepts, is replacement cost less depreciation to the existing (pre-flood) structure. (a) Replacement cost is the cost of physically replacing (reconstructing) the structure (only). Depreciation accounts for deterioration occurring prior to flooding, and variation in remaining useful life of structures. (b) Assessed value, real estate appraisal and market value data do not necessarily provide acceptable and directly useable estimates of replacement cost less depreciation, even when separate land and improvement values are reported. A variety of particular causes may make the data inappropriate, but the fundamental reason is that these data are produced for and primarily used for a purpose other than estimation of flood damages, that is for other than NED benefit estimation purposes."

**Action taken:** In response to the request for documentation in the report, the Feasibility Report Appendix B Section 2.01 documents that the study is in compliance with the Corps of Engineers Policy Guidance on Coastal Storm Damage Reduction, ER 1105-2-100. Appendix B Section 2.07 documents the use of replacement cost less depreciation and summarizes value by reach. Appendix B attachment B-3 provides a replacement cost less depreciation value for every structure listed on the inventory.

**5. IEPR Comment – High Significance: The benefits associated with the non-structural alternative may have been underestimated or not fully evaluated, and the spatial distribution of benefits is unclear.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that a more detailed non-structural analysis could have been conducted, and that a more detailed analysis would result in a more accurate assessment of non-structural net benefits. The non-structural analysis that was performed in Section 5.05.1 and Appendix P of the report was a preliminary analysis that was performed to see if there were potentially enough net benefits to justify doing a more full scale analysis. Because the preliminary analysis yielded a very low benefit to cost ratio, a more detailed analysis was not necessary for this study.

Additional text has been added to section 5.05.1 of the main report to indicate that recreation benefits from such a plan are not zero, and qualitatively discuss the potential for an increase in recreation benefits under the non-structural plan.

The report indicates that the distribution of storm damage reduction benefits, the majority of the damages are incurred in the first row of structures in the without project condition.

**6. IEPR Comment – High Significance: The presented geotechnical data are either incomplete or indicate that the proposed borrow sites are not well-suited to meet the requirements and predicted performance of the Selected Plan from engineering, economic, and environmental standpoints.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that the geotechnical data and assumptions used in the study should be re-examined and risk with regards to borrow availability should be addressed in more detail. The volume estimate for the project has accounted for both placement and mechanical losses in the overfill ratio. However, the average overfill ratio used for the renourishment cycles in the report was determined to be incorrect. As a result, the report was revised to incorporate these changes and the project volume requirements were increased.

Vibracore locations identified within hard bottom buffers were not used in volume calculations. Figure A-6 in Appendix A (Project Maps), which illustrates a hard bottom buffer zone in borrow area E was incorrectly labeled. The accurate hard bottom buffer zone is depicted in Figure A-1. Figure A-6 was corrected in the final report to reflect this fact.

USACE concurs with the suggestion of adding a vertical buffer in the volume calculations. In order to generate a more conservative volume estimate, in the final report volume availability was recalculated using a 6 inch vertical buffer.

Section 7.04.2 and Table 7.5 of the main report have been modified to reflect an increase in project volume requirements and a decrease in volume availability. After these recalculations, there was still a 9% contingency (reduced from 16%) for material availability when accounting for the requirements of all proposed projects on Topsail Island.

Section 7.10.3 of the main report has been greatly expanded to discuss project risk as it relates to borrow volumes, as well as the availability of contingency material. It is acknowledged the geotechnical data is limited in scope. Additional characterization will be conducted in the engineering and design phase of this project which will include additional vibracoring and compatibility analysis. The volume estimate will be reevaluated upon completion of further compatibility analysis.

**7. IEPR Comment – High Significance: The justification for developing and applying the historical shoreline erosion rate, as presented in the FR/EIS, needs more detail.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that more discussion regarding use of the historical shoreline rate should be added to the report. Appendix D (Coastal Engineering) has been updated to include figures showing input values for the planform evolution modeling analysis. A simplified sensitivity analysis of reduced erosion rates was also conducted and added as section 5d to Appendix D. This analysis was done since there is minimal detailed data to support erosion rates calculated with the end-point analysis.

**8. IEPR Comment – High Significance: The proposed geometry of the berm and dune appears inconsistent with natural beach profiles.**

**USACE Response: To be Adopted**

**Action to be taken:** USACE concurs that the geometry of the designed berm and dune is something that can be looked at in more detail in future studies. However, similar geometries as the one used in this study have been used on other beach projects in the region with long lasting results.

USACE is aware of test projects in Florida using a sloped berm “turtle friendly” profile and these efforts will be monitored. USACE agrees that it is important to consider alternative types of dune and berm geometries and will certainly consider analyzing or implementing such things as a "turtle friendly" profile in the future.

**9. IEPR Comment – Medium Significance: The recreation benefits analysis omits overnight users, lacks an explanation for selecting the contingent valuation benefit estimate over the travel cost benefit estimate, and omits a discussion of congestion, all three of which can be addressed with existing project data or literature.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that there are limitations in the recreation analysis that warranted additional discussion in the report. Language has been added to Appendix O (Recreation Analysis) which describes the limitations of the recreation analysis, including omission of overnight users, avidity bias, endogenous stratification, and issues regarding congestion. The appendix qualitatively discusses how these limitations would impact the results (either increasing or decreasing benefits).

**10. IEPR Comment – Medium Significance: The cost estimates need more detailed explanation, including the rationale for calculating interest during construction.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that additional discussion regarding cost estimates and interest during construction should be added to the report. This information is included in Appendix N (Cost) of the report.

Interest during construction is calculated as a matter of USACE policy. The rationale is listed in the ER 1105-2-100 (Planning Guidance Notebook), Appendix D. Information regarding the basis for calculating Interest During Construction has been added to section 7.03.2 of Appendix B (Economics) for clarity.

**11. IEPR Comment – Medium Significance: The study documentation should indicate the degree to which anthropogenic replenishment and prior storm impacts have influenced the representative beach profiles applied in SBEACH and GRANDUC models.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that more information regarding the development of representative profiles should be added to the report. Appendix D (Coastal Engineering) has been updated in section 3(b) to include discussion of other coastal storm damage reduction projects along the NC coast, and additional information about the representative profiles is also provided. Groupings of profiles with similar features were further reviewed. Of the 52 beach profiles within the selected plan limits, 16 were used as representative profiles. Although the 2002 profiles likely are continuing to show effects of the storms of the 1990's, no other profile data is available for comparison. An addendum (D:5) to Appendix D has been added with plots of each group of profiles showing their similarities.

**12. IEPR Comment – Medium Significance: Local data sets and prior analyses on longshore sediment transport, wave height, and background erosion rate have not been fully discussed.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that additional information regarding sediment transport, wave height, and background erosion rates, if available, should be added to the report. Discussion has been added as section 4(c) to Appendix D (Coastal Engineering) concerning the local bathymetry. No data is available to analyze historical volume changes or actual storm responses.

**13. IEPR Comment – Medium Significance: Additional risk and uncertainty analysis is necessary to address the assumptions and inherent variability in project costs, property values, climate change, and recreation.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that additional discussion regarding project risks should be added to the report. A cost and schedule risk analysis was conducted and certified by the USACE Cost Engineering Branch Center of Expertise. The cost and schedule risk analysis report has been added to the final report as part of Appendix N (Cost).

The GRANDUC program does not conduct a risk and uncertainty analysis with regards to recreation. Recreation benefits can be added on within GRANDUC "after the fact" (in other words, although a value for recreation benefits can be inserted into GRANDUC, it is simply a value added on at the end to the coastal storm damage reduction benefit that is calculated). A section to Appendix O (Recreation Analysis) has been added that qualitatively discusses some of the uncertainties regarding the recreation analysis.

Sea level rise is incorporated into GRANDUC as a single value that is then applied at the start of the project. The main report discusses in section 7.10.4 how different scenarios of accelerated rates of sea level rise would affect the economics of the selected plan. Information has also been added to this section that lists the amount of additional borrow material that might be required under these accelerated sea-level rise scenarios.

**14. IEPR Comment – Low Significance: The fishery resources discussion should be expanded to include nearshore shellfish species and relationships between Essential Fish Habitat (EFH) and commercial/recreational fishery values.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that information regarding shellfish resources should be added to the report. Section 2.01.12 was added to the main report, and discusses shellfish resources in the area and their relation to the commercial fishing industry.

**15. IEPR Comment – Low Significance: The FR/EIS should be expanded to address the relevant Federal and State protected species statutes and should be updated to clarify the present status of several species.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that additional information regarding Federal and State protected species statutes should be incorporated into the report. Section 2.02.4 of the main report has been updated to reflect incorporation of text on ESA, State law, Bald Eagle Protection Act, and MMPA. Tables 2.7 and 2.12 of the main report have been updated and checked for accuracy and consistency. A section (3.02.9) has been added to Appendix I (Biological Assessment) regarding Smalltooth Sawfish.

**16. IEPR Comment – Low Significance: Historical conditions, including storm impacts and dredged material disposal activities at and near the project area, need to be described more thoroughly due to their influence on future erosion rates and renourishment requirements.**

**USACE Response: Adopted**

**Action taken:** USACE concurs that discussion regarding historical conditions should be discussed in the report. There have not been large scale prior federal shore protection activities on Topsail Island. Table 3.1 of the main report lists the intensity of all major storms that have directly hit SE North Carolina, from 1815 to 1999. A major hurricane has not hit the area since 1999.

Section 5.06.3 has been updated to better explain why material from the inlets was excluded from consideration for the project– the primary reason is cost relative to the amount of material available, although CBRA zone and environmental factors were also considered.