



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
WASHINGTON, D.C. 20314-1000

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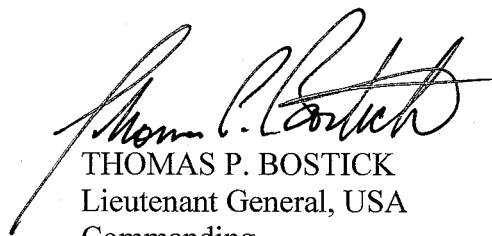
AUG 17 2012

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: Savannah Harbor Expansion Project, Chatham County, Georgia and Jasper County, South Carolina, General Re-Evaluation Report (GRR) and Environmental Impact Statement (EIS)

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 1165-2-209, 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 nine individuals with technical expertise in hydraulic engineering, civil engineering, economics, plan formulation, coastal environmental engineering, environmental resources and compliance engineering, real estate, cost engineering, and water quality 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 Report. The IEPR Report and USACE responses have been coordinated with the vertical team and will be posted on the internet, as required in EC 1165-2-209.
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.

Enclosure


THOMAS P. BOSTICK
Lieutenant General, USA
Commanding

**Savannah Harbor Expansion Project
General Re-Evaluation Report and Environmental Impact Statement**

**FINAL
U.S. Army Corps of Engineers Response to
Independent External Peer Review
August 2012**

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of WRDA 2007, EC 1165-2-209, EC 1105-2-410, 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 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 Savannah Harbor Expansion Project (SHEP) Draft General Re-Evaluation Report and Draft Environmental Impact Statement (EIS).

The Battelle IEPR panel conducted a preliminary review of the Economic Appendix and model and the Cost Engineering Appendix in the summer of 2010. The team provided 7 comments on the Economic Appendix and model and 1 comment on the Cost Engineering Appendix. The IEPR panel did not identify any of the comments as being significant. The District addressed the comments as it finalized the draft reports. The panel reviewed these same subjects during its review of the Draft General Re-Evaluation Report (GRR) and Draft EIS, and supporting documentation, in late 2010. Battelle issued its Final IEPR Report in February 2011.

The IEPR panel provided 19 comments on the Draft GRR/EIS, 5 comments on the updated chloride modeling, and 1 comment on the public and agency comments received on the draft reports (25 total), none of which they identified as having high significance. They indicated 8 had medium significance, while the rest they identified as having low significance. The IEPR panel also provided a general comment about the public comments that the Corps received from review of the draft reports. The IEPR report states that “Overall, the Panel believes that, when all of the SHEP GRR, Tier II EIS, and supporting documents are taken into account, a very thorough assessment of the economic, engineering, and environmental impacts and benefits of the SHEP was prepared.”

Battelle’s Final IEPR Report contains their detailed comments and suggested ways to resolve their concerns. The following discussion presents the USACE Final Response to the 25 IEPR comments.

1. Comment – *Medium Significance*: The currently chosen open water boundary condition for salinity for the Environmental Fluid Dynamics Code (EFDC) hydrodynamic model is located in an area that is potentially impacted by discharge from the Savannah River, which could result in an inadequate representation of the cause-effect relationship between river discharge and ocean salinity that affects salinity and the affected resources in Savannah Harbor.

USACE Response: Not Adopted.

The original EFDC model grid was developed by EPA in its work for the Dissolved Oxygen TMDL for the harbor. Salinity conditions are very important in such determinations. A major purpose of the grid boundary conditions and location 17 miles offshore was to propagate a tide and salinity condition to match long term tidal records from USGS gages located at the mouth of the river and multiple locations within the inner harbor. The Corps recognizes that there are shelf circulation patterns that occur offshore which are not captured or simulated by the SHEP model. This issue was discussed among the natural resource agencies in 2004 and 2005. The agencies identified the upper portion of the estuary as containing critical natural resources that could be affected by a harbor deepening, whereas biological resources in the open ocean were not expected to be substantially impacted by harbor deepening outside the footprint of the construction. Because the deepening alternatives under consideration do not change the quantity or timing of flow coming from the Savannah River, they were judged by the Corps, and the natural resource agencies, as being unlikely to affect circulation patterns on the continental shelf, salinity in that offshore area (South Atlantic Bight), or seasonal variations in those parameters. Hydrodynamic modeling experts from the District, the Corps (ERDC), and the natural resource agencies agreed that the focus of the model calibration should be on the locations where critical biological resources reside (the upper estuary) that could be affected by a harbor deepening. Model runs were accomplished with a higher salinity in the offshore boundary condition, but this did not improve the overall calibration of the model. The agencies agreed that the tide and salinity propagation at the mouth of the river was more important in determining salinity conditions in the estuary. A substantial amount of interagency coordination occurred during development of the model, and the regional natural resource agencies concurred that the present (and agency-approved) setup of the model grid makes the best use of a lengthy historic dataset that allows better overall model calibration and applicability to a wide range of conditions.

The natural resource agencies developed performance expectations for the model prior to the model development. The calibration process required that strengths and weaknesses of the model be identified. Once identified, each strength and weakness was vetted and accepted by the modeling technical review group. The existing model calibration, with its ocean boundary conditions and locations, met the goals of the natural resource agencies and was approved by the Corps' technical reviewer (ERDC-CHL). These models were primarily developed to identify potential impacts to waters and marshes within the estuary, not offshore. Even so, the model technical review group found the calibration to be acceptable in the offshore area. If the ocean boundary conditions and locations were changed, model predictions in the upper portion of the inner harbor, where highly valued resources are located, would not be improved. Adopting the suggested revisions to the model would not improve the accuracy of the impact predictions or change the project recommendations. Note that monitoring and adaptive management will be

implemented as outlined in the Final Environmental Impact Statement, which will allow for the modification of features, if deemed necessary. In order to provide additional clarification, discussion on the salinity boundary has been added to Section 7.3 of the Engineering Appendix.

2. Comment – *Medium Significance*: The current plan for mitigation of low dissolved oxygen (DO) conditions - using direct injection of pure oxygen into the water column - does not appear to take into account the resulting supersaturated river water that could kill fish species passing through, entrained within, or captured by the injection “plume.”

Three recommended actions were identified:

1. Provide information on the DO tolerance ranges for the threatened and endangered fish species as well as all other expected fish species.

2. Provide information in the SHEP Tier II EIS sections and within the appendices cited that describes the decision-making process for arriving at oxygen injection using Speece Cones, and discuss what considerations were used concerning biota (fish species in particular).

3. Provide an analysis of cost efficiency in the project review documents that either supports or challenges the assertion (Section 5.2.2 of the SHEP Tier II EIS) that “oxygen injection is the most cost-effective method for raising DO levels in the harbor.”

USACE Response: Adopted.

Action Taken: The Corps included consideration of supersaturating the river water in its design considerations for this mitigation feature and the report was revised to better explain this as indicated below. Recommendation #1 requested information concerning the DO tolerance ranges for the threatened and endangered fish species, as well as all other expected fish species. A literature search was conducted concerning the upper limit for DO tolerance ranges for expected fish species in the project area. Although the lower dissolved oxygen limit for survival is well documented, no specific literature addressed the upper limit of DO tolerance. However, according to Charnet, "Fish can tolerate water supersaturated with oxygen quite well, at least temporarily." The Corps has added this information to the Final EIS in Section 5.02.2. In addition, the Corps recognizes that fish mortality has been associated with oxygen injection systems due to the formation of gas bubbles. The gas bubbles formed when atmospheric oxygen is used for oxygen systems and is due to the presence of nitrogen in the atmosphere. The Speece Cone design would use pure oxygen that does not contain nitrogen, so this phenomenon would not occur in this application.

Fish toxicity and super saturation effects were included in the 2009 MACTEC report titled “Savannah Harbor Reoxygenation Demonstration Project, Supplemental Data Evaluation Report”, which documented a demonstration project that the Georgia Ports Authority conducted of the Speece cone technology in Savannah Harbor. According to the MACTEC report no fish mortality was noted during the demonstration test, although abundant wildlife was observed in the vicinity of the project. State and local environmental agencies participated in the demonstration project and did not express any concerns about fish mortality. There were no toxicity issues in the 2007 Demonstration Project. The demonstration project reports have been

added to the supplemental studies attachment to the GRR Engineering Appendix (#48, “Savannah Harbor Reoxygenation Demonstration Project, January 2008 and #49, “Savannah Harbor Reoxygenation Demonstration Project Supplemental Data Evaluation Report”).

Recommendations 2 and 3 relate to topics that are addressed in the 2005 MACTEC Report titled "Identification and Screening Level Evaluation of Measures to Improve Dissolved Oxygen in the Savannah River Estuary, Savannah Harbor Expansion Project and Savannah Harbor Ecosystem Restoration Study, Chatham County, Georgia", which the Corps used to identify and evaluate measures that could be used to increase oxygen levels in the harbor's waters. That analysis concluded that oxygen injection is the most cost-effective method for raising DO levels in the harbor. This report has been added to the supplemental studies attachment to the GRR Engineering Appendix (#47, “Identification and Screening Level Evaluation of Measures to Improve DO in the Savannah River Estuary”).

3. Comment – *Medium Significance*: The review documents do not sufficiently describe, justify, and validate the respective models employed and do not contain the information needed to verify whether the models accounted for the extra dredge depths specific to over-dredging and advanced maintenance.

USACE Response: Adopted.

Action Taken: The analyses conducted for this project account for the complete dredging depths in each channel segment, including the design dredge depth, overdredge tolerance, and advanced maintenance. This was a topic of much discussion during development of the impact prediction models. The SHEP model includes advanced maintenance and overdredging depths for all model runs, including those for the existing conditions. Additional discussion requested on model description and justification, vertical datums, and the results of the model calibration and validation, were added to the GRR Engineering Appendix Section 7.3, Model Development and Calibration.

4. Comment – *Medium Significance*: Documentation of assumptions used throughout the analyses in the SHEP GRR and Tier II EIS are incomplete and need further explanation to support the conclusions.

USACE Response: Adopted.

Action Taken: Additional discussion of civil, environmental and cost engineering assumptions was added to the GRR Engineering Appendix, Section 13.0 titled Cost Engineering. A summary of the rationale for selecting the risk analysis and cost contingency projections was added to the GRR Engineering Appendix, Section 13.3.4. Details of the cost/risk analysis are further described in the Project Cost and Schedule Risk Analysis Report, which is included as Attachment 4 of the Engineering Appendix. The plan formulation and plan selection rationale have been expanded in the EIS Section 3.0, GRR Section 6.0, and the GRR Appendix D -- Plan Formulation Appendix.

5. Comment – *Medium Significance*: The conceptual model for water quality interactions in Savannah Harbor needs additional explanation and justification to support the exclusion of the benthic release of ammonia as a source term for ammonia in the water quality model.

USACE Response: Adopted.

Action Taken: During model development, the Corps analyzed the Sediment Oxygen Demand and flux data with an interagency team of water quality experts, who decided that ammonia fluxes were not significant and not needed in the WASP model. The water quality model does include spatial differences in SOD within the estuary. This explanation was added to the GRR Engineering Appendix, Section 7.3.3.

6. Comment – *Low Significance*: The EFDC hydrodynamic model setup for the open water boundary condition and representation of the southeast boundary line offshore from Tybee Island has not been defined, causing an infinitely high barrier in the ocean that does not allow flow and mass transport across the southeast boundary.

USACE Response: Not Adopted.

The Corps does not believe it is necessary to put a tidal boundary on the southern portion of the EFDC model grid. As stated previously, the hydrodynamic and water quality model was developed with extensive coordination with Federal and State natural resource agencies (please see response to Comment #1). This issue is insignificant in the overall evaluations of the adverse impacts and the effectiveness of mitigation options. The Corps has added these clarifications to the GRR Engineering Appendix, Section 7.3.1.

7. Comment – *Low Significance*: Beneficial uses of dredged materials from the Inner Harbor are not fully evaluated in the SHEP GRR, Tier II EIS, or Dredged Material Management Plan (DMMP).

USACE Response: Adopted.

Action Taken: Three major beneficial use opportunities were investigated for this project: (1) covering cadmium-containing sediments (with cleaner new work sediments); (2) using material placed in Confined Disposal Facilities (CDFs) for future dike raisings; and (3) placing sediments in the nearshore area off Tybee Island. The final reports recommend implementation of beneficial use opportunities (1) and (2). Section 3.07 of the EIS was revised to include a short summary of these and other beneficial use opportunities that were investigated.

Section 11.2 of the Engineering Appendix describes opportunities (1) and (2) and the Corps' plan to implement the selected beneficial use opportunities, i.e., the selective placement of

dredged material so that clean sediments are used to cover cadmium-laden sediments to be deposited in DMCA 14A and /or 14B and deposition of suitable quality new work material in CDF 13A that will be used in the future for dike raising and/or maintenance. In addition, see the discussion of beneficial use in Sections 1.5, 1.6, and 2.2 of the Dredged Material Management Plan (Document 39 of GRR, Appendix C, Attachment 3).

In the draft reports, the Corps recommended placement of new work material in the nearshore area off the coast of Tybee Island. Based on comments received from both Georgia Department of Natural Resources and the City of Tybee Island, the Corps removed nearshore placement of new work dredged material from the Selected Plan. Further explanation, including the history of the plan development, has been added and/or expanded in the EIS Section 3.07.

8. Comment – *Low Significance*: Impacts to Tybee Island from the existing navigation channel and future navigation channel, including downdrift impacts, need further explanation.

USACE Response: Adopted.

Action Taken: The cumulative impacts of the Savannah Harbor Navigation Project are addressed in the cumulative impacts analysis (EIS Appendix L). A specifically authorized study, known as the Tybee Channel Impacts Study, provides the authorization for the Corps to study the impacts (Phase I) and determine appropriate mitigation measures (Phase II). Phase I of the study was completed in 2008. The Corps was working with the City of Tybee to continue with Phase II of the study. However, in September 2010, the City of Tybee Island stated that they did not have a source of matching funds required to continue the study as the non-Federal cost-sharing partner. Should the City of Tybee find a source of matching funds, the cost-shared study could be resumed.

The 2007 report entitled “Impact of Savannah Harbor Deep Draft Navigation Project on Tybee Island Shelf and Shoreline”, has been added to the GRR Engineering Appendix, Supplemental Materials (Document 55) and additional discussion has been added to Section 2.2 of the Engineering Appendix.

9. Comment – *Low Significance*: Design assumptions in the SHEP GRR need further clarification to explain risk and uncertainty to project cost and schedule.

USACE Response: Adopted.

Action Taken: Additional discussion on project contingencies and the cost risk analysis was added to the GRR Engineering Appendix, Section 13.3.4, and the Cost Risk Analysis was added as Attachment 4 to that appendix.

10. Comment – *Low Significance*: The conceptual model for water quality interactions in Savannah Harbor needs additional explanation and justification to support the exclusion of algae as a state variable in the water quality model.

USACE Response: Adopted.

Action Taken: Through data analysis and model simulations, it was concluded that algal activity effects on dissolved oxygen are negligible. The interagency team of water quality modeling experts decided in 2005 that excluding algae, and therefore not using the full eutrophication capabilities of WASP, was appropriate for Savannah Harbor. This information has been added to the GRR Engineering Appendix, Section 7.3.3.2.

11. Comment – *Low Significance*: The discussion of the process for selecting the various plans is unclear.

USACE Response: Adopted.

Action Taken: Based on guidance at the time, the draft reports contained references to both the “tentatively recommended plan” (the 47-foot depth alternative) and the “maximum authorized plan” (the 48-foot depth alternative). As a result of refinements that have occurred since their release, the Final GRR and EIS recommend only one plan, the “Selected Plan”, i.e. the 47-foot alternative. The reports have been revised accordingly. Table 11-3 in the GRR presents a system of accounts for comparison of the no-action alternative and the alternative plans. Section 14 of the Final GRR was added to provide specifics on the Selected Plan.

12. Comment – *Low Significance*: Documentation regarding commodity movement data is insufficient to support the commodity movement projections presented in the analysis.

USACE Response: Adopted.

Action Taken: As recommended by the panel, the Corps incorporated 2008 – 2010 data on cargo tonnage, twenty-foot equivalent units (TEUs) (laden and empty), and tonnage by service for imports and exports, grouped by trade routes. This creates a new tonnage and TEU forecast by trade route for Savannah Harbor container cargo that includes the latest information on Savannah trade and outlook, and includes the effects of the recent economic downturn.

The Corps updated the world fleet forecast by vessel classes, as well as relationships of that world fleet to the anticipated fleet calling Savannah. This update likewise includes the recent economic downturn, its effects on cancellations and new orders, and the most currently available outlook of fleet expansion through 2030. It also includes an update of relationships for vessel capacity calling Savannah to TEUs handled at Savannah using a 2000-2010 period, and the percent share of that capacity predicted to be in Post-Panamax Generation 1 and Post-Panamax Generation 2 vessels.

This updated information has been incorporated throughout the analyses described in the GRR Economic Appendix.

13. Comment – *Low Significance*: The socioeconomic resources are not described in sufficient detail.

USACE Response: Adopted.

Action Taken: An updated and expanded socioeconomic resources section has been included in the EIS, Section 4.13. Output from the economic Impact Forecasting System Model has been included to describe the potential economic impacts to the local economy (GRR Economic Appendix, Section 8.2.1).

14. Comment – *Low Significance*: The commodity movement model and analysis needs to be strengthened by including data for 2008, 2009, and even 2010 to capture the economic downturn.

USACE Response: Adopted.

Action Taken: As recommended by the panel, an updated commodity forecast was developed to include historical data from 2010, along with an updated 2005 through 2010 Global Insight South Atlantic Trade forecast. These resulting growth rates were applied to the new baseline to establish a new long-term trade forecast (metric tons) and reflect the impacts of the recent economic downturn and more current projections of future import and export trade.

Other information used in the commodity forecast and TCSM such as changes in trade routes, tonnes per TEU, and percent empty containers were updated using the 2005 thru 2010 data.

Section 5.4.1 of the GRR and Section 3.3 of the Econ Appendix were revised and updated based on the new commodity forecast and updated fleet forecast.

15. Comment – *Low Significance*: The application of a 25% contingency to different portions of the same alternative may result in artificially increased cost projections.

USACE Response: Adopted.

Action Taken: Additional information has been added to Section 13.3.4 of the GRR Engineering Appendix to explain the contingency application. The Project Cost and Schedule Risk Analysis Report (Attachment 4 of the GRR Engineering Appendix), prepared by the Corps' Cost Engineering Directory of Expertise, confirms the project contingency estimates.

16. Comment – *Low Significance*: Predictions regarding the lack of future increases in overall cargo amounts require further explanation.

USACE Response: Adopted.

Action Taken: The Corps expects the volume of cargo moving through the port to increase over time in response to increases in population in the Southeast. The same rate of increase is expected in both the With and Without Project conditions. The analyses indicate the port would reach its maximum throughput around 2030, when the Garden City Terminal reaches its throughput capacity. The GRR Economic Appendix Section 3.3.3.3 contains a revised description of the expected growth. More information can also be found in the Economic Appendix Sections 3.3.1, 3.5, and 6.2.2.1, which were revised and Section 7.2 which was added to the report to summarize updated information after the draft report.

17. Comment – *Low Significance*: The approach to measuring Regional Economic Development (RED) impacts does not appear to follow the Water Resource Council Economic and Environmental Principles and Guidelines (P&G) for Water and Related Land Resources Implementation Studies.

USACE Response: Adopted.

Action Taken: An analysis using the Economic Impact Forecasting System (EIFS) Model has been included that describes the expected RED effects. EIFS draws information from a tailored socioeconomic database for any county (or multi county area) in the U.S., to estimate the changes associated with any project proposal to assess potential impacts on four elements of a local economy: business volume, employment, personal income, and population. The EIFS model provides the flexibility for the evaluation of alternative scenarios. In response to public comments, the Corps conducted additional analyses using RECONS (Regional Economic System). Section 8.2 of the GRR Economic Appendix has been revised to incorporate this analysis, which is consistent with the P&G.

18. Comment - *Low Significance*: The report should address the current status of, and any impacts of delays in, the Panama Canal deepening.

USACE Response: Adopted.

Action Taken: The Panama Canal Authority has continued to make progress on its enlargement of the Panama Canal. That work is scheduled to be complete in October 2014, and all indications are that the work will be finished on or near that date. The final GRR describes a revised completion date of 2017 for construction of the Savannah Harbor Expansion Project. Even if the Panama Canal is not complete in 2014 as expected, it is very unlikely that it would not be complete prior to the proposed deepening of Savannah Harbor. The present status of the Panama Canal enlargement is discussed in the GRR (Section 1, 4.1, and 4.2) and in the GRR Appendix A (Economic Appendix), Section 3.2.

19. Comment - *Low Significance*: Potential effects of future climate change are not fully described and addressed.

USACE Response: Adopted.

Action Taken: In recognition of the uncertainties in predicting future events, the Corps performed various sensitivity analyses during the course of the SHEP evaluations. Those scenarios varied by resource and included evaluation of potential project impacts to dissolved oxygen and wetlands under average and drought flows; to Striped bass habitats under average, high and low river flows; and to wetlands under various amounts of sea level rise. The District consulted with the Interagency Coordination Teams to identify scenarios that the natural resource agencies believed would be required to evaluate this harbor deepening in sufficient technical depth so that they would reasonably understand the likely impacts from implementation of the project and the sensitivity of those predictions to other conditions. The Interagency Coordination Teams recommended sensitivity analyses to evaluate this project that include a sufficient range of conditions to address potential changes in conditions resulting from climate change.

The climate change discussion is summarized in the Final EIS (Section 5.20.3). Sea level rise and its potential effects were examined in detail and considered to be the most important factor to determine potential effects of the proposed action relating to climate change. The Corps performed impact analyses for several rates of sea level rise. The results of those analyses and their associated impacts are summarized in Sections 5.01 and 5.15 of the EIS, and Section 7.5 of the GRR, Appendix C. The description of the calculations for various rates of sea level rise in Section 7.5.2.2 of Appendix C of the GRR was expanded to describe the results of the detailed analyses that the Corps performed concerning various sea level rise scenarios, which were conducted in accordance with Corps policy (EC 1165-2-212, dated October 2011).

Final Panel Summary on the Savannah Public Comments

Comment - *Low Significance*: Several concerns noted in the Public Comments on the Savannah Harbor Expansion Project (SHEP) General Reevaluation Report (GRR) and Tier II Environmental Impact Statement (EIS) should be further analyzed and documented.

USACE Response: Adopted.

Action Taken: Over 2,600 public and agency comments were received on the draft documents. The Corps included responses to each of those comments in the Final EIS. Additional analyses were performed where necessary and their results were included in the final documents. The IEPR identified the following items that the Corps should be aware of in the public comments. A brief summary of the action the Corps took follows each issue:

- Fish ladder effectiveness – The expected effectiveness of the fish bypass was greatly increased as a result of a substantial enlargement of the fish bypass that would be constructed. Goals for fish passage effectiveness are included in the Final EIS.
- Removal of the New Savannah Bluff Lock and Dam – The Corps held an interagency workshop to review the fish passage issue. The feasibility of dam removal was one of the items specifically discussed. The selected plan includes a fish bypass around the dam, rather than dam removal.
- Placement of dredged sediments near Tybee Island – The Corps received numerous comments about the proposed nearshore placement plan. In light of concerns about the quality of the sediments, the State of Georgia and the City of Tybee Island requested the Corps modify its sediment placement plan. As a result, the Corps revised the plan and new work sediments will not be placed in the Tybee nearshore area. This change is included in the final documents.
- Methods to determine the suitability of dredged material to be placed in the nearshore should be better documented to allow the public to understand the rigorous requirements the Corps follows – The Corps developed additional detail about the sediment characterization and provided it to Georgia DNR and the City of Tybee Island. In light of their continued concerns about the quality of the sediments, the State of Georgia and the City of Tybee Island requested the Corps modify the sediment placement plan. As a result, the Corps removed the nearshore placement of new work sediments from the project.
- Effectiveness of the mitigation monitoring periods – The Corps extended post-construction monitoring for some features from the original five-year duration to ten years.
- Chloride impact assessment – The Corps completed its additional evaluation of potential chloride increases at the City of Savannah’s water intake. As a result, the Corps has included construction of a raw water impoundment as mitigation for expected chloride increases during periods of low river flow and high tides. The final documents include the updated impact analyses and description of the proposed mitigation.
- Additional air quality, noise, environmental justice, and cumulative impact evaluation – Additional analysis and discussion was conducted and was included in the final documents for these factors.
- Economic calculations for each alternative should include the cost of adjusting U.S. Coast Guard Aids to Navigation - The final documents include the costs of additional navigation aids required by the proposed changes to the navigation channel.
- Additional information on the steps USACE will take to ensure that mitigation is conducted – The Corps coordinated extensively with the natural resource agencies on this issue in 2011. Appendix D of the Final EIS contains much more detail on the monitoring and adaptive management that would be performed.
- Apparent lack of use of ecological performance measures during the Adaptive Management – Appendix D of the Final EIS has been revised to include additional ecological performance measures in the discussion of the evaluation of the project’s performance, including of the mitigation features.

- Because in-kind mitigation of adverse impacts to tidal freshwater wetlands is not possible, some agencies suggest that the neither the National Economic Development (NED) plan nor the Locally Preferred Plan (LPP) be chosen - The Corps continued to coordinate with the natural resource agencies in 2011 concerning mitigation for secondary impacts to wetlands. Appendix C of the Final EIS has been updated to provide more information about the mitigation proposed for the expected adverse impacts.
- Impacts from potential development of a Jasper terminal have not been addressed – The requested information is outside of the scope of the SHEP project and the Corps’ Congressional authorization and funding. The Corps considered deepening the harbor to sites in Jasper County for a new terminal early in the study process. That analysis is found in various places in the GRR and EIS, including EIS Appendix O. The Corps incorporated recent information on the status of that conceptual proposal in its update of a discussion of the Without Project Condition in GRR Appendix D.
- Maritime landside transportation developments - Some detail regarding expected landside development was added to the final reports. Some of the requested information is outside of the scope of the SHEP project since future With and Without Project landside development would be the same.
- Selection of shoreline segments for shoreline and bank erosion/stability studies should be explained – Additional explanation was added to the GRR Engineering Appendix, Section 9.1.5.
- Channel does not meet USACE design standards – Additional explanation was added to Section 6.0 of the GRR Engineering Appendix to further explain how the channel design standards were incorporated into the project design.
- Apparent consideration of only deepening to the Garden City Terminal - The alternatives analysis considered other potential sites for the project, including other South Atlantic ports (Jacksonville, Charleston, Wilmington, and Norfolk), and eight alternative locations or sites for a port/terminal along the Savannah River (including a proposed terminal in Jasper County). That analysis is found in various places in the GRR and EIS, including EIS Section 3.0, Alternatives; EIS Appendix O, Formulation of Alternatives; GRR Section 6, Formulation of Alternatives; GRR Appendix A, Economics; GRR Appendix A, Attachment 6 (Regional Port Analysis); GRR Appendix A, Attachment 4 (Multiport Analysis); and GRR Appendix D, Plan Formulation Appendix. The report documenting that analysis of potential terminal locations was included as EIS Appendix O. The Corps revised the GRR Section 6 to better summarize and reference that analysis.

Final Panel Member Comments on the Chloride Model Review

CL-1 Comment - *Medium Significance*: The currently chosen open water boundary condition for salinity for the Environmental Fluid Dynamics Code (EFDC) hydrodynamic model is located in an area that is potentially impacted by discharge from the Savannah River, which could result in an inadequate representation of the cause-effect relationship between river discharge and ocean salinity that affects salinity and the affected resources in Savannah Harbor.

USACE Response: Not Adopted.

Please see response to Comment #1 for a detailed explanation regarding model boundary conditions.

CL-2 Comment - *Medium Significance*: Grid cell coordinates and the design of the curvilinear grid scheme for the extended grid model of the harbor and the initial condition for salinity may cause mass balance problems for the hydrodynamic model.

USACE Response: Adopted.

Action Taken: Several of the coordinates were corrected in the latest model input files. The corrections will make future reviews and use of the models easier when the grid cells are plotted. The EFDC results were not affected, since the grid coordinates are not directly used in the model calculations.

Discussions regarding grid convergence and orthogonality were added to the GRR in the Engineering Appendix, Section 7.3.1.

CL-3 Comment (- *Medium Significance*: A discrepancy between the volume of the EFDC model domain and the actual volume of a high-resolution Digital Elevation Model (DEM) for the Savannah area can result in potential errors in the simulations of the impact of channel deepening and mitigation scenarios on salinity intrusion in tidal fresh wetlands and chlorides at the City of Savannah water intake.

USACE Response: Not Adopted.

Although the Corps typically uses a digital elevation model in lake and reservoir models, the practice is not appropriate for estuaries. A significant amount of the wetted volume in an estuary is due to tidal prism, which is dependent upon tide range, water depths, and areas of inundation. During the initial phases of development of the hydrodynamic model, the Corps and its federal and state partners established guidelines to evaluate the performance of the models. One of the guidelines concerned water volumes in the estuary, specifically, the extent to which the model replicated the propagation of the tides (water surface elevation comparisons) and volume of the water over a tidal period. These expectations for model performance were met and found to be acceptable to the interagency model review team without the use of a high-resolution DEM. While a DEM may have been helpful during the calibration process, it was not necessary to successfully reach the performance goals for the model. Adopting the suggested revision to the model would likely not change the project recommendations.

Discussion of marsh cell volumes, their calibration and river-marsh interactions was added to Section 7.4.4.1 of the GRR Engineering Appendix. Further details are included in the January 2006 Hydrodynamic and Water Quality Models Report and the December 2010 Chloride

Modeling Report, attached to the GRR Engineering Appendix as Supplemental Materials #5 and #54, respectively.

CL-4 Comment - *Low Significance*: The EFDC hydrodynamic model setup for the open water boundary condition and representation of the southeast boundary line offshore from Tybee Island has not been defined, causing an infinitely high barrier in the ocean that does not allow flow and mass transport across the southeast boundary.

USACE Response: Not Adopted.

This issue is similar to that identified in Comment # 6 (please see those responses).

CL-5 Comment - *Low Significance*: Data and information related to the withdrawal flow for the City of Savannah water intake, used to represent the impact of pumping at the water intake on chloride levels in the modeling analysis, are not correctly documented, and may not be correctly assigned in the setup of the hydrodynamic model.

USACE Response: Adopted.

Action Taken: The Chloride Modeling Report has been clarified and the erroneous label in the model input file identified by the commenter was corrected in the final chloride model and the final Chloride Modeling Report, which is included in the Final GRR Engineering Appendix, Supplemental Materials. The file label identified is not used in the EFDC calculations. For the SHEP model, the labels and Savannah water treatment plant's withdrawal amounts are correct. The withdrawal rate (1.57 cms) is based on a monthly average.