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JAN 7 2013

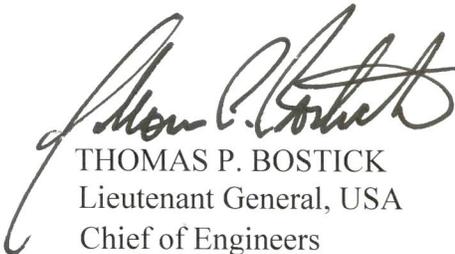
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MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: Freeport Harbor, Texas, Channel Improvement Project – 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 1165-2-209, 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 members with technical expertise in economics, environmental processes, geotechnical engineering, coastal engineering, and plan formulation.
3. I approve the final written responses to the IEPR contained in the enclosed document. The IEPR Report and USACE responses will be posted on the Internet, as required in EC 1165-2-209.
4. Please direct questions to Ms. Sandy Gore, Deputy Chief, Southwestern Division Regional Integration Team, at 202-761-5237.

Encl



THOMAS P. BOSTICK  
Lieutenant General, USA  
Chief of Engineers

# Freeport Harbor, Texas, Channel Improvement Project Feasibility Report and Environmental Impact Statement

## U.S. Army Corps of Engineers Response to Independent External Peer Review October 2012

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 U.S. Army Corps of Engineers (USACE) Civil Works program is to always provide scientifically sound, sustainable water resources 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 the USACE, was engaged to conduct the IEPR of the Freeport Harbor Channel Improvement Project (FHCIP) Draft and Final Feasibility Report (FFR) and Environmental Impact Statement (EIS).

The Battelle IEPR panel reviewed the Draft Feasibility Report (DFR) and Draft EIS, as well as supporting documentation. The Final IEPR Battelle Report was issued in 20 August 2008. A follow-on review was completed on the Final Feasibility Report (FFR) and EIS dated 25 April 2011. It should be noted that the FFR and EIS were further revised, and the final responses contained in this document reflect the revised version dated June 2012.

Overall, 22 comments were identified and documented; 13 were identified as having high significance, seven were identified as having medium significance and two were identified as having low significance. The following discussions present the final responses to the 22 comments.

### **1. Comment – *High Significance*: The problem statement is too general and does not include a quantitative analysis of current cost and operations.**

This comment includes six recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information about existing operating processes and procedures for the channel as well as vessels utilizing the channel.

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

**Action Taken:** The IEPR panel recommended (a) a clear account of the economic, safety, and environmental problems created by current channel conditions. In response, the Economic Appendix was extensively revised to contain more detail. Current channel conditions are discussed in Sections 1-5. The IEPR panel recommended (b) detailed descriptions of all

significant vessel operating categories – direct calls, lightering, shuttles, lightening, supply/seismic vessels. In response, these items are discussed in Sections 3 and 6 of the revised Economic Appendix. The Traffic Forecast section (Section 6.0) of the Economic Appendix was modified to address the commodity markets and utilization patterns. The IEPR panel recommended (c) quantified information on constraints imposed by depth and width. In response, quantitative analysis on constraints is located in Section 7 of the revised Economic Appendix. The IEPR panel recommended (d) up-to-date (through 2007) tabular data on the number and type of vessels in each category; commodities and tonnages; vessel sizes, design drafts, and sailing drafts; and discernible trends. In response, Sections 2 and 3 of the Economic Appendix were revised. The plan formulation updates include additional detail on commodity growth forecasts; additional detail on commodity markets and Freeport’s utilization patterns and expectations; updated commodity projections with most recent data; and quantitative analyses of the comparative modes of shipment are presented. The IEPR panel recommended (e) an explanation of the decision process for direct calls vs. lightening vs. lightering: amount transferred; locations and procedures; and cost functions. In response, the modes of shipment discussion was expanded in Section 3.2.1.1 in the Economic Appendix. In response to the lightered tonnage concern, a table (Table 6-8) was added showing crude petroleum tonnage and Table 6-7 shows percentages by region or origin; the previous table just showed percentage. Additional information on operating costs, as coordinated with USACE Headquarters, were added to the Benefits section (Section 7.1) of the revised Economic Appendix. In response to the concern that total transportation costs by trade route are not presented, several tables (Tables 7-9, 7-10, 7-11, 7-12, 7-19, 7-20, 7-21, 7-22, 7-23, 7-24) were added to the Economic Appendix. The IEPR panel recommended (f) documentation of the pilots’ rules, their rationale and their impact on vessel operations (including vessels handled on a “per job” basis). In response, Section 3.1 in the revised Economic Appendix discusses the pilot rules and their ramifications.

**2. Comment – *High Significance*: The reports need to include an explicit, well-documented analysis of vessel drafts and loading practices.**

This comment includes five recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on existing and future vessels usage and operating processes.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended (a) the Draft Feasibility Report must demonstrate the cause-and-effect linkage between current channel dimensions, vessel choice, and vessel loading practices. In response, data utilized from industry, the Port, and pilots was used to clearly document the existing condition. The IEPR panel recommended (b) the pilots’ rules and their impact on vessel choice and loading should be clearly spelled out. In response, the Economic Appendix was extensively revised. Section 3.1 discusses the pilot rules and their ramifications. The IEPR panel recommended (c) that design vessel choices should be discussed in greater detail, with documented comparisons between design vessels and existing fleets for container vessels. In response, the world fleet data was re-analyzed since the existing fleet data is for a different reach and channel depth, and existing fleet is largely irrelevant since different commodities will be transported through the Velasco Terminal. Vessel fleet is discussed in the revised Economic Appendix in Section 3 and 6. The IEPR panel recommended (d) that to

establish the impact of channel width and depth on vessel size and draft, the report must: document the design drafts and sailing drafts of current vessels on a vessel-by-vessel basis; determine the typical unrestricted sailing draft for those vessels; demonstrate that any differences between recorded sailing drafts and typical sailing drafts are attributable to Freeport Harbor channel depth or width. The USACE Study Team collaborated, which helped ensure a sound analysis. IWR's Load Factor Analysis was used for containerized cargo drafts. Up-to-date tabular data on the number and type of vessels in each category, commodities and tonnages, vessel sizes, and design and sailing drafts are included in the revised Economic Appendix. Tables 6-3, 7-4, 7-5, 7-6, and 7-7 presenting loaded vessel drafts and tonnages by deadweight tons were added. Section 6.1.1 in the Economic Appendix has been modified to include information showing crude petroleum imports by trade route and loaded draft range, draft of crude oil import vessels in Section 3.2.1, and the change in costs per ton and vessel loads due to increase in channel depth was added in Tables 7-9, 7-10, 7-11, and 7-12. The IEPR panel recommended (e) forecasts of with-project vessel size and draft, pilots' rules, and the choice of design vessel should all be subjected to sensitivity analysis. In response, the sensitivity analyses were conducted for all of the listed concerns and are found in Section 7.2 of the revised Economic Appendix.

**3. Comment – *High Significance*: The evaluation of the alternatives is too cursory, both at the initial screening and the subsequent discussion of chosen alternatives.**

This comment includes one recommendation for resolution, which has been adopted as discussed below. The comment details the need for additional information on how channel alternatives were evaluated throughout the study.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended a more detailed description of the alternatives evaluation and that the current data and study process, when presented, explained and documented, should be sufficient to improve the report. In response, the Economic Appendix was extensively revised to add additional documentation in Section 7 of the project alternatives. Channel widening is addressed by the non-Federal sponsor under the Section 204 authority. The status of the Section 204 widening initiative was updated in the revised report. Sensitivity analyses to address the concern of underkeel clearance and other pilot rules were added to the Economic Appendix in Table 7-33. The systems costs per ton by channel depth and method of shipment are documented in the revised Economic Appendix in Tables 7-9, 7-10, 7-11, and 7-12. Section 7.1.1 in the revised Economic Appendix compares and contrasts the cost per ton for direct shipment and lightering and lightening, and explains the screening criteria for the alternatives.

**4. Comment – *High Significance*: The alternatives analysis ignores major non-structural alternatives.**

This comment includes one recommendation for resolution, which has been adopted as discussed below. The comment details the need for additional information on non-structural alternatives considered throughout the study process.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended that the report needed to be expanded to replace the cursory discussion of non-structural alternatives with a serious investigation of at least the three alternatives (relaxation of the pilot's rules, expanded "per job" deep draft vessel transits, increased lightering/lightening); and the non-structural alternatives must be carried through the same screening process as the deepening and widening plans. In response, Sections 2.6 and 3.2.1.1 of the revised Economic Appendix include additional discussion of non-structural factors such as pilot rules, lightering, and lightening. Section 7.2 addresses these factors as sensitivities. Sensitivity calculations of 2.5 to 4-foot underkeel clearance were included in Table 7-33. A higher underkeel clearance increases the transportation savings benefits, so using a three foot underkeel clearance provides conservative estimates.

**5. Comment – High Significance: The risk from oil and chemical spills for all alternatives has not been addressed.**

This comment includes one recommendation for resolution, which has been adopted as discussed below. The comment details the need for additional information on risks associated with oil and chemical spills for the alternatives evaluated.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended the report be expanded to include a detailed analysis of oil and hazmat spill risks under all alternatives, and a detailed analysis of potential impacts from oil and hazmat spills under all alternatives. In response, the language in both the Feasibility Report and the EIS regarding oil and chemical spills was modified in order to negate any inference that project alternatives are likely to reduce oil and chemical spills. Reduction in the likelihood of collisions and spills is not considered a quantitative benefit from the project. However, the possibility of a collision, oil spill, fire or adverse environmental consequences are noted. Project benefits are based solely on reduction in transportation costs.

**6. Comment – High Significance: The recommended plan is not justified by the current analysis of economic factors.**

This comment includes seven recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on the economic information utilized to evaluate alternatives and select a recommended plan.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended (a) the report needed to be expanded to include: information on the economics in the initial screening of alternatives; (b) detailed discussion on the costs of direct shipment, lightering and lightening relative to draft and shipper decisions; and (c) more detailed information on the process, analysis and rationale for choosing alternatives. In response, the Economic Appendix was extensively modified to include additional detail. Specifically, Section 7 discusses alternatives and modes of shipment costs. Sections 6 and 7 discuss the analytical process. The IEPR panel recommended (d) the report be expanded to

include: historical trends in traffic and (e) historical information on containerized cargo in the Gulf around this port relative to future movement on the harbor. In response, the Economic Appendix was extensively modified to include additional detail. Specifically, Sections 2 and 3 document historical trends in traffic while Section 6 shows forecasted traffic levels. The IEPR panel recommended (f) the report be expanded to include: a ship size analysis more specific to the Freeport Harbor, with explanations of sizing choices; and (g) an analysis of the effect of national and regional conditions on the petroleum and chemical industries final traffic projections. In response, all commodity benefits were recalculated in collaboration with the study team. The recalculations reflect inclusion of 2008-2011 data and are based on more recent projections. The updated forecasts are documented and explained in the revised Economic Appendix in Section 6.0. Updated tables and figures regarding traffic forecasts for crude petroleum, petroleum product imports, chemical product exports, container imports and exports, and crude petroleum imports by trade route are included in Section 6.0.

**7. Comment – *High Significance*: The vessel traffic and commodity growth forecasts are not documented or justified.**

This comment includes six recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on how forecasts were developed and utilized to select a recommended plan.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended (a) both vessel and commodity forecasts must: begin with the most recent available detailed historical data (properly sourced); (b) explain past growth trends, discontinuities, and volatility; and (c) as with other critical project analyses, the traffic forecast for no action, non-structural, and structural alternatives must contain a clear audit trail, enabling readers and reviewers to determine exactly what data were used, what assumptions were made, what methodologies were followed, and how sensitive the results are to key factors. In response, the Economic Appendix was extensively modified to include additional detail. Detailed historical data and trends are documented in Sections 2 and 3 of the revised Economic Appendix. Traffic forecasts, assumptions, and methodologies are documented in Section 6 of the revised Economic Appendix. Sensitivity analysis is included in Section 7.2 of the revised Economic Appendix. Documentation was also added to the Freeport Harbor Channel Improvement Project economic model utilized to determine the projects benefits. The IEPR panel recommended (d) providing a convincing, well-documented rationale for the methods used to forecast future vessel movements and commodity flows, and including “reality checks” for such factors as refinery capacity to process imported crude, initiatives at competing ports (e.g., the Bayport terminal at Houston), and impacts of market trends (e.g., rising crude prices and declining U.S. consumption). In response, the traffic forecasts, assumptions, and methodologies in Section 6 of the revised Economic Appendix have been documented. The Freeport Channel does not have any crude petroleum refineries directly on the channel, but currently much of the oil imported to Freeport is refined at Sweeny, Texas with a refining capacity of 229,000 barrels per day. Texas has a refining capacity of 5.2 million barrels per day given today’s technology. Some of Freeport’s imported oil is presently transported to other neighboring states to be refined, as detailed in the revised Economic Appendix in Section 1. The container analysis was modified and is discussed in Sections 6.4 and 7.1.4 in the revised Economic Appendix. Capacities at

neighboring ports in Houston were analyzed. Frequencies of vessel calls were calculated. Several tables were added to the revised Economic Appendix, including Institute for Water Resources (IWR)'s Load Factor Tables in Tables 7-5, 7-6, and 7-7. Information on the Bayport terminal at Houston was considered in the revised analysis and further collaborated with the economics study team. Other areas of uncertainty were addressed as sensitivities. The IEPR panel recommended (e) that both vessel and commodity forecasts be validated through pro-active contacts with industry participants (e.g., refineries, container shipping companies, supply vessel operators) and stakeholders (e.g., ports, government agencies, and regional planners). A close working relationship between industry participants and stakeholders has been maintained throughout the entire process of this study. Data and assumptions provided have been verified by reliable websites. A resolution panel of subject matter experts was formed and concluded that modifications were sufficient to address the comment. The IEPR panel recommended (f) both vessel and commodity forecasts be incorporated in a thorough sensitivity analysis. In response, sensitivity analyses were performed for market share and national growth that could increase or decrease forecast values on the benefits. Results can be viewed in Section 7.2 of the revised Economic Appendix. Specifically, Tables 7-28, 7-29, and 7-30 were prepared to show effects. More than 60 of the assumptions used in the economic model have been included in the revised Economic Appendix (Section 7.2), including cargo forecasts, and are addressed as sensitivities in Table 7-33. Their respective effect on the benefit cost ratio is displayed in Table 7-33.

**8. Comment – *High Significance*: There is insufficient detail or documentation to determine the validity of the transportation cost benefits.**

This comment includes two recommendations for resolution, one of which was adopted as discussed below. The comment details the need for additional information on how cost benefits were developed and how a more a more detailed multi-port analysis is necessary.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended (a) that the report include tabular comparisons of transportation costs for the no action and plan alternatives (including non-structural alternatives) by commodity; and explanations of cost factors and cost functions for lightening, lightering, and direct vessel calls, as well as a step-by-step explanation of the cost estimation methodology (in appendix, if needed); and a thorough sensitivity analysis of the cost estimates. In response, the Economic Appendix was extensively modified to include additional detail. Transportation costs are detailed at length by commodity in Section 7 of the revised Economic Appendix. All data utilized for the analysis was evaluated to ensure proper level of detail. Industry was contacted to obtain input on utilization patterns. The USACE Waterborne Commerce data records, which include vessel size and load data, were utilized extensively. With the assistance of the study team, careful and detailed attention was given to the variance of changes in assumptions and utilization patterns.

**USACE Response: Not Adopted.**

The IEPR panel recommended (b) that for containerized cargo that would otherwise have moved via Houston or other ports, the analysis include differences in terminal handling costs, port charges (wharfage and dockage), drayage costs, and inland sail transport costs for both loaded and

empty containers. The panel also stated that the existing “multiport analysis” is cursory and does not appear to meet USACE standards. In response, the study team collaborated to discuss this issue and to ensure a sound analysis. Although costs are calculated for Freeport, the extensive multiport analysis is not needed in this case because Freeport is expected to help alleviate future supply shortages caused by increased demand in the markets Houston and Corpus Christi currently serve, even with their planned expansions. Additionally, the majority of the traffic is bulk in nature and tied to the port infrastructure. The analyses and applications presented in the appendix are based on adherence to guidance and procedures. A panel of subject matter experts was formed and concluded that modifications were sufficient to address the comment. The IEPR panel recommended that for the supply and “seismic” vessel movements to the Upper Stauffer Channel, the analysis should compare all cost-related aspects of a shift from Galveston, including relocation of operating bases and changes in supply sourcing. Although industry has been proactively contacted throughout this study, the extensive cost analysis the panel requested is not necessary. The majority of rigs are closer to Freeport than Galveston. Therefore, there will be time saving benefits by going to Freeport. The deauthorized channel is currently used, but many vessels are not reported because it is not required. The level of effort the panel desired was not commensurate with the scope of that portion of the project.

**9. Comment – *High Significance*: The relationship between the channel depth, direct shipment, lightening and lightering should be documented and quantified.**

This comment includes four recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on how the relationship of the four factors identified affect the overall analysis.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended (a) the report needed to be expanded to include information on the economics involved in the decision process by shippers in choosing alternative unloading means. (b) It should also include detailed discussion and analysis on the specific costs of direct shipment, lightering and lightening. (c-d) Overall, the panel recommended that the study needed more detailed information on the process, analysis and rationale for chosen shipping alternatives. In response, the Economic Appendix was modified to include additional detail. Relationships between modes of shipments and channel depths are addressed in Sections 3.2.1.1 and 7.1.1. Tables 7-9, 7-10, 7-11, and 7-12 were added to the Economic Appendix. The analysis recognizes potential changes in the sources and trade routes for crude petroleum, and this uncertainty is addressed in Table 7-33 as sensitivities. A resolution panel of subject matter experts was formed and concluded that modifications were sufficient to address the comment.

**10. Comment – *High Significance*: The economic sections lack focus and useful sensitivity analysis, leaving the reliability of the findings in doubt.**

This comment includes four recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional sensitivity analyses and better descriptions of how those analyses helped select a recommended plan.

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

**Action Taken:** The IEPR panel recommended elements of the sensitivity analysis be revised in the following manner: (a) the sensitivity analysis should be conducted by determining which variables or assumptions would have the greatest impact on findings; (b) a full sensitivity analysis of crude petroleum imports should be conducted, including consideration of costs, volumes, modes, and sizes of shipments in the first level analysis; (c) container projections should receive the same detailed analysis, including the potential market share captured by the Freeport Harbor facility; (d) the sensitivity analysis should consider the uncertain traffic forecasts, the estimates of no action transportation costs, and transportation costs/savings overall; and the analysis should be done in a segmented fashion, comparing each issue/variable independently of others. In response, the Economic Appendix was extensively modified, and the sensitivity section of the Economic Appendix (Section 7.2) was revised based on recent industry and market changes. Fifty-four additional sensitivities were added to the Economic Appendix as detailed in Table 7-33. The purpose of the report is to address the Federal interest in providing improved access to the existing crude petroleum terminals, petroleum product and chemical terminals, the container terminal under construction, and the offshore oil service industry. Each of these markets and the benefits associated with improvements to the channel segments which they served are addressed in the economic appendix with a more fluid and focused approach. The main report was also revised and provides an overview of the basis for the benefits and summarizes the findings.

### **11. Comment – *High Significance*: The potential benefits of the project are not supported by the analysis in the report.**

This comment includes nine recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on how benefits were identified and quantified and how those decisions were used to identify a recommended plan.

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

**Action Taken:** The IEPR panel recommended (a) we describe the screening process, include maps and comparisons between plan alternatives and show the analysis underlying the initial screening of alternatives. In response, the Economic Appendix was extensively revised. The screening process and alternatives are detailed in Sections 6 and 7. Maps are included in Section 1. The IEPR panel recommended (b) that the ship simulation be explained, showing the relationship between simulations and plan alternatives. In response, an explanation of the ship simulation and relationships were documented in Section 6.4 of the revised Economic Appendix. The IEPR panel recommended (c) describing in some detail the existing commerce and navigation on the channel. In response, the historic and existing use of the channel is detailed in Sections 2 and 3 of the revised Economic Appendix. The IEPR panel recommended (d) that much of the plan formulation be rewritten in greater detail, especially relative to the no action/without project alternative. In response, the without project conditions and plan formulation and alternatives are better described in Chapters 4 and 5 of the revised Economic Appendix. The IEPR panel recommended (e) explaining the calculation of the benefits estimates, (f) developing the sensitivity analyses that show the independent importance of relevant variables, (g) including a better description of how the Stauffer Channel is being used

and will be used, and (h) detailing the possibility of offshore supply and the Velasco container terminal's impact. In response, the calculations for project benefits are detailed in Chapter 7 of the revised Economic Appendix. The vessel operating costs are included in Section 7.1 of the revised Economic Appendix. Quantitative analyses of the comparative modes of shipment are presented in the revised Economic Appendix in Section 7.1.1. The commodity growth forecasts are documented in the revised Economic Appendix in Chapter 6, updated with the most recent commodity projections available. In Section 7.2 of the revised Economic Appendix, sensitivity analyses were performed for market share and national growth that could increase or decrease forecast values on the benefits. Tables 7-28, 7-29, and 7-30 were prepared to show effects. More than 60 of the assumptions used in the FHCIP economic model have been included in the revised Economic Appendix (Section 7.2), including cargo forecasts, and are addressed as sensitivities in Table 7-33. Their respective effect on the benefit cost ratio is displayed in Table 7-33. The IEPR panel recommended (i) that the report include a final straight-forward comparison of existing conditions, no action alternatives, and the recommended plan, possibly in a summary table. In response, summary tables were inserted in Section 8 of the revised Economic Appendix.

**12. Comment – *High Significance*: A detailed description of the no action and the without project alternative must be presented in comparison to the recommended plan.**

This comment includes seven recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on the no action and without project condition and how the associated economic determinations helped identify the recommended plan.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended (a) that a full description of the no action and without project alternatives must be developed, including current and future commercial uses of the Channel; (b) inclusion of a table showing the depths and a map/figure indicating the stations along the Channel; and (c) a description of the future of the Velasco container terminal in a no action alternative. In response, the Economic Appendix was revised. Additional documentation and commodity and market specific discussions were added throughout the main report and the Economic Appendix. Discussions comparing without project versus with project alternatives is also included throughout the Appendix, and highlighted in Sections 4 and 5. Maps and figures are included in Section 1. The IEPR panel also recommended (d) analyzing the possibility of expanded or more efficient lightening/lightering operations; (e) examination of relaxation of various Pilots' rules; and (f) consideration of additional transits of deep draft vessels on a "per job" basis. In response, sensitivity analyses were performed for market share and national growth that could increase or decrease forecast values on the benefits. Section 7.2 of the Economic Appendix documents the sensitivities. Specifically, Tables 7-28, 7-29, and 7-30 were prepared to show effects. More than 60 of the assumptions used in the FHCIP economic model have been included in the Economic Appendix (Section 7.2), including cargo forecasts, and are addressed as sensitivities in Table 7-33. Their respective effect on the benefit cost ratio is displayed in Table 7-33. Detailed analyses were performed to determine how shipping modes might be expected to change based on changes in Freeport's channel depth. Aggregations of the lightering, lightening and direct shipment costs have been included in the revised Economic

Appendix in Tables 7-9, 7-10, 7-11, and 7-12 of Section 7.1.1. Section 7.2 in the revised Economic Appendix addresses sensitivities to the methodology and assumptions. Sensitivities pertaining to lightening and lightening volume and cost estimates are included in Tables 7-27, 7-28, and 7-32. The IEPR panel recommended (g) a final table showing the comparison of the no action/without project alternatives. In response, summary tables were inserted into Section 8 of the revised Economic Appendix.

**13. Comment – *High Significance*: The DFR, DEIS and appendices would benefit from professional editing, better maps and better diagrams.**

This comment includes one recommendation for resolution, which has been adopted as discussed below. The comment details the need for additional review and editing to ensure clear and concise presentation of the information.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended that the reports and appendices be professionally edited and reorganized, graphics be improved, missing information be added and conflicting passages resolved. In response, the main report was revised, reorganized, and maps were added to better define the study area and specific project areas. The Economic Appendix was rewritten with additional updated detail added. Sections of the report were modified to contain data and assumptions used in the initial evaluations. Interest rates were updated. Reports were professionally edited and formatted.

**14. Comment – *Medium Significance*: The effects of deepening on hydrology and the associated water quality within the enclosed portion of the channel are not addressed adequately.**

This comment includes two recommendations for resolution; both have been adopted as discussed below. The comment details the need for additional information on the expected affects of deepening on water movement in the channel after deepening and the potential for degradation of water quality.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended (a) that the report be expanded to include a detailed analysis of the effects of the various project alternatives on mixing, stratification and dissolved oxygen levels in the upper part of the project. The panel also recommended (b) that the focus should be the enclosed channel upstream of the Intracoastal Waterway. In response, the Environmental Impact Statement Section 4.2.1 was revised to discuss the potential for impacts to water quality in the channel upstream of the Intracoastal Waterway that could be associated with deepening. Potential effects on mixing, stratification and dissolved oxygen levels were evaluated using hydrologic and historical data, and these effects are described for each alternative. The additional evaluation concluded that the existing channel and proposed channel improvements do not support conditions conducive to channel stratification and poor mixing, and therefore hypoxic conditions are not expected to occur with an increase in channel depth.

**15. Comment – *Medium Significance*: The impact analysis for the adjacent beaches is not complete and the opportunities for mitigation are not considered.**

This comment includes three recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on any affects deepening would have on the beach front and whether beneficial use of dredged material to potentially reduce erosion in these areas was adequately considered.

**USACE Response: Adopted.**

**Action Taken:** The panel recommended that the report be expanded to include: (a) a characterization of the conditions of the two jetties due to a possible increase of erosion and shoaling; (b) a quantification of the beach and nearshore sediment characteristics; and, (c) consideration of potential beneficial uses of dredged material should the dredged material sediments be found compatible with those of the native beach and nearshore. In response, Section 4.1.3.2 of the Environmental Impact Statement and Section 4.11 of the Engineering Appendix were modified to address the comments. The sections were revised to explain that no increase in erosion and shoaling is expected because the core stone structure in the jetties has been designed to minimize sand transport directly through the structure. The existing sandy beach and nearshore sediments are better described, and a detailed description of the beneficial use evaluation previously conducted during this study has been added. Since sediments to be dredged are expected to be predominantly clay, shoreline placement would not be compatible with existing sediment types.

**16. Comment – *Medium Significance*: For the south jetty, the report should address stability for the end of construction condition and the low factor of safety for the long-term condition should be justified.**

This comment includes two recommendations for resolution, which both have been adopted as discussed below. The comment details the need for additional information on potential impacts deepening would have on existing jetties that currently protect the jetty channel.

**USACE Response: Adopted.**

**Action Taken:** The panel recommended (a) that the geotechnical section of the report should be expanded to include an end-of-construction stability analysis for the south jetty. The panel further recommended (b) that arguments justifying a factor of safety of less than 1.5 for the South Jetty be established. In response, Section 4.8 of the Engineering Appendix was modified to address this comment. From a review of prior stability analysis conducted by Fugro Engineering during prior deepening and widening, these results have indicated the "long term" factors of safety for widening scenarios to be notably lower than the "end of construction" factors of safety. Additionally, after a number of long term stability analysis trials were run on the recommended plan, an "end of construction" stability analysis was conducted at the South Jetty station. Based on the long term results, an "end of construction" factor of safety above 3 was realized for a 57-foot deep channel configuration. Based on study of prior stability analyses, the high factor of safety for follow-up "end of construction" analysis at conservative location, and engineering judgment, the decision was made to focus primarily on the long term stability

conditions for the new deepening project. For the long term stability analysis, a lowered factor of safety criteria of 1.3 was adopted for the jetty, based on consideration of the consequences of failure and likelihood that a slide along the jetty would not be an immediate danger to human health or loss of life. The primary consequences of failure would be economic, and a factor of safety of 1.3 was considered to be a reasonable factor of safety.

**17. Comment – *Medium Significance*: Several dredging issues should be clarified to increase confidence in predictive capability and possibly reduce dredging and adjacent beach erosion.**

This comment includes five recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on how dredging quantities were developed and inclusion of potential actions that could reduce shoaling.

**USACE Response: Adopted.**

**Action Taken:** The panel recommended (a) that a presentation of the applicability of the table top estimation methodology through comparisons with other constructed projects be made. The panel further recommended (b) a presentation and interpretation of the present areal distribution of dredging requirements. The study team coordinated with the Coastal Hydraulics Lab of the Engineering Research and Design Center. A 3D model was used to estimate the shoaling rate based on proposed channel changes. In response, Section 2.4 of the Engineering Appendix was modified to address this comment. The panel's third recommendation suggested (c) that the jetties be better described. The core stone structure in the jetties has been designed to minimize sand transport directly through the structure so expected impacts are minimal. In response, Section 4.11 of the Engineering Appendix was modified to address the comment. The panel further recommended (d) inclusion in the monitoring program of the distribution of shoaling, especially in the entrance channel. They stated that if shoaling is abnormal in the vicinity of the placement areas, it may signal the need to reconsider continued placement in these areas. The panel's fifth recommendation (e) asked that cross-sections of the existing channel be provided, questioning, in particular, whether the design slope of 1:3 is generally stable. In response, cross sections of the existing channel were included in the Engineering Drawings. Geotechnical investigations were conducted along the channel and borings were taken to depths up to 90 feet. The material is consistent with material within the existing channel. The existing channel is at 1:3 side slopes and no problems have been encountered. Geotechnical discussions are located in Section 4 of the Engineering Appendix.

**18. Comment – *Medium Significance*: Scoping and outreach efforts appear to meet only minimal requirements for local participation, and fall short of proactive efforts needed to support report findings.**

This comment includes five recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on steps taken to coordinate with the public.

**USACE Response: Adopted.**

**Action Taken:** The panel recommended that the report be expanded to include: (a) identification of attendees at the meeting, their interests and involvement in the plan formulation and later evaluations; (b) a listing of who else was contacted; and (c) an audit trail of the interviews that were or may have been held and the information that was discovered and evaluated. In the fourth recommendation, the panel advised (d) new interviews with representatives from the refineries, current vessel operators, potential users of the Velasco terminal, competing ports, shippers and receivers, railroads and container providers. In the final recommendation, the panel suggested (e) consideration of an additional public meeting since it had been four and a half years since the last meeting was held. In response, Section 13.0 of the Feasibility Report and Section 13.0 of the Environmental Impact Statement have been modified to reflect these efforts. Outreach efforts were extended and input was solicited from various channel users and Port tenants (i.e., refineries, Freeport Liquefied Natural Gas, additional vessel operators, and other commercial/industrial interests), regarding proposed channel improvements. A final public meeting was conducted on January 13, 2011. Public comments were minimal and had no significant study impact.

**19. Comment – *Medium Significance*: The project justification rests in part on data that are now several years old and must be verified and updated.**

This comment includes one recommendation for resolution, which has been adopted as discussed below. The comment details the need for use of updated information in the report before making a final selection of a recommended plan.

**USACE Response: Adopted.**

**Action Taken:** The IEPR panel recommended the report be updated to reflect the current status and latest plans for: traffic by commodity, vessels, loading, drafts, relevant refinery capacity, lightening and lightering practices, operation of the Liquefied Natural Gas terminal, development of the Velasco container terminal, pilots' rules and operating practices, and developments at competing ports (Houston, Galveston). In response, the Economic Appendix was extensively revised. Current status and plans for facilities are included in Section 1 of the revised Economic Appendix. The most recent data available has been incorporated in the benefits analysis and is detailed in Section 6 and 7. The vessel operating costs provided by USACE Headquarters are effective May 2011 (Economic General Memorandum 11-05). The 2009-2010 USACE Waterborne Commerce data was used to look at historical tonnage of the commodities and included in Sections 2 and 3 of the revised Economic Appendix. Port data from 2011 on lightering and lightening provided the basis for some assumptions used. Forecasts dated 2010 from Global Insight and the US Department of Energy were used and included in Section 6 of the Economic Appendix. Load factor tables were provided by Institute for Water Resources in January 2012 for containers. Costs were updated on March 2012. Pilot rules are discussed in Section 3.1 of the revised Economic Appendix. Developments at competing ports are discussed in Sections 6.4 and 6.5 of the revised Economic Appendix.

**20. Comment – *Medium Significance*: There remain significant uncertainties in the environmental analysis that should be addressed by further testing and documentation in the reports.**

This comment includes three recommendations for resolution, all of which have been adopted as discussed below. The comment details the need for additional information on the potential for sediment contamination and how contaminant spills are documented.

**USACE Response: Adopted.**

**Action Taken:** The panel recommended the report be expanded to include: (a) an inventory of spilled substances in order to evaluate the potential for sediment contamination; (b) a detailed explanation of how the project sponsors will address the uncertainty associated with the spatial extent of potentially contaminated sediments prior to or during actual dredging; and (c) estimates of environmental sample frequency and location of areas known to experience a high number of spills and/or near hazardous waste sites. In response, the recommended information was included in the Environmental Impact Statement Sections 3.5, 3.11, and 4.9, and Appendix D as appropriate. The report was revised to include an inventory of spilled substances. Data describing the types of constituents released, number of occurrences, and media affected within the project area have been compiled. According to the data, the vast majority of events (172) affected air. The majority of all events were associated with DOW Chemical. For contaminants introduced to the water column, several factors (dilution, distribution, volatilization, and natural attenuation) would reduce the probability for contaminants at concentrations of concern in channel sediments. Estimates of historical sample frequency and the location of previous spills have also been included in Appendix D. USACE water and sediment analyses test for many of the materials or material surrogates identified in the hazardous, toxic and radioactive waste (HTRW) analyses. For contaminants encountered during construction, the non-Federal sponsor will perform the required environmental investigations necessary to identify the nature and extent of any CERCLA regulated substance. All work will be appropriately delayed until the non-Federal sponsor and appropriate agencies are consulted and the nature and extent of the problem identified. Measures to avoid the contaminated site will be considered or other alternatives devised. The non-Federal sponsor will be responsible for planning and accomplishing any response measure including appropriate investigations.

**21. Comment – *Low Significance*: Grassland benefits of flood protection and water quality enhancement are not captured in the HEP analysis.**

This comment includes one recommendation for resolution, which has not been adopted as discussed below. The comment details the need for additional analysis associated with calculation of habitat impacts and benefits.

**USACE Response: Not Adopted.**

**Action Taken:** The panel recommended that the report be expanded to include a description of how other non-habitat values and functions such as water quality protection and flood protection will be affected as a result of the various predicted changes in land use and/or loss of wetlands/prairies under each alternative. The basis for the comment clarifies that it pertains

specifically to grassland which were not included in the Habitat Evaluation Procedure (HEP) analysis. The existing grasslands located within proposed Placement Areas (PAs) 8 and 9 are degraded, overgrazed cattle pasturelands possessing extremely low ecological habitat value. As stated in the Environmental Impact Statement, impacts to these grasslands were not computed in the HEP analysis in determining required mitigation compensation because these lands do not meet USACE criteria for significant resources as outlined in Appendix-C of ER 1105-2-100.

**22. Comment – *Low Significance*: The proposed plan for increasing the levee elevation is reasonable, however a cost estimate that addresses the possibility that dredged sediment consolidation could inhibit the rate of levee enlargement and methods in addition to grouting for strengthening the foundation should be considered.**

This comment includes two recommendations for resolution, neither of which have been adopted. The comment details the need for additional information on how consolidation of dredged material is evaluated and that certain proposed techniques are applicable.

**USACE Response: Not Adopted.**

**Action Taken:** The panel recommended (a) verification through an analysis that the rate of consolidation of the dredge material can keep pace with the planned rate of levee expansion, or adoption of engineering measures to ensure that the rate of levee expansion will not be inhibited by the rate of dredge material consolidation. The second recommendation called for (b) verification that grouting is an effective alternative for strengthening a weak, fine-grained foundation. The USACE did not concur and the comment was not adopted. At Placement Area 1, the recommended plan includes in the cost estimates the requirement for pumping new work material around the entire perimeter of the site. This provides several follow-up options in the early Operation and Maintenance (O&M) cycles depending on how much consolidation is measured during the early years of O&M levee work. If adequate consolidation is present for continuing with a conventional levee lift, the new work will be shaped. If the designers during early O&M years determine that the material has not consolidated to the desired level and additional measures are required, a viable option will be to shape the new work into a berm with a levee lift that is offset into the PA to increase the overall failure plane distance and improve the global factor of safety. Additional measures may be detailed at that time to ensure adequate support of an inset levee on the softer dredge materials (to counter shallow slides). With plans for the new work to already be in place around the perimeter levees (for potential levee shaping variations in O&M) which is a large cost (for hydraulically placing) paid up front and already accounted for and contingencies included for potential quantity/design changes during O&M, the feasibility level cost is considered adequate to cover concerns with questions about the extent of future consolidation and potential need for adjusting the levee templates, or later implementing other recommended measures (such as trenching or other dewatering methods to improve consolidation).