Addendum to Final External Peer Review Report

SABINE-NECHES WATERWAY (SNWW) CHANNEL IMPROVEMENT PROJECT FEASIBILITY STUDY

Prepared by

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Prepared for
U.S. Army Corps of Engineers
Mobile District

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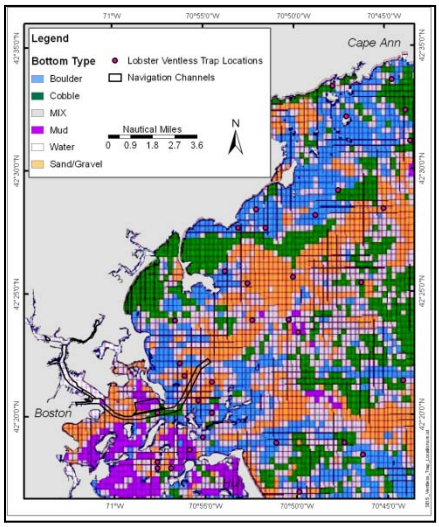
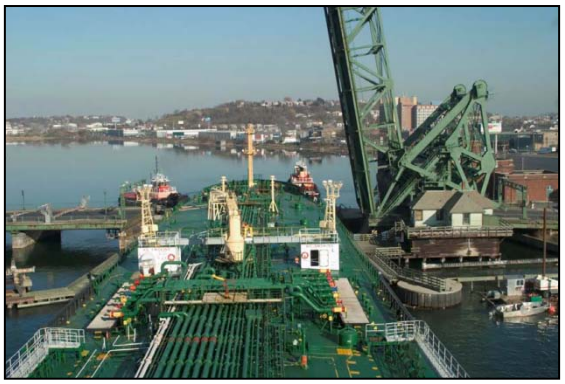
June 16, 2010





SHORT-TERM ANALYSIS SERVICE (STAS)

on

Battelle Memorial Institute's Participation in
Civil Works Review Board for Sabine Naches Waterway, Texas

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References to the USACE SNWW CIP Draft Feasibility Report and Draft Environmental Impact Statement Documents

DFR = SNWW CIP Draft Feasibility Report – Main Report (June 2007)
Example cross-referencing:
DFR Section IV = SNWW CIP Draft Feasibility Report, Volume 1, Section IV
DFR IV-44 = page 44 of the DFR Section IV
DFR IV, Tables 1 through 4 = Tables 1 through 4 in the DFR Section IV

DEIS = Draft Environmental Impact Statement

DFR EA = Economic Appendix of the DFR (DFR Appendix A)

KEY TO ABBREVIATIONS IN THE USACE REPONSE

References to the USACE SNWW CIP Final Feasibility Report and Final Environmental Impact Statement Documents

CIP	Channel Improvement Project
EQ	Environmental Quality
ERDC	Engineering Research and Development Center
FFR	SNWW CIP Draft Feasibility Report – Main Report (June 2010)
FEIS	Final Environmental Impact Statement (June 2010)
FFR EA	Economic Appendix of the FFR (FFR Appendix 2)
HS	hydrodynamic-salinity
LNG	Liquified Natural Gas
NED	National Economic Development
OSE	Other Social Effects
RED	Regional Economic Development
RSLR	relative sea-level rise
SNWW	Sabine-Neches Waterway
VMS	Vessel Monitoring System
VTS	Vessel Tracking Service

INTRODUCTION

This addendum is a supplement to the *External Peer Review Report for Sabine Neches Waterway (SNWW) Channel Improvement Plan (CIP) Draft Feasibility Report, Draft Environmental Impact Statement, and Supporting Documentation* (hereafter: SNWW Final IEPR Report) submitted on December 13, 2007 by Battelle. The SNWW Final IEPR Report was prepared under Contract No. DACW33-03-D-0004, Delivery Order: CK01. The activities associated with this addendum were conducted under Contract No. W911NF-07-D-0001, Task Control Number: 10-159, Delivery Order Number: 0932.

The addendum was prepared to document activities associated with the independent external peer review (IEPR) comment/response process associated with the IEPR panel comments contained in Appendix A of the SNWW Final IEPR Report. The comment/response process usually takes place immediately after submitting the Final IEPR Report, but the SNWW Final IEPR Report was submitted prior to the newly released USACE guidance (EC 1165-2-209) requiring that the comment/response process be conducted and documented. The comment/response process was coordinated by the Deep Draft Navigation Planning Center of Expertise (DDN PCX) and Battelle. The comment/response process involved the Galveston District Project Delivery Team (PDT) responding to the IEPR comments (Evaluator responses), and the IEPR panel responding to the PDT responses to the comments (BackCheck responses). The details on this comment/response process are described below.

Battelle received the USACE Evaluator responses on April 20, 2010. Following their receipt, no activities were conducted until Battelle was approved under a pre-award funding authorization from the ARO Contracting Office while the official Notice to Proceed was being processed (NTP received May 25, 2010). Battelle provided the USACE Evaluator responses to the IEPR panel on May 21, 2010. The panel was instructed to review the USACE Evaluator responses and prepare their BackCheck responses for submittal to Battelle by May 24, 2010. The BackCheck responses were submitted by Battelle to the DDN PCX on May 24, 2010. The PDT, DDN PCX, and the Office of Water Project Review requested a teleconference with the IEPR panel to discuss specific BackCheck responses where the panel indicated that they did not concur with the USACE Evaluator response. The purpose of this teleconference was to (1) prepare for the Civil Works Review Board (CWRB) on the following day (May 25, 2010), and (2) determine the next steps for completing the comment/response process. The goal of the process was for the PDT and the IEPR panel to reach "concurrence" on the panel comments, but understanding that there may be some panel comments where concurrence could not be reached. The economics panel members (Mr.Dan Smith and Dr. Kenneth Casavant) and Karen Johnson-Young participated in the CWRB via teleconference and in person, respectively.

Following the CWRB, two teleconferences were conducted to discuss the IEPR panel BackCheck responses for which the panel did not concur with the USACE Evaluator responses. The first teleconference (June 3, 2010) focused on the economics-related IEPR panel comments (panel comments 1-8). The second teleconference (June 7, 2010) focused on other comments (panel comments 12, 13, 14). On June 10, 2010, the PDT provided revised Evaluator responses to panel comments 1, 3, 4, 6, 12, 13, and 14. The response to panel comment 6 was provided on

June 11, 2010. Battelle provided the revised Evaluator responses to the IEPR panel for them to develop revised BackCheck responses.

This addendum contains the IEPR panel comments and the original and revised USACE Evaluator and IEPR panel BackCheck responses generated during this project.

Comment 1:

The Plan Formulation as described in DFR section IV appears questionable

Basis for Comment:

The Plan Formulation does not adequately address either structural or non-structural alternatives, and fails to address at least one key project element. The screening process is unclear, and seems to have been cursory in some areas.

*No Action Alternative***.** The No Action alternative is not developed in sufficient detail. On the No Action alternative the report states, "the current dimensions will continue to limit the efficient movement of commodities," "safety will continue to be a concern," "the need to lighter products and/or light load vessels will increase," etc., but does not quantify any of these statements. In the absence of a detailed No Action alternative it is difficult to understand the problem being addressed or justify the need for the project.

Structural Alternatives. Neither alternative channel depths nor alternative channel widths are discussed in sufficient detail. The Draft Feasibility Report does not explain why it is necessary or cost-effective to widen the channel to 700' rather than some other width. Virtually no attention is given to possible widths between 500' and 700', and there appears to have been no incremental analysis of channel widths.

The report is unclear why both turning basins and channel widening are part of the plan. On page DFR VI-44, the report says that the Sabine Pilots suggested the use of turning basins "as a less costly and more practical alternative to the Neches River widening." The notes from meetings with the pilots also make it clear that the turning basins and anchorages are a higher priority than channel widening.

Non-Structural Alternatives. Insufficient attention is paid to non-structural alternatives. The report does not consider the obvious non-structural alternative: relaxation of the Sabine Pilots' rules. The entire project justification rests on the need to accommodate more traffic and larger vessels under the existing rules. The rules themselves, however, are never analyzed to determine if they are necessary or if they optimize the balance between productivity and safety. Relaxing the 50% rule for passing vessels, for example, would significantly reduce the need to widen the channel.

The use of offshore oil terminals is discussed but not analyzed. USACE's initial response to comments notes that expansion of Louisiana Offshore Oil Port (LOOP) or development of another offshore facility would reduce the economic viability of the SNWW project. The discussion of off-shore terminals remains general, and as noted in the text no quantitative analysis was performed. The contention that crude petroleum importers have not found LOOP to be a cost effective alternative is not documented. Moreover, that assertion seems to be contradicted by the reported operation of LOOP at full capacity and the expectation of two expansion proposals in December. There was apparently no attempt to estimate the cost of expanding LOOP or making the necessary pipeline connections. Given that there are active proposals to expand LOOP and parties actively pursuing developments elsewhere, a detailed quantitative analysis of offshore terminal expansion is mandatory. LOOP, or the proposed LOOP expansions, should be analyzed as an alternative to widening and deepening SNWW for the largest vessels, not as a replacement for all crude petroleum movements.

Basis for Comment (Continued):

The report contains almost no information on the vessel lightering/lightening processes being used. Additional lightering/lightening is not considered as an alternative means of handling larger vessels. The total system costs of lightering, lightening and direct shipment should be compared to verify that the proposed shipment system is economically superior.

The VMS/VTS system is too quickly dismissed, especially since it is lauded elsewhere in connection with the "barge shelf" concept. The appendix cites the success of the VMS system in several places.

The EPR panel suggests that several non-structural approaches be given more thorough analysis as stand-alone alternatives or as components of alternatives focused on deepening and widening:

- Expanding and connecting to the LOOP is likely a viable alternative for crude petroleum, the dominant commodity on the SNWW and the only commodity carried in the largest, widest vessels. USACE seems to dismiss this alternative as expensive and hard to implement without thorough analysis. LOOP, or the proposed LOOP expansions, should be analyzed as an alternative to widening and deepening SNWW, not as a replacement for all crude petroleum movements. The contention that crude petroleum importers have not found LOOP to be a cost effective alternative is not documented. Moreover, that assertion seems to be contradicted by the reported operation of the current LOOP facility at full capacity and the expectation of two expansion proposals in December.
- Relaxation of the Sabine Pilots rules should be evaluated as an alternative. The current rules are never analyzed to determine if they are necessary and if they optimize the balance between productivity and safety. Easing the pilot's rules to permit vessels with greater beam to pass and adding night operations should be fully evaluated.

A more detailed assessment of the VMS/VTS system is also warranted. The report includes discussion of the effectiveness of the VTS system and plans for upgrading this system to better control vessel traffic in restricted reaches of the SNWW. Non-structural VTS should be considered as a component of the channel modification alternatives. The inclusion of VTS as a component allows for a reduced need for channel widening in selected reaches thereby enhancing the efficiency of the channel modification alternatives.

Missing Element. There is no analysis of the 13-mile channel extension in the Plan Formulation section or elsewhere, yet the channel extension appears to be a key element of the project. The project depth is given as 48'. No economic analysis for deepening the Sabine Bank Extension channel to 50' was found in the report. The proposed dredging of the outer channel to 50' and the resulting 13.2 mile extension is thus far unjustified.

Screening Process. The screening process described in DFR section V is difficult to follow or understand. The description of the screening process left reviewers uncertain of the choice criteria and the original selection of alternatives. It is shortsighted to only look at crude petroleum and petroleum products in the initial screening when the subsequent LNG analysis has significant impacts on findings. In the absence of maps or diagrams the list of options on page DFR V-1 is largely incomprehensible. T he relationship between the commodities handled, the choice of project draft, and the plan formulation is unclear. There is a confusing

Basis for Comment (Continued):

discussion of commodity impacts on optimal draft that is hard to reconcile with the screening process described in DFR section V. DFR V, Tables 1 through 4 are difficult to follow and require better explanation. The "analysis conducted for other studies" mentioned on page DFR V-4 needs a complete citation, and copies should be presented in an appendix and made available for this review.

Significance – High:

The apparent problems with the Plan Formulation are highly significant, as they call into question the basic elements of the proposed project. It is unclear that the proposed widening and dredging of the SNWW is in fact the best plan to address the situation.

Comment Cross-referencing:

(3) Comment: The crucial analysis of vessel design and sailing drafts is inadequately supported by data and appears questionable.

(7) Comment: The choice of project design vessel appears to drive the project design and benefits estimates, yet remains unjustified in the report.

(15) Comment: The presentation of data in maps, figures, and tables needs to be substantially improved.

(17) Comment: The analysis and conclusions are based on what appears to be over-reliance on the pilots or at least a lack of documentation of their opinions.

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include:

1. A detailed, quantified description of the No Action alternative.
2. Detailed examination of incremental widening and deepening alternatives, and a "turning basins and anchorage" alternative.
3. Thorough consideration of non-structural alternatives, including lightering larger vessels, handling large vessels at off-shore terminals, VMS/VTS improvements, and relaxing or altering the Pilots' rules.
4. An analysis of the channel extension portion of the project.
5. A clear, well-documented description of the screening process.
6. A quantitative economic analysis of the use of the existing or an expanded LOOP facility and the pipelines and other facilities necessary utilize it.
7. A detailed examination of how modification of the Sabine Pilots' rules and operations could improve productivity and how safety would be impacted.
8. Explicitly consider the contributions of VMS/VTS systems in reducing the need for channel widening.

USACE Response to Comment 1:

EPR RECOMMENDATION:

1. *A detailed, quantified description of the No Action alternative.*

DISCUSSION: *Expanded discussions of the without project future (no action alternative) have been added to the main report. Expanded quantification of the without project future has been added to the economic appendix).*

SWG ACTION TAKEN: *Additional information on the No-Action Alternative and Future Without-Project Condition have been added in the following locations:*

- *Final Feasibility Report (FFR), Section II (Problems and Opportunities).*
- *FFR, Section IV.C. (Future Without-Project Condition).*
- *FFR, Section IV.D, (Second Screening, Non-Structural Alternatives).*
- *FFR, Appendix 2 (Economic Appendix), Section 4 (Existing Vessel Traffic).*
- *FFR, Appendix 2, Section 3.5.1 (Methods of Shipment).*
- *FFR, Appendix 2, Section 6.3 (Channel Widening).*
- *Final Environmental Impact Statement (FEIS), Section 2.2 (Preliminary and Second Screening)*

EPR RECOMMENDATION:

2. *Detailed examination of incremental widening and deepening alternatives, and a "turning basins and anchorage" alternative.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Section IV.D. (Second Screening).*
- *FFR, Section V.E (Channel Widening Benefits).*
- *FFR, Appendix 2, (Economic Appendix), Section 6.3 (Channel Widening Benefits), Section 6.3.1.4 (Entrance Channel Widening Benefits, Section 6.3.1.5 (Neches River Holding Areas), Section 8.3 (Vessel Trip Reduction Due to Channel Deepening).*

EPR RECOMMENDATION:

3. *Thorough consideration of non-structural alternatives, including lightering larger vessels, handling large vessels at off-shore terminals, VMS/VTS improvements, and relaxing or altering the Pilots' rules.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Section IV.D. (Second Screening, Non-Structural Alternatives) includes discussion of LOOP.*
- *FFR, Section IV.D (Second Screening) includes a section on Relaxation of Pilot Rules.*
- *FFR, Appendix 2 (Economic Appendix), Section 3.1 (SNWW Vessel Casualties).*
- *FFR, Appendix 2, Section 3.2 (Offshore Alternatives).*
- *FFR, Appendix 2, Section 3.5.1 (Methods of Shipment). Additional discussion of Methods of Shipment are included in Section 6.4.1.1 (Crude Oil Imports).*

EPR RECOMMENDATION:

4. *An analysis of the channel extension portion of the project.*

DISCUSSION: *Length of extension channel was determined by the distance offshore required for the 8-foot increase in channel depth (including overdepth, advanced maintenance and any additional advance maintenance). The orientation of the extension channel is consistent with the existing channel bearings.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Section IV (Formulation and Evaluation of Alternatives), Structural Plans. Explanation is provided that "In order to reach the appropriate depths offshore, all deepening alternatives would involve an increase in the Entrance Channel ranging from 5 to 25 miles in length."*

EPR RECOMMENDATION:

5. *A clear, well-documented description of the screening process.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, SectionSection IV (Formulation and Evaluation of Alternatives) has been revised to better describe the formulation and screening process.*
- *FEIS, Sections 2.1 through 2.3 have been revised to include more detail of the formulation and screening process.*

EPR RECOMMENDATION:

6. *A quantitative economic analysis of the use of the existing or an expanded LOOP facility and the pipelines and other facilities necessary utilize it.*

DISCUSSION: *The qualitative analysis was expanded and updated. Quantitative information on LOOP expansion costs is not available and a traditional BCR cannot be estimated within the scope of the feasibility study. The oil companies using the SNWW have not been provided detailed cost estimates related to project construction. They noted that they would be provided anticipated "per barrel throughput costs" when a proposed "LOOP-Type" expansion approaches construction; however, the expansion proposal is only being discussed periodically and has not moved forward to construction.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Section IV.D (Second Screening), Non-structural Alternatives section provides more explanation of how non-structural alternatives were evaluated resulting in their ultimate elimination from further review.*
- *FFR, Appendix 2 (Economic Appendix), Section 3.2 (Offshore Alternatives).*

EPR RECOMMENDATION:

7. *A detailed examination of how modification of the Sabine Pilots' rules and operations could improve productivity and how safety would be impacted.*

DISCUSSION: *Relaxation of the rules would reduce transit times under ideal conditions; however, relaxation of pilot rules cannot be dictated by the Corps and is not an implementable plan. At the same time, the FFR relies less on pilot input. For instance, while the pilots do not have confidence in the HarborSym results for the Neches River reach, the model results were used by the Corps for the baseline evaluation. A side analysis was prepared by SWG prior to the completion of the HarborSym modifications. The side analysis reflects how the pilots expect the Neches River anchorages and basins to function.*

SWG ACTION TAKEN: *Additional analysis and discussion of pilot rules is provided in the following locations:*

- *FFR, Section IV.D (Second Screening), Non-Structural Alternatives.*
- *FFR, Section V.E. (Channel Widening Benefits).*
- *FFR, Appendix 2 (Economic Appendix), Section 3.1 (SNWW Vessel Casualties).*

EPR RECOMMENDATION:

8. *Explicitly consider the contributions of VMS/VTS systems in reducing the need for channel widening.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Clarification of the Vessel Traffic Service and additional discussion evaluation of this non-structural alternative is provided in the following locations:*

- *FFR, Section IV (Formulation and Evaluation of Alternatives), Section IV.D (Second Screening), Non-Structural Alternatives*
- *FFR, Section V (Economic Evaluation of Alternatives), Section V.E (Channel Widening Benefits).*
- *FFR, Appendix 2 (Economic Appendix), Section 3.1 (SNWW Vessel Casualties)*

Panel BackCheck Response to Comment 1:

Based on materials and time available for review, Non-Concur.

Taking the requirements for resolution in order:

1. A detailed, quantified description of the No Action alternative.

   We could not locate a quantified description of the No Action alternative in terms of vessel operations, cargo movements, costs, etc. The discussion remains qualitative. The alternatives need to be compared to the No Action alternative on an equal basis, in the same terms. The same variables and data set utilized for the Alternatives should be available for the No Action alternative. This allows definitive comparison of the alternatives relative to the No Action option.

   In particular, the report still refers in many places to congestion and vessel delays, yet no data are presented on either point. The rewrite did not respond adequately to this request.

2. Detailed examination of incremental widening and deepening alternatives, and a "turning basins and anchorage" alternative.

   The IEPR Panel has been unable to locate a detailed discussion of widening alternatives (e.g. different widths), and there appears to be no distinct "turning basins and anchorage" alternative, although the discussion of turning basins appears to have been augmented and is helpful in a descriptive sense. . The turning basins discussion was not focused on the widening alternatives, which was the focus of the request by the IEPR Panel. This can be done and should be done in further rewriting and analysis.

3. Thorough consideration of non-structural alternatives, including lightering larger vessels, handling large vessels at off-shore terminals, VMS/VTS improvements, and relaxing or altering the Pilots' rules.

   Non-structural alternatives are still dismissed early on in the screening process, although they are given additional discussion. The dismissal of the non-structural alternatives would be supported by a solid consideration of them.

4. An analysis of the channel extension portion of the project.

   The channel extension is said to be justified as a required element of any other structural alternative, but the issue would seem to warrant more discussion. Sourcing such justification would allow more comfort by the IEPR Panel.

USACE Revised Response to Panel BackCheck Response to Comment 1:

Response to Comment 1, #4: Concur

The following information is provided as additional background discussion for the IEPR panel:

The channel extension is required for the channel to reach the new authorized depth on the sloping Inner Continental Shelf of the Gulf of Mexico. The length of extension channel was determined by the distance offshore required for the 8-foot increase in the authorized channel depth, plus an additional 2 feet of allowable overdepth and 2 feet of advanced maintenance. The orientation of the extension channel is consistent with the existing channel bearings. The route of the selected channel extension provides the shortest route to deep water, as demonstrated by the detailed bathymetric chart presented as Figure 2.6 in the FEIS Appendix B. Core borings within the proposed extension confirm that it passes through unconsolidated sediments comprised of clays/silts, sands and gravels (USACE, 1982). Similar sediments are expected for all other potential routes. Therefore the selected route would be the least-costly of all possible routes and is the most reasonable choice for the selected alternative.

Panel BackCheck Response to Comment 1, Continued:

5. A clear, well-documented description of the screening process.

   The screening process has been described in more detail, but much of the process appears to be qualitative rather than quantitative, and relies heavily on judgment rather than analysis. In plan formulation some use of qualitative information is acceptable and is a common practice early on in the plan development, but as the screening process proceeds, all available quantitative information should be utilized or it should be explained why it has not been utilized.

6. A quantitative economic analysis of the use of the existing or an expanded LOOP facility and the pipelines and other facilities necessary utilize it.

   This analysis is still dramatically missing. There is now more extensive background information on LOOP, but the text dismisses it as uneconomic simply because SNWW crude petroleum customers do not use it yet and it would be costly to connect it to the preferred distribution system. Without a quantified analysis, as requested by the IEPR Panel, this is insufficient grounds to exclude it. Moreover, the analysis still

does not consider the possibility that LOOP could handle only the larger vessels and the SNWW continue to handle smaller ships. There is no comparison of the costs of connecting LOOP, or the costs of using LOOP for larger vessels, with the costs of dredging. **This is still a major shortcoming of the report, yet it appears such an analysis would be feasible in any reexamination of the project and subsequent rewrite.**

7. A detailed examination of how modification of the Sabine Pilots' rules and operations could improve productivity and how safety would be impacted.

   The IEPR Panel finds that the report still does not make any serious effort to determine the impact of the pilots' rules, or how vessel traffic could be accommodated if the rules were relaxed. Lack of control over the rules does not eliminate the need to analyze them. No efforts were made to apply HarborSym or other tools to the pilots' rules. Without a serious, quantitative analysis of the rules it is impossible to determine whether the channel dimensions or the rules themselves are the barrier to more efficient vessel operations. It does not make sense to spend $91 million on dredging simply because the pilots are stubborn. This institutional problem requires attention and data to track the discussions with the pilots, before this can be so lightly dismissed. **This is a second major report shortcoming.**

8. Explicitly consider the contributions of VMS/VTS systems in reducing the need for channel widening.

   Although there is additional material on this point it appears to be inconclusive and lacks quantification.

   Overall, while the report's treatment of some of these subjects is improved, there are still critical shortcomings, particularly in consideration of the non-structural alternatives and the quasi-structural LOOP alternative. The report does not make a conclusive or convincing case that alternatives to the preferred option were conscientiously pursued. In particular, the reliance on the pilots statements, with little data to support the decision, is unhandy and weakens the credibility of the analysis. The IEPR panel strongly feels that this request is not insurmountable and can be done; the report can be strengthened and potentially meet the criteria for concurrence, if done so.

Panel Revised BackCheck Response to Comment 1:

Non-Concur.

The additional information on Recommendation for Resolution 4 is helpful, although not as extensive as might be desired by the Panel. Other Recommendations for Resolution, notably 1, 2, 6, and 7, remain unaddressed in the USACE revised response. If USACE responses to other comments were intended to answer the substantial questions in the Panel BackCheck Response, they should be identified in this response.

Specifically, analysis of the pilots' rules, the LOOP usage and the VMS/VTS are continuing weaknesses of this section and require more detail and information to obtain concurrence.

Comment 2:

The report does not present a strong analysis of the current and future vessel fleet, or of vessel dimensions

Basis for Comment:

While there is extensive discussion of current and future vessel fleets, there is little in the way of solid data or clear explanation of reasoning. For example:

- The discussions of vessel fleets for chemical, grain, steel slab, ore, limestone, rock, and wood product carriers provide no data or documentation.
- The Taylors Bayou vessels have a 124' beam, clearly intended to allow passing and meeting under the Pilot's rules in the 500' channel. Yet the analysis claims that these vessels are regularly impacted by delays. An explanation is needed.
- The Appendix refers to "transportation analysis conducted for SNWW and other coastal ports" in connection with tanker size limits (DFR EA p. 4). A complete citation should be provided and the analysis presented in an appendix.

Significance – High:

The Plan Formulation and the benefits depend on the future vessel fleet and its dimensions.

Comment Cross-referencing:

(3) Comment: The crucial analysis of vessel design and sailing drafts is inadequately supported by data and appears questionable.

(5) Comment: There is no comprehensive description of existing vessel operations.

(7) Comment: The choice of project design vessel appears to drive the project design and benefits estimates, yet remains unjustified in the report.

(9) Comment: The report is written at a summary level and lacks proper documentation throughout.

Recommendations for Resolution:

The report requires clear, organized data on current vessel fleets, clear explanation of how future vessel fleets were predicted, documentation of trends, and appropriate sensitivity analysis.

USACE Response to Panel BackCheck Response to Comment 2:

DISCUSSION: *The FFR has been updated to include additional documentation of the chemical, grain, steel slab, ore, limestone, rock, and wood product fleets. Deepening benefits were not calculated for wood products. In response to the comment that the Taylors Bayou vessels have a 124' beam, SWG concurs that this vessel would not generally be affected by pilot rule #1. This vessel would be able to meet vessels with comparable or lesser beams if the loaded draft of the vessel it is meeting is less than 30 feet.*

Presentation of specific data for other ports cannot be presented in the report because the data is unpublished and proprietary; in addition, specific presentation of data associated with operations at comparable ports is not presented in report due, in part, to Title 18, U.S. Code, Chapter 93, Sect. 1905, as it relates to confidentiality of data.

SWG ACTION TAKEN: *Data on current and future fleets and trends are provided in the following locations:*

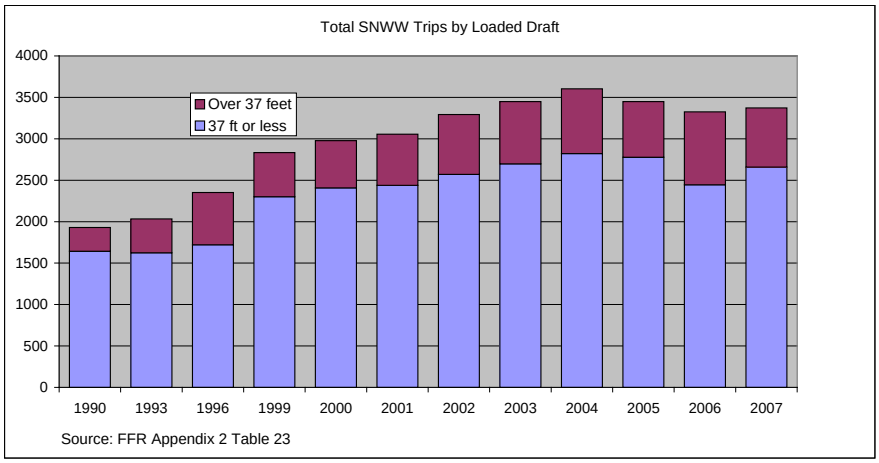
- *FFR, Appendix 2 (Economic Appendix), Section 3.3 (Vessel Utilization and Operating Practices), Table 27 (Chemical Product Imports and Exports), Section 3.7 (Chemical Product Carriers). Section 3.8 (Grain Exports), Section 3.9 (Steel Slab and Iron Ore Carriers), Section 3.10 (Limestone and Rock Carriers).*
- *FFR, Appendix 2 (Economic Appendix), pp. 25, 73, 75, 85, 88, 100 outlines existing vessel loaded draft utilization.*

Panel BackCheck Response to Comment 2:

Concur with comments.

The report does provide far more useful and defendable data on vessel counts, sizes, loaded draft, etc. **However, some of these data raise more questions than they answer.** Moreover, most of the data only cover through 2007, which is not acceptable in a reported dated 2010. If these 2007 data meet the rules and guidelines, it should be so stated and the IEPR Panel comments would be negated.

Table 23 does not show an obvious trend toward deeper loaded drafts. The charts below, developed from Table 23, show a modest decline the in the number of trips and a stable share of trips with loaded drafts over 37'.



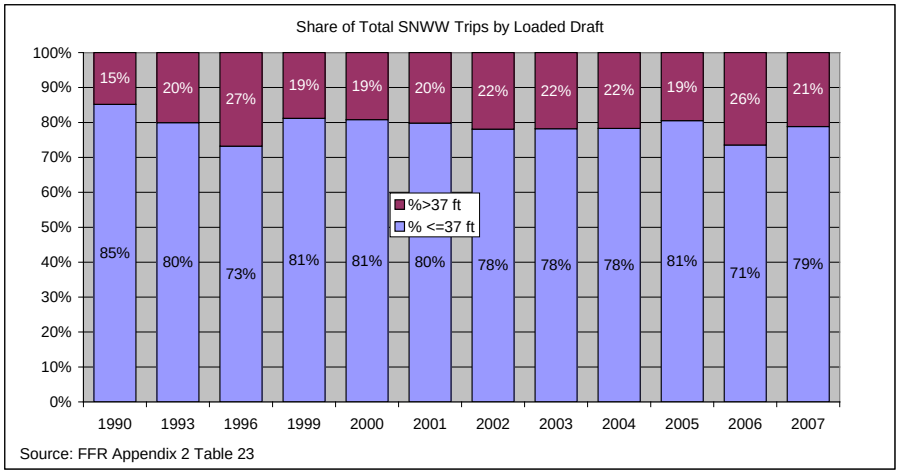
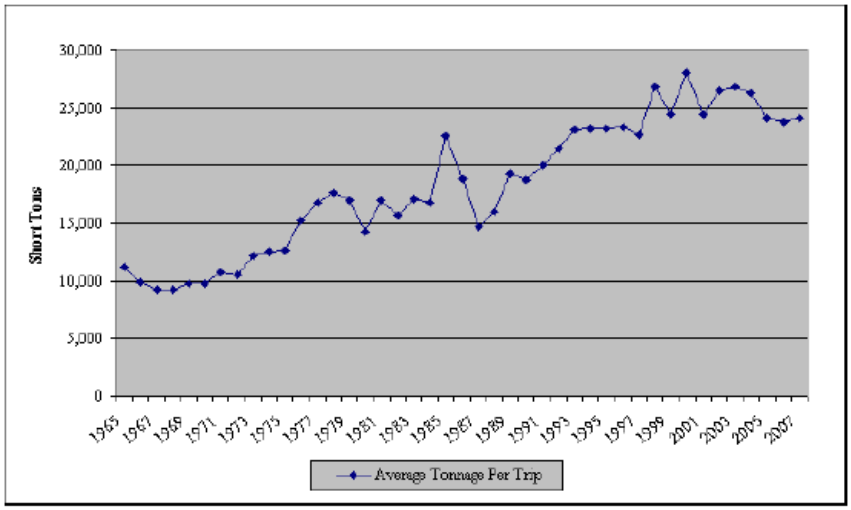


Figure 22, on page 59 p of the Economics Appendix (reproduced below) shows recent modest declines in average tonnage per trip.

Figure 22
Sabine-Neches Waterway
Average Tonnage Per Trip for Ocean-Going Vessels



Source: USACE, Waterborne Commerce of the U.S., Part 2, 1965-2007.

Table 24 likewise shows declining tonnage.

These tables appear to undercut the justification for the project, as the trends they show imply falling trade and declining vessel transits. The data in these tables likewise appear to contradict or weaken predictions of cargo growth and rising market share, on which much of the project benefits depend. The report appears to attribute this decline to Hurricane Rita, although no analysis is presented to explain why the downturn persisted so long. The more addition of more recent data to 2010 or at least 2009, would either lessen the IEPR Panel's concerns or further weaken the declining tonnage predictions.

The Panel would strongly recommend that the analysis be extended through 2009 to determine if these adverse trends have abated. If such data are available, the report would be strengthened and concerns by the IEPR Panel lessened.

Comment 3:

The crucial analysis of vessel design and sailing drafts is inadequately supported by data and appears questionable

Basis for Comment:

As noted above, no data are provided on actual sailing drafts of loaded vessels compared to available channel draft and vessel design draft. This is a crucial shortcoming. Several points in the draft discussion need more explanation. For example:

- A greater percentage of crude petroleum carriers were loaded to drafts of 38' or more for Port Arthur than for Beaumont (DFR EA p. 25). Why?
- Vessels are claimed to be loaded to deeper drafts for longer voyages (DFR EA p. 25). Why?

The discussion of loaded and ballast drafts (DFR EA p. 83) is vague, and lacks data or documentation.

Commodity Fleets and Drafts. The discussion of commodity fleets contains unsupported assertions regarding the future percentage of tonnage with loaded drafts over 40 feet. No data, analysis, or citations are provided for these crucial assumptions. These percentages are then used to estimate the benefits of channel deepening without a sensitivity analysis. There is no explanation or justification given for the estimated proportions of each commodity that would use greater draft.

"Draft Constrained" Vessels. Although the economic analysis repeatedly refers to "draft-constrained" conditions, ***there is no demonstration that existing vessels are actually draft-constrained***. The report notes: **"**The emphasis throughout the report is that the result of a deeper and wider channel will be increased utilization of existing vessel sizes." This is a critical unverified assumption, and very risky. While shippers would be expected to exploit deeper drafts once they became available, the report authors must make an effort to verify that no other factors are limiting vessel loads. In the absence of such an effort the assumption cannot be accepted. The same assumption was the result of strenuous external review panel objections in the Columbia River project.

In 2002–2004 only 36% of the vessels had loaded drafts over 35' (e.g. less than 5' of underkeel clearance in a 40' channel). In the absence of some industry contact or analysis it cannot be said with any certainty that those vessels would have used more draft had it been available. For example, virtually all Port Arthur crude carriers are currently loaded at or over 38' of draft, and investigation is required to determine if loading them deeper is really practical or likely. There is no analysis or investigation of why the other 64% of the vessels are not taking advantage of the available draft. There is no reason to assume, as the analysis does, that 36% of the vessels would then use 45' of draft (i.e., load to 40' with 5' under keel).

Basis for Comment (Continued):

Vessels might be "light-loaded" for a number of reasons beside draft restrictions, including:

- Restrictions at loading docks or ports.
- Preferred shipment or batch size.
- "Normal" capacity utilization of 90-97% (DFR Table 71)
- Limitations on receiving berths such as transfer rates, occupancy limits, or storage tank capacity.

Taylors Bayou Fleet. The Taylors Bayou fleet is a case in point. The analysis argues that Taylors Bayou vessels would be more fully loaded with more draft available. Yet most of the vessels serving Taylors Bayou were designed for current conditions, so treating them as underutilized requires some explanation. These vessels have a 43' design draft. Why would they have a 43' design draft for a 40' channel unless something less that 43' of sailing draft was acceptable? Table DFR 71 on vessel utilization indicates that vessel capacity is typically 90-97% utilized. This suggests that the 43' draft vessels might routinely be loaded to 38'+ of draft consistent with their use in a 40' channel. They would have to achieve unusually high utilization to use their full 43' of draft in a 48' channel.

LNG Vessel Drafts. The LNG vessel draft discussion is cursory. The analysis claims benefits for decreased LNG vessel delays due to deepening and widening despite acknowledging that all LNG vessels require one-way movement. No explanation is given. The report actually says on page DFR VI-49 that "LNG vessels represent a large increase in vessels that travel shorter distances than the existing tanker fleet going to the Neches River and, therefore will not be subject to delays." The text concludes that a depth of 43-44' would be required for vessels of 39-40', yet 87% of the tonnage shown has design drafts of 37' or 38', and depth of more than 40' would only be required if they are loaded completely full. The ERDC LNG simulation vessels had 37.4' and 39.4' of draft. There is no support for the assertion that the majority of LNG vessels will be loaded to 39 feet, especially since most have design drafts of 37' or 38' feet. The "multiport analysis" for LNG shipments is not presented anywhere.

Significance – High:

Much of the project justification depends on transportation cost savings achieved through greater vessel loading to deeper drafts. Without thorough investigation and analysis it *cannot* be safely concluded that vessels are light loaded solely due to draft constraints or that vessels would use the post-project draft proportionately.

Comment Cross-referencing:

(2) Comment: The report does not present a strong analysis of the current and future vessel fleet, or of vessel dimensions.

(5) Comment: There is no comprehensive description of existing vessel operations.

(7) Comment: The choice of project design vessel appears to drive the project design and benefits estimates, yet remains unjustified in the report.

(9) Comment: The report is written at a summary level and lacks proper documentation throughout.

Recommendations for Resolution:

The report requires a thorough analysis of current design and sailing drafts, and a convincing demonstration that:

1. some specified portion of the existing (or future) vessels are (or will be) constrained by available draft, rather than by some other factor; and
2. some portion of future vessels will be able to use additional draft and will not be limited by another factor.
3. The "multiport analysis" for LNG shipments should be presented in an appendix.

USACE Response to Comment 3:

EPR RECOMMENDATION:

The report requires a thorough analysis of current design and sailing drafts, and a convincing demonstration that:

1. *some specified portion of the existing (or future) vessels are (or will be) constrained by available draft, rather than by some other factor;*

DISCUSSION: *Data associated with current design and sailing drafts has been added to the report. Constraints other than the SNWW channel depth will affect utilization and project benefits reflect constraints.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), Tables 23-28.*
- *FFR, Appendix 2, p. 100 first paragraph and Table 110.*

EPR RECOMMENDATION:

2. *some portion of future vessels will be able to use additional draft and will not be limited by another factor.*

RESPONSE*: The benefit calculations recognize that factors other than*

SNWW channel depth (i.e. trade route limitations and parcel size demand) will affect vessel loads Pages 192-197 and Tables 112-113 provide specific information on the crude petroleum imports and vessel utilization. Sections 4.4 through 4.14 outlines the percentage of commodities other than crude oil imports for which deepening benefits were calculated.

EPR RECOMMENDATION:

3. *The "multiport analysis" for LNG shipments should be presented in an appendix.*

DISCUSSION: *A multiport assessment was presented in the 2007 Economic Appendix. Since 2007, two of the three proposed LNG terminals have been constructed. The SWG report shows the SNWW receiving 20 percent of the U.S. Department of Energy forecast volume, adjusted to reflect ocean-going movements. The SNWW forecast was estimated using 2009 Annual Energy Outlook (March 2009).*

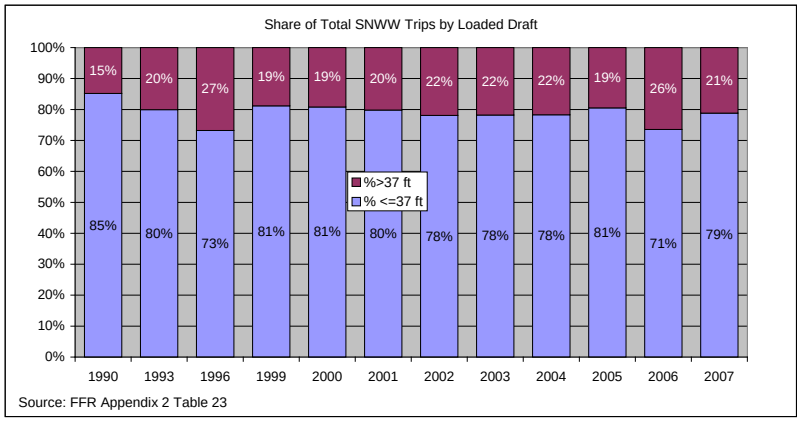
SWG ACTION TAKEN: *An LNG multiport analysis is presented in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), Section 2.7 (Expansion of the Existing Traffic Base, Liquefied Natural Gas).*
- *FFR, Appendix 2, Section 4.15 (U.S. LNG Forecast).*

Panel BackCheck Response to Comment 3:

Based on material and time available, Non-Concur.

The IEPR Panel could locate no data that relate loaded draft specifically to design draft, so it is impossible to determine if the vessels are draft constrained and, if so, to what extent. The chart below, developed from Table 23, shows a stable share of trips with loaded drafts over 37' and no apparent trend toward higher draft utilization. There appears, from this analysis, to be no trend towards deeper drafts. The added discussion does offer some insight to the overall size of ships in the industry but little specific to this project and the future drafts of the traffic in these channels.



Tables 112-113 do not have data on vessel utilization, as claimed above. A review of pages 192-197 located no comparisons of design and loaded draft.

The LNG analysis remains cursory and lacks credibility. The "multi-port analysis" in Appendix 2 (Economic Appendix), Section 2.7 contains barely a full page of text and a chart that shows a declining outlook for LNG imports beyond 2019, which appears to undercut any projections for long-term LNG-related benefits. The discussion in Appendix 2, Section 4.15 (U.S. LNG Forecast) is likewise cursory, and offers no justification for the arbitrary assumption

that SNWW will get 20% of the US market. (see Comment 6). A multi port analysis is a commonly used analytical instrument that allows a more global analysis of trade and traffic. The discussion provided in the current report version falls short of a multiport analysis. USACE guidance or other reports should be consulted as examples of multi-port analysis.

Appendix 2, p. 100 first paragraph bears no relation to the subject, nor does Table 110.

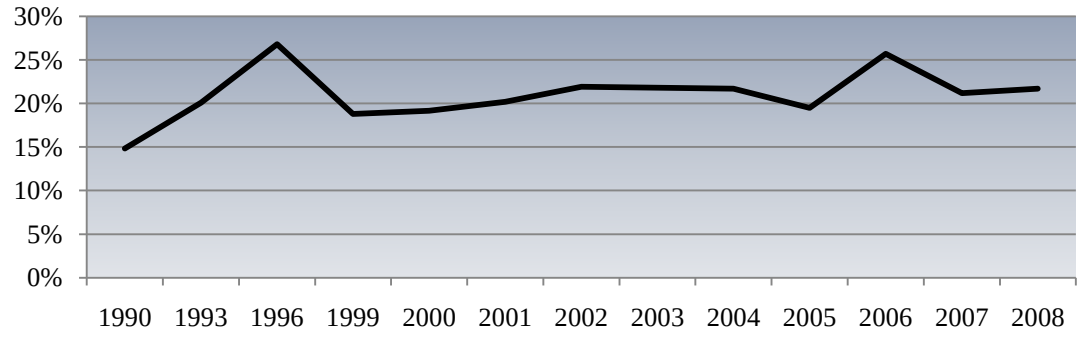
The project benefits depend on greater vessel draft utilization and the LNG outlook. With crucial analytic weaknesses in these areas, the benefit estimates are risky. Again the IEPR Panel feels these analysis can be done to add to the acceptability of the report and to attain concurrence by the IEPR Panel.

USACE Response to Panel BackCheck Response to Comment 3:

The primary focus of the first part of comment response is crude petroleum imports and the concern expressed during IEPR follow-up (4 June 2010) crude oil tanker loaded draft and design drafts and expectations relating to the percentage of crude oil tonnage that would be loaded to drafts over 40 feet. The second part of the comment response pertains to LNG market share.

In response to the concern that Table 23 shows a stable share of trips with loaded drafts over 37 feet and appears to undercut justification for the project, the review team needs to recognize that the forecast for the next 50 years cannot be made based on a few years of data. Recent inclusion of 2008 in the figure below shows a slight upturn; however, what is of interest is that the percentage of tonnage shipped in vessels with loaded drafts over 37 feet has exceeded the 1990 levels for 1993-2008 in spite of peaks and valleys. Data from the early 1970s showed less than one percent of total tonnage transported in vessels with loaded drafts over 37 feet; inclusion of this earlier period data is shown in displays prepared in response to IERP.

FIGURE 3A
Percentage of Tonnage Shipped In Vessels with Loaded Drafts Over 37 ft



Source: USACE, Waterborne Commerce of the U.S., Part 2, IWR-WCSC-1990-2008-2

Table 3A (next page) shows the relationship between crude oil design and loaded drafts draft. The second part of Table 3A shows the relative volume and percentage of tonnage transported in vessels with loaded drafts over 37 feet. While not exhibiting dramatic increases, Table 3A clearly shows a high concentration of loaded drafts over 37 feet for all years, with the percentage of tonnage loaded to drafts over 37 feet increasing from 60 percent in 1990 to 71 percent in 2008. Table 3B (also on the next page) includes additional distribution summary

data. Trends are more apparent from the second table which shows an average of 7 percent of 2006-2008 tonnage associated with design drafts over 40 feet, compared to 15 percent for 1999-2001. For the 1999-2008 period, the use of vessels with design drafts less or equal to 40 feet ranged from 2 percent in 2008 to 27 percent in 1990, with a mean of 12 percent and median of less than 10 percent. The data in Tables 3A and 3B show more efficient utilization patterns within the constraints of the existing channel depth and given uncertainties associated with spot market sales, variability in refinery input needs, congestion, and dock and pilot availability.

TABLE 3A
SNWW Total Crude Oil Imports (1,000's of Short Tons) 1990-2008*
and Imports Transported at Loaded Drafts Over 37 feet (Short Tons and Percentage Distribution)

Design Draft (ft)	1999	2000	2001	2002	2003	2004	2006	2007	2008
	Total Crude Oil Imports by Vessel Design Draft and Year								
<=40 ft	14,597	6,329	5,334	9,415	2,727	14,414	4,763	6,256	770
41-44	18,863	15,422	25,821	13,019	17,673	5,816	9,497	13,171	13,858
45-49	18,889	43,994	31,450	39,073	43,263	43,934	39,445	34,200	32,554
>50	1,485	1,442	1,621	4,876	6,495	5,711	3,910	2,452	2,690
Total	53,834	67,187	64,226	66,383	70,158	69,875	57,615	56,078	49,872
Design Draft (ft)	Total Tonnage for Loaded Drafts Over 37 feet by Design Draft Class and Year								
<=40 ft	9,744	2,473	2,294	7,814	1,176	12,684	3,334	5,277	364
41-44	10,460	7,706	14,976	7,291	8,499	3,955	5,318	11,502	11,276
45-49	11,832	26,378	20,757	24,225	22,958	27,678	24,062	23,418	22,487
>50	793	432	859	3,364	3,446	3,598	1,369	1,192	1,049
Total	33,170	36,622	38,536	42,485	36,067	47,515	33,993	41,181	35,176
Design Draft (ft)	Total Tonnage for Loaded Drafts Over 37 feet by Design Draft Class and Year								
<=40 ft	65%	43%	43%	83%	52%	88%	70%	85%	47%
41-44	54%	55%	58%	56%	58%	68%	56%	88%	81%
45-49	61%	66%	66%	62%	64%	63%	61%	69%	69%
>50	52%	33%	53%	69%	64%	63%	35%	49%	39%
Total	60%	60%	60%	64%	62%	68%	59%	74%	71%

Source: USACE, Navigation Data Center Detailed Files (unpublished)
CY2005 data is not presented due to reporting problems with the loaded draft field

TABLE 3B SNWW Total Crude Oil Imports 1990-2008* Percentage of Imports by Vessel Design Draft									
Design Draft (ft)	1999	2000	2001	2002	2003	2004	2006	2007	2008
	% of Total Crude Oil Imports by Vessel Design Draft and Year								
<=40 ft	27%	9%	8%	14%	4%	21%	8%	11%	2%
41-44	35%	23%	40%	20%	25%	8%	17%	24%	28%
45-49	35%	66%	49%	59%	62%	63%	68%	61%	65%
>50	3%	2%	3%	7%	9%	8%	7%	4%	5%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Design Draft (ft)	Loaded Drafts Over 37 ft (Percentage of Imports by Vessel Design Draft) by Year								
<=40 ft	29%	7%	6%	18%	3%	27%	10%	13%	1%
41-44	32%	21%	39%	17%	24%	8%	16%	28%	32%
45-49	36%	72%	54%	57%	64%	58%	71%	57%	64%
>50	2%	1%	2%	8%	10%	8%	4%	3%	3%
Source: USACE, Navigation Data Center Detailed Files (unpublished). CY2005 data is not presented due to reporting problems with the loaded draft field.									

Estimation of how the Table 3A and 3B distributions might change given an increase in channel depth is difficult to discern based on the eight years of data; therefore, comparison to 1970-72 data was made in order to provide overall perspective. While the earlier data is unfortunately more general it provides a useful basis for evaluating overall changes (Table 3C). The change from 1970/72 to 2006/08 is dramatic and emphasizes how tanker load patterns evolved within a period of 35 years with no change in channel depth. As discussed in the Appendix vessel trips have increased at a lower than tonnage (see Figure 22, p. 59, of the Appendix) because more cargo is transported per vessel, through a greater concentration of larger vessels. As outlined in the Appendix, expectations are that the number vessels will increase as SNWW's cargo base diversifies due to LNG and increases in manufactured goods and dry bulk.

TABLE 3C SNWW Inbound Tanker Trips 1970/1972 and 2006/2008 (includes All Crude Petroleum and Petroleum and Chemical Products)						
Loaded Draft (ft)	1970	1971	1972	2006	2007	2008
<=24	1,015	973	991	185	168	184
25-29	144	113	199	187	151	184
30-37	228	238	198	481	363	337
38-40	1	2	14	492	588	558
Total		1,325	1,402	1,345	1,270	1,263
Loaded Draft (ft)	Distribution by Loaded Draft					
<=24	73%	73%	71%	14%	13%	15%
25-29	10%	8%	14%	14%	12%	15%
30-37	16%	18%	14%	36%	29%	27%
38-40	0%	0%	1%	37%	46%	44%
Total	100%	100%	100%	100%	100%	100%
Source: USACE, Waterborne Commerce of the U.S., Part 2, IWR-WCSC-1970-2008-2						

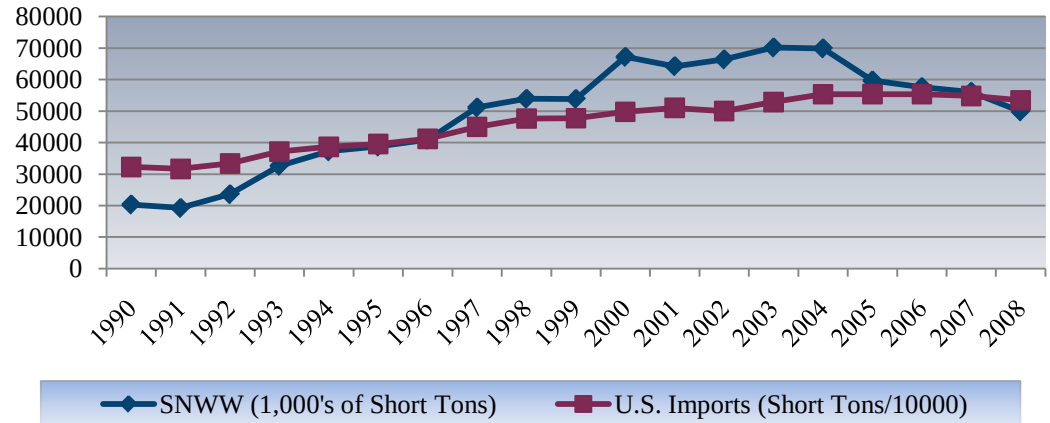
Table 3D below provides a separate breakout of crude oil tanker trips included in the Table 3C. As noted, 2006-08 tonnage is down due to the effects of hurricanes and planned outages due to refinery expansion, with regional imports increased at significantly higher rates than the nation until 2004 (Figure 3B). The effect of the major hurricanes is illustrated in Figure 3C.

TABLE 3D
SNWW Inbound Crude Oil Tanker Trip Data (Trips and Tonnage)

Loaded Draft (ft)	1990	1993	1999	2001	2002	2003	2004	2006	2007	2008
	SNWW Inbound Crude Oil Tanker Trips									
<=24	4%	3%	0%	0%	1%	0%	0%	0%	0%	1%
25-29	5%	4%	1%	1%	1%	0%	1%	2%	1%	3%
30-37	32%	58%	38%	38%	34%	38%	33%	42%	26%	29%
38-40	59%	36%	60%	60%	64%	61%	66%	55%	72%	66%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Crude Oil Imports (Millions of Short Tons)									
	20.3	32.6	53.8	64.2	66.4	70.2	69.9	69.7	57.6	49.9

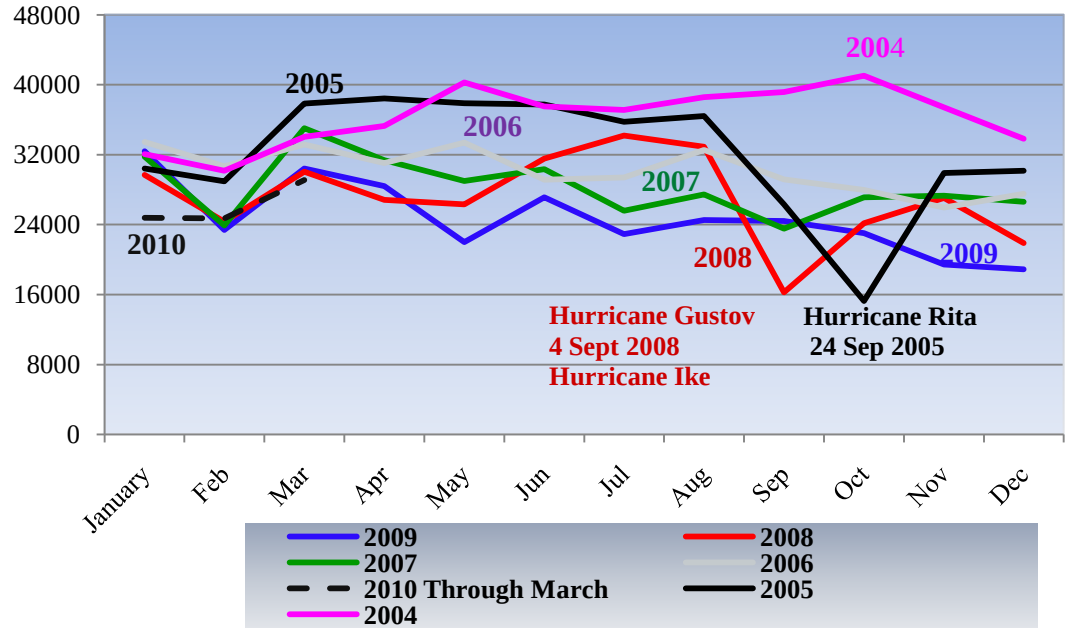
Source: USACE, Waterborne Commerce of the U.S., Part 2, IWR-WCSC-1990-2008-2 and Navigation Data Center Detailed Files (unpublished). CY2005 data is not presented due to reporting problems with the loaded draft field

FIGURE 3B:
SNWW and U.S. Crude Oil Imports



Source: USACE, Waterborne Commerce of the U.S., Parts 2 and 5, IWR-WCSC-1990-2008.

FIGURE 3C:
SNWW Crude Oil Imports by Month 2006-2010 (1,000's of Barrels)



Source: Aggregated from U.S. Department of Energy Monthly Import Statistics, 2004-2010

As noted on p 99 on the Appendix, the hurricane surge resulting from Rita resulted in sand bars at the offshore entrance channel and silting of the Neches River Channel to Beaumont. Silting of the Neches River channel severely limited transit of the upper reaches for several months and resulted in tonnage diversions to other ports due to loaded draft limitations into 2006. The effect of shoals in the entrance channel and silt deposits on the Neches River due to the hurricane surge had a particularly strong effect on crude petroleum traffic due to the use of large heavily loaded vessels.

Specific estimation of future expectations concerning the relationship between loaded drafts and design drafts and future utilization were made based on strong long-term utilization of the existing channel, industry interest in channel deepening, the lack of constraints at the points of origin, increasing concentration of larger vessels (Table 3E, replicated and expanded from the Economic Appendix, p. 68), and reductions in transportation costs (Table 3F replicated from the Economic Appendix, p. 197) are indicative that load patterns will continue to become more efficient. A major advantage of the 45- to 50-foot channel depth alternatives is that it allows for the reduction in the number of shuttles needed to lighter a VLCC (Economic Appendix, Table 110). Additionally, the transportation cost reductions produced from the proposed channel depth increase will allow the increasingly large concentration of 90,000 to 119,999 DWT vessels to be loaded more fully. Vessels in this group have design drafts between 45 and 49 feet (Economic Appendix, Table 33, p. 71). The table below helps illustrates the large concentration of 90,000 to 119,999 DWT vessels and the dramatic increase in their use since 1980. As shown in the Appendix, the design drafts for all vessels groups except those less than 50,000 exceed 40 feet. Examination of the 2008 SNWW 50,000 to 74,500 DWT showed a design draft range of 39 to 48 feet, with a median of 45 feet. For the <50,000 DWT range, the maximum design draft was 43 feet and the median 27 feet.

TABLE 3F
SNWW Crude Petroleum Imports by Vessel Size
Percentage of Imports by Vessel DWT

Vessel DWT (1000)	Median Desig	1980	1990	1993	1998	1999	2002	2003	2004	2006	2007	2008
<50	37	*	1%	0%	0%	0%	0%	1%	2%	1%	1%	2%
50–74.5	45	*	4%	1%	9%	9%	3%	2%	2%	3%	4%	4%
75–84.9	43	*	18%	8%	24%	9%	18%	20%	18%	25%	23%	18%
85–89.9	42	*	**17%**	**11%**	10%	10%	5%	1%	0%	0%	0%	0%
90–	48	<1%	56%	72%	54%	66%	66%	68%	72%	64%	66%	70%
120–	54	0%	2%	3%	1%	3%	3%	3%	3%	2%	2%	2%
150–	53	0%	2%	5%	1%	5%	5%	6%	4%	5%	5%	3%
Total		100	100	100	100	100	100	100	100	100	100	100

Source: USACE, Navigation Data Center Detailed Files (unpublished), 1990-2008. CY2005 data is not presented due to reporting problems with the loaded draft field.
*Data from SNWW 1981-period report shows that the largest vessel size in 1980 was 99,600. Indications are that the most common were 60,000 to 78,000 DWT.

Table 3G displays the project average annual cost and benefits based on various assumptions of associated with the percentage of crude petroleum imports that will be loaded to vessel drafts over 40 feet. The first column shows the benefits presented in Economic Appendix (p. 221). The calculations in the remaining columns are based on alternative percentages. The results of this analysis, based study region vessel utilization trends data from 1970-2008, industry expectations, and transportation cost savings indicate that it is reasonable to expect that a significant port of future crude oil imports will be loaded to drafts over 40 feet given an increase in channel depth for the 50-year planning period starting in CY2019. The sensitivity tonnage forecast variations is addressed in response to comment 6.

TABLE 3G
SNWW Project Average Annual Costs and Benefits
Sensitivity Scenarios for the Percentage of Crude Oil Loaded to Drafts Over 40 ft

Channel Depth (ft)	Average Annual Cost ($1,000) at 4.375%
45	$70,217
46	$77,258
47	$84,299
48	$91,341
49	$96,626
50	$101,911

Average Annual Benefits Calculations ($1,000's) at 4.375%
Based on Variation in the Percentage of Future Tonnage Using Channel Depth Increase
2019-2069

Depth (ft)	94%	50%	60%	70%	80%	100%
45	$83,841	$65,538	$69,651	$73,764	$77,877	$86,103
46	$95,856	$74,207	$79,072	$83,937	$88,802	$98,532
47	$104,303	$80,535	$85,876	$91,217	$96,558	$107,240
48	$115,074	$87,893	$94,001	$100,109	$106,217	$118,434

49	$122,875	$93,428	$100,045	$106,663	$113,280	$126,515
50	$127,696	$97,099	$103,974	$110,850	$117,726	$131,478
	Net Excess Benefits ($1,000) Based on Utilization Scenarios					
45	$13,624	-$4,679	-$566	$3,547	$7,660	$15,886
46	$18,598	-$3,051	$1,814	$6,679	$11,544	$21,274
47	$20,004	-$3,764	$1,577	$6,918	$12,259	$22,941
48	$23,733	-$3,448	$2,660	$8,768	$14,876	$27,093
49	$26,249	-$3,198	$3,419	$10,037	$16,654	$29,889
50	$25,785	-$4,812	$2,063	$8,939	$15,815	$29,567
	BCRs Based on Utilization Scenarios					
45	1.2	.0.9	.0.9	1.1	1.1	1.2
46	1.2	.0.9	1.0	1.1	1.1	1.3
47	1.2	.0.9	1.0	1.1	1.1	1.3
48	1.3	.0.9	1.0	1.1	1.2	1.3
49	1.3	.0.9	1.0	1.1	1.2	1.3
50	1.3	.0.9	1.0	1.1	1.2	1.3

The remainder of this comment response addresses the IEPR follow-up (4 June 2010) contain pertaining to changes in the market share used for LNG. The other item was to define the basis for the market share.

The first part of this response addresses the basis for the market share. Table 3H displays the EIA U.S. LNG import forecast and the SNWW LNG forecasts that appears in the in the Economic Appendix (Table 72). As noted in the Appendix LNG permits were approved for the Cheniere Sabine Pass, Exxon-Mobil Golden Pass, and the Sempra Port Arthur Terminals. Cheniere opened in 2008 and Golden Pass is scheduled to open by 2011. Construction of the Sempra Terminal is planned after 2012

TABLE 3G
U.S. and SNWW LNG Waterborne LNG Forecast
Short Tons

Year	U.S. Waterborne LNG Imports	SNWW Waterborne LNG Imports
2005	16,565,000	
2006	18,617,000	
2007	21,238,000	4,000
2008	12,072,000	39,000
2009	15,514,400	
2019	38,852,755	5,827,913
2020	38,045,447	9,511,362
2025	31,049,691	7,762,423
2029	24,698,681	6,174,670
2030	22,309,819	6,174,670
2069	22,309,819	6,174,670

Source: USACE, Waterborne Commerce of the U.S., Part 2, IWR-WCSC-2005-08, Parts 2 and 5 Navigation Data Center and the U.S. Department of Energy, 2009 Annual Energy Outlook, March 2009.

As noted in the Appendix, the SNWW LNG forecast is based on a market share of 20 percent. Determination of the expected SNWW market forecast was based on evaluation of industry input, and a report prepared by Michael Gorecki of Alexander Aaron, Inc. in May 2007 for the Galveston District. This report will be attached to the Economic Addendum. The information presented in report included projected market share based on a U.S. LNG imports divided based on an long-term even anticipated utilization rate level, the distribution amongst the facilities would range from 28.6 to 41.5 percent. The 28.6 percent share was based on SNWW having two LNG terminals and the 41.5 percent was based on SNWW having three LNG terminals. Table 3H displays the anticipated U.S. market share presented in the Alexander Aaron, Inc. report. These market shares were expected to be reasonable given construction progress and industry investments. As noted, construction is complete for the Cheniere Terminal and nearly complete for Golden Pass. The market analysis indicated that given two SNWW terminals, the region was likely to capture 28.6 percent of the U.S. LNG import market. The Galveston District used a lower percentage in order to account for uncertainty. The percentage used in the Appendix is 15 percent in 2019 and 25 percent for 2029-2069, with import tonnage remaining constant after 2030.

The remainder of this response addresses the effects of varying the market share used in the report. Table 3I displays the EIA U.S. LNG import forecast and a range of SNWW LNG forecasts.

TABLE 3H
U.S. LNG Existing and Anticipated Terminals

Name	Operational Bcf/d	Operational Rate	Annual Import Bcf	Operational Bcf/d	Operational Rate	Annual Import Bcf
Everett, MA	0.869	0.627	199.0	0.869	0.719	228.3
Cove Point, MD	1.512	0.627	346.2	1.512	0.719	397.1
Elba Island, GA	1.777	0.627	406.7	1.777	0.719	466.5
Lake Charles, LA	1.764	0.627	403.8	1.764	0.719	463.2
Sempra Hackberry,	2.226	0.627	509.6	2.226	0.719	584.6
Freeport, TX *	3.360	0.627	769.2	3.360	0.719	882.4
SNWW LNG Terminals						
Cheniere *	3.360	0.627	769.2	3.360	0.719	882.4
Golden Pass *	2.268	0.627	519.2	2.268	0.719	595.6
Sempra	2.520	0.627	576.9			
Total	19.656		4500.0			

Special Report prepared for the Galveston District by Michael Gorecki of Alexander Aaron, Inc., Sabine-Neches Waterway Project Liquefied Natural Gas Market Share, May 2007
*New or under construction in 2010.
Bcf/d: Billion cubic feet per day

TABLE 3I
SNWW Market Share Sensitivity Analysis

Year	SNWW LNG Forecast Range			
	Economic Appendix	Half of the Economic Appendix Volume	28.6% of the U.S. Market	41.5% of the U.S. Market
2019	5,827,913	2,913,957	6,993,496	9,713,189
2030	6,174,670	3,087,335	7,582,495	13,164,397
2069	6,174,670	3,087,335	7,582,495	13,164,397
	Average Annual Benefits Calculations ($1,000's) at 4.375% Based on Range of SNWW LNG Market Shares, 2019-2069			
45	$83,841	$78,271	$86,312	$92,753
46	$95,856	$90,286	$98,327	
47	$104,303	$98,733	$106,774	$113,215
48	$115,074	$109,504	$117,545	$123,986
49	$122,875	$117,305	$125,346	$131,787
50	$127,696	$122,126	$130,167	$136,608
	BCRs Based Range of SNWW LNG. Market Shares (The Average Annual Costs Used for the BCR Calculations are Shown at the top of Table 3G)			
45	1.2	1.1	1.2	1.3
46	1.2	1.2	1.3	1.4
47	1.2	1.2	1.3	1.3
48	1.3	1.2	1.3	1.4
49	1.3	1.2	1.3	1.4
50	1.3	1.2	1.3	1.3

The following tables summarize evaluation of the crude petroleum vessel utilization and LNG market share presented in Tables 3G and 3I.

TABLE 3J
SNWW Combined Analysis of LNG Market Sensitivity and Crude Oil Vessel Utilization Share

Channel Depth (ft)	Scenario Description					
	Economic Appendix	Half of the LNG Market And 50% of Crude Petroleum Loaded to Drafts Over 40 ft	Half of the LNG Market And 70% of Crude Petroleum Loaded to Drafts Over 40 ft	28.6% the LNG Market And 80% of Crude Petroleum Loaded to Drafts Over 40 ft	41.5% the LNG Market And 80% of Crude Petroleum Loaded to Drafts Over 40 ft	41.5% the LNG Market And 100% of Crude Petroleum Loaded to Drafts Over 40 ft
	Average Annual Benefits Calculations ($1,000's) at 4.375% Based on Range of SNWW LNG Market Shares, 2019-2069					
45	$83,841	$59,968	$68,194	$80,348	$86,789	$95,015
46	$95,856	$68,637	$78,367	$91,273	$97,714	$107,444
47	$104,303	$74,965	$85,647	$99,029	$105,470	$116,152
48	$115,074	$82,323	$94,539	$108,688	$115,129	$127,346

49	$122,875	$87,858	$101,093	$115,751	$122,192	$135,427
50	$127,696	$91,529	$105,280	$120,197	$126,638	$140,390
Net Excess Benefits ($1000's) (The Average Annual Costs Used for the BCR Calculations are Shown at the top of Table 3G)						
45	$13,624	-$10,249	-$2,023	$16,572	$10,131	$24,798
46	$18,598	-$8,621	$1,109	$20,456	$14,015	$30,186
47	$20,004	-$9,334	$1,348	$21,171	$14,730	$31,853
48	$23,733	-$9,018	$3,198	$23,788	$17,347	$36,005
49	$26,249	-$8,768	$4,467	$25,566	$19,125	$38,801
50	$25,785	-$10,382	$3,369	$24,727	$18,286	$38,479
BCRs Based Range of SNWW LNG. Market Shares Range and Variation in Crude Petroleum Loaded Draft Utilization (The Average Annual Costs Used for the BCR Calculations are Shown at the top of Table 3G)						
45	1.2	0.9	.9	1.1	1.2	1.4
46	1.2	0.9	1.0	1.2	1.3	1.4
47	1.2	0.9	1.0	1.2	1.3	1.4
48	1.3	0.9	1.0	1.2	1.3	1.4
49	1.3	0.9	1.0	1.2	1.3	1.4
50	1.3	0.9	1.0	1.2	1.2	1.4

In conclusion, the sensitivities presented in Tables 3G-3J indicate that project justification is much more sensitive to crude oil tanker vessel utilization than to LNG market share. The results of the analyses presented in Table 3G shows that if less than 60 percent of 2019-2069 crude oil imports are regularly loaded to drafts less than 40 feet, the BCR will fall below unity. While not shown in the table, the BCR remains at unity given a reduction in the LNG market share to one-half of the percentages of 15 percent in 2019 and 25 percent for 2029-2069 in combination with 65 percent of 2019-2069 crude oil imports being loaded to drafts over 40 feet. In conclusion, the tanker utilization data presented in Table 3A (1990-2008) and Table 3C (1970/72 and 2006/08) provide sufficient justification that to reasonably conclude that the crude oil tanker fleet will continue to realize increased efficiencies under both the without and with project future.

Panel Revised BackCheck Response to Comment 3:

Concur with Comments.

The response to Comment 3 has been significantly improved. While Table 3A is not an impressive trend, the write up accepts that fact. The sensitivity analysis is useful and is the only place where it is shown clearly that the District is expecting 94% of the crude vessels to take advantage of the deeper draft. The new material does not make it clear how much draft the ships need to use to make the numbers work.

Table 3D shows that 34% of the inbound crude vessels arrive at 37 ft or less, indicating that most of them are not using all the available draft. The analysis would have been improved if USACE had provided that same analysis at 36 feet or less. The future assumption of 94% using the available draft is crucial and should be monitored.

As an aside but worthwhile note, if formats, years and definitions were not being changed in tables throughout this report, and especially this response, the analysis and discussion would be easier to follow.

Comment 4:

The benefits estimates cannot be validated from the report material, and include some questionable uses of ranges and averages

Basis for Comment:

The discussion of projected cost savings is much too general and cannot be validated from the material presented. Compared to the long discussions of commodities and vessel fleets the account of the actual benefits estimate is relatively cursory.

- HarborSym was not used for the Neches River Turning Basins (DFR EA p. 95), but it is not clear what was used instead.
- The benefits calculations used savings of "6–14 hours" (DFR EA p. 99), but it is not clear what values were actually used or how the values were chosen.
- The basis of the time savings estimates (DFR EA p. 102) and the means of reconciling different estimates are not documented or explained.
- DFR Tables 77, 78, 79, 82, 83, and 84 all need more extensive documentation and explanation.
- The vessel cost and savings discussion (DFR EA p.104-107) is cursory, and does not explain the calculations in the example (Table 76) or document the various cost and time factors used.
- The "detailed analyses of crude oil, petrochemical products, breakbulk, and LNG fleet utilization in relationship to existing and future" (p. DFR VI-3) are likewise not presented.
- The "port depth, trade route, and historical vessel utilization data…used to identify the percentage of tonnage anticipated to benefit" are also missing from the report.

The costs appear to include the correct subsystem costs but how each is derived is not consistently available to the reader in this report. Essentially they are presented in an economic spreadsheet but all cost elements and cost savings need verification and sourcing. Sensitivity analyses on some of the cost elements, relative to impact on BCR, are needed. This will strengthen the report and provide the decision maker with the appropriate sense of confidence in the decision.

Transportation Cost Estimates. The transportation cost estimates as demonstrated in DFR VI Table 18 are not sufficiently explained or documented. There are no sources or explanation for the unloading rates and costs, or the loads at each draft. The basis of the cost savings estimates in DFR VI Table 48 is not given, nor are many of the cost factors sourced.

Lightering and lightening are mentioned but are not explained in any detail. The cost savings claimed on DFR VI-20 are not documented. DFR VI Tables 19 through 20 require additional explanation. The cost savings calculated for other commodities likewise require more detailed backup.

Basis for Comment (Continued):

The report also discusses the sailing distances used in the cost analysis. These are all averages or representative values rather than actual distributions of distances from different ports. There is not enough information presented for the EPR panel to determine whether or not this was a legitimate analytic shortcut. In particular, there was no sensitivity analysis.

Significance – High:

In the absence of proper documentation and explanation the benefits estimates cannot be considered reliable or complete.

Comment Cross-referencing:

(9) Comment: The report is written at a summary level and lacks proper documentation throughout.

Recommendations for Resolution:

The benefits analysis should be documented in detail, with appropriate source citations for input values, careful analysis of any ranges or averages, and provision of actual data.

USACE Response to Comment 4:

DISCUSSION: *The EPR recommendations are addressed as outlined in the SWG Action Items.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), Section 3.5.1 (Methods of Shipment). Additional discussion of Methods of Shipment are included in Section 6.4.1.1 (Crude Oil Imports).*
- *FFR, Appendix 2, Section 6.3 (Channel Widening Benefits), Paragraph 3, the HarborSym model was used in evaluation of the entrance channel widening and the Neches River turning basin and anchorage features.*
- *FFR, Appendix 2, Section 6.4.1.1 (Crude Petroleum Imports), Tables 110-113, 120-122. These tables replace DFR Tables 77, 78, 79, 82, 83, and 84.*
- *FFR, Appendix 2, Section 6.4.1.1, Tables 104-106 and text outline the transportation cost calculations. Pages 192-197 provide additional documentation on the calculations.*

Panel BackCheck Response to Comment 4:

Based on material and time available, Non-Concur.

It is still not possible to determine if the cost estimates are correct from the material presented and major explanation and sourcing are needed..

Economic Appendix Section 3.5.1 (Methods of Shipment) gives valuable additional general information on lightering, but the actual volumes lightered were apparently estimated in a round-about process, not well explained, based on trade route. No cost data are presented. No information on the convoy system or barge operations are presented in this section. Benefits are bases on the relationship of costs for alternatives and this information is not produced.

Economic Appendix Section 6.4.1.1 Crude Oil Imports is difficult to follow and contains a number of statements that are critical to the analysis but are not supported or documented. For example:

"Review of the depths at trading ports and significant savings per ton indicates that a large share of crude petroleum tonnage from Mexico, Venezuela, and Trinidad would be loaded to vessel drafts over 40 feet.' (p. 194)

"At the same time, the effect of a SNWW deeper channel depth will reduce the cost differential and make direct shipment more cost competitive for Africa and North Sea routings and, therefore, may result in a greater frequency of direct shipment, with the uncertainty associated with offshore transfers being a key variable affecting shippers' decision." (p.198)

The critical statement that: *"An increase in the channel depths to Port Arthur from 40 to 45 feet would allow the existing range of 90,000 to 120,000 DWT vessels to carry approximately 20 percent more cargo. A depth increase from 40 to 50 feet or more would allow the same range of vessels to carry 35 percent more cargo."*(EA p.194) relies on the unstated and unsubstantiated assumption that vessels would use the maximum draft available for their design draft – an assumption that is not supported by any data in the report. As noted elsewhere, the current fleet apparently does not always use the available draft. This becomes another of the critical major shortcoming of the analysis.

A sensitivity analysis that *"addresses the effects of Port Arthur's future share increasing relative to Beaumont's present share"* (EA p. 193) is not acceptable – the sensitivity analysis should address the impact of assumptions such as cargo growth rates on the project benefits, including the totals used in Table 108. In fact this revision missed the whole point of the IEPR Panel's original request.

While the information presented in the Economic Appendix may suffice for the general public, it is not sufficient for an external review to verify the validity of the process or the estimate thus derived. The cost savings estimates, however, apparently assume that all vessels will load to their maximum carrying capacity for the new drafts (Table 109). That assumption is not reasonable, and results in overstating the project benefits to an unknown degree. If the Panel's reading of this assumption is incorrect, then the section has to be rewritten with greater detail and sourcing.

USACE Response to Panel BackCheck Response to Comment 4:

This response provides data and discussion concerning lightering volumes and trade route choices. The calculations are based on 100 percent of crude oil imports from Middle East and Africa being lightered. The transportation cost calculations were made on a cost per ton basis; specific vessel volumes lightered were available. The cost calculations were made given knowledge of the range of vessel sizes used. The specific distribution of shuttle vessels used for lightering and lightening is not known because the Corps NDC data records do not provide that level of detail; however, the EGM deep-draft vessel operating costs were used to calculate and, verify the most efficient range of vessels. Additionally, SPT Marine, http://www.sptmts.com/navigator/ and http://www.teekay.com/ ,and the oil companies have identified the fleet range. It is known that shuttle vessels are 80,000 to 120,000 DWT vessels. The number of shuttle trips necessary to offload a 325,000 DWT class VLCC is shown in Table

110 of the Appendix. The volume unloaded at the lightering zone relates to Texas Gulf channel depth constraints and refinery input needs. Vessel size data were obtained from the detailed waterborne commerce statistics. The vessel sizes used for existing condition lightering are identified in the Appendix (Table 111). The vessel sizes for existing condition lightening are identified in the Appendix (Table 112). Determination of which method of shipment was less costly was made based on comparison of direct shipment, lightering, and lightening costs using the Corps EGM deep-draft vessel operating cost and optimal lightering turnaround data obtained as published in the Skaugen PetroTrans "Introduction to Lightering" and periodic inquiries to this company and to oil company personnel. Table 4A displays lightering cost components by major trade route for the segment from the foreign port of origin to the Gulf of Mexico lightering zone used in the Corps analysis.

TABLE 4A
Lightering Cost for Traditional 325,000 DWT Vessel

325,000	Mother Vessel DWT
0.97	Max load Ratio
315,250	Fully-loaded cargo capacity
15	Speed (knots)
$2,114	Hourly Cost at Sea (Economic Guidance Memorandum)
$1,377	Hourly Cost in Port Economic Guidance Memorandum)
24,917	Mideast Round Trip Mileage Via Cape to Lightering Zone
19,509	Mideast Round Trip Mileage Via Suez to Lightering Zone
11,488	Africa/North Sea Round Trip Mileage to Lightering zone
3,805	Venezuela Round Trip Mileage to Lightering Zone
1,220	Mexico Round Trip Mileage to Lightering Zone
$82,710	Loading Cost at Origin Port (based on loading rate of 5,250 tons per hour)
$3,593,602	Total Transportation Cost (Middle East via Cape)
$2,831,596	Total Transportation Cost (Middle East via Suez)
$1,701,409	Total Transportation Cost (Africa/North Sea)
$618,847	Total Transportation Cost (Venezuela/Eastern South America)
$254,612	Total Transportation Cost (Mexico)
$11.40	Middle East Cost Per Ton via Cape
$8.98	Middle East Cost Per Ton via Suez
$5.40	Africa/North Sea Cost/ton
$1.96	Venezuela/Eastern South America Cost/ton
$0.81	Mexico Cost/ton

Table 4B displays the number of shuttles needed to fully load a 325,000 DWT vessel, Table 4C lists the number of hours to offload the 325,000 DWT vessel based on a range of shuttle vessels from 90,000 to 135,000 DWT. Based per ton transportation costs this range represents the maximum efficiencies. Use of smaller shuttles is not cost effective when lightering (see Tables 4C-4H). In order to illustrate this point, a 42,500 DWT tanker is included in the tables that follow. Vessel utilization presented in the Appendix also illustrates this point (see Appendix Table 31 and IEPR Comment Response 3, Table 3F). Tables 4B through 4E provide input data and Tables 4F and 4G display the cost per ton lightering cost for the Middle East and Africa/Med/ North Sea routings. The cost for direct shipment is presented in Tables 4H-4I. Table 4H presents the direct shipment cost for Africa/North Sea/Mediterranean and Middle East

routings. Table 4I presents the direct shipment cost for Mexico and Venezuela/Eastern South America.

TABLE 4B
Number of Shuttles Needed to Unload a 325,000 DWT Tanker

Channel Depth ft.	Shuttle Vessel DWT							
	42,500	90,000	110,000	115,000	120,000	125,000	130,000	135,000
40	9.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0
43	9.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
44	9.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
45	9.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
46	9.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
47	9.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
48	9.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0
49	9.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0
50	9.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0

TABLE 4C
Number of Hours to Offload 325,000 DWT Tanker Based on Channel Depth Alternative and Shuttle DWT

Channel Depth	Shuttle Vessel DWT							
	42,500	90,000	110,000	115,000	120,000	125,000	130,000	135,000
40	67.0	64.0	70.1	71.9	73.6	60.2	61.4	62.5
43	67.0	71.1	62.5	64.1	65.6	67.1	68.5	69.8
44	67.0	73.4	64.6	66.3	67.9	69.4	70.9	72.2
45	67.0	60.6	66.8	68.5	70.2	71.7	73.2	74.7
46	67.0	62.5	68.9	70.7	72.4	74.1	75.6	77.1
47	67.0	64.4	71.1	72.9	74.7	76.4	78.0	79.5
48	67.0	65.1	73.2	75.1	76.9	78.7	60.3	61.5
49	67.0	65.1	75.3	77.3	79.2	60.7	62.1	63.3
50	67.0	65.1	77.5	79.5	61.1	62.5	63.8	65.1

TABLE 4D
Cost to Offload 325,000 DWT Tanker Based on Channel Depth Alternative and Shuttle DWT

Channel Depth	Shuttle Vessel DWT							
	42,500	90,000	110,000	115,000	120,000	125,000	130,000	135,000
40	$141,66	$135,30	$148,14	$151,93	$155,52	$127,13	$129,69	$132,09
43	$141,66	$150,22	$132,08	$135,49	$138,73	$141,82	$144,75	$147,52
44	$141,66	$155,19	$136,61	$140,13	$143,50	$146,71	$149,77	$152,66
45	$141,66	$128,13	$141,13	$144,78	$148,28	$151,61	$154,79	$157,80
46	$141,66	$132,11	$145,66	$149,43	$153,05	$156,50	$159,81	$162,95
47	$141,66	$136,09	$150,18	$154,08	$157,82	$161,40	$164,82	$168,09
48	$141,66	$137,68	$154,70	$158,73	$162,59	$166,30	$127,38	$129,92
49	$141,66	$137,68	$159,23	$163,37	$167,36	$128,39	$131,15	$133,78
50	$141,66	$137,68	$168,27	$176,53	$138,58	$144,77	$150,96	$157,15

TABLE 4E
Cost for Shuttle Travel Time Set-Up/Associated Logistics,
Based on Channel Depth Alternative and Shuttle DWT (Middle East Routings)

Channel Depth	Shuttle Vessel DWT							
	42,500	90,000	110,000	115,000	120,000	125,000	130,000	135,000
40	$266,30	$147,94	$147,94	$147,94	$147,94	$118,35	$118,35	$118,35
43	$266,30	$147,94	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35
44	$266,30	$147,94	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35
45	$266,30	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35
46	$266,30	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35
47	$266,30	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35	$118,35
48	$266,30	$118,35	$118,35	$118,35	$118,35	$118,35	$88,769	$88,769
49	$266,30	$118,35	$118,35	$118,35	$118,35	$88,769	$88,769	$88,769
50	$266,30	$118,35	$118,35	$118,35	$88,769	$88,769	$88,769	$88,769

TABLE 4F
Total Cost Per Ton for Mother and Shuttle Vessels based on Vessel Range
and Channel Depth Alternative (Middle East Routings)

Channel Depth	Shuttle Vessel DWT							
	42,500	90,000	110,000	115,000	120,000	125,000	130,000	135,000
40	$15.21	$14.34	$14.40	$14.45	$14.45	$14.25	$14.24	$14.25
43	$15.22	$14.24	$14.10	$14.15	$14.15	$14.14	$14.14	$14.15
44	$15.22	$14.21	$14.07	$14.12	$14.13	$14.12	$14.11	$14.12
45	$15.22	$13.99	$14.05	$14.10	$14.10	$14.10	$14.09	$14.10
46	$15.22	$13.96	$14.02	$14.07	$14.08	$14.07	$14.07	$14.08
47	$15.22	$13.94	$14.00	$14.05	$14.05	$14.05	$14.04	$14.06
48	$15.22	$13.93	$13.98	$14.03	$14.04	$14.03	$13.80	$13.81
49	$15.22	$13.93	$13.97	$14.02	$14.02	$13.79	$13.78	$13.79
50	$15.22	$13.93	$13.96	$14.02	$13.80	$13.80	$13.81	$13.83

TABLE 4G
Total Cost Per Ton for Mother and Shuttle Vessels based on Vessel Range
and Channel Depth Alternative (Africa, North Sea, and Mediterranean Routings)

Channel Depth	Shuttle Vessel DWT							
	42,500	90,000	110,000	115,000	120,000	125,000	130,000	135,000
40	$9.21	$8.34	$8.40	$8.45	$8.45	$8.25	$8.24	$8.25
43	$9.21	$8.24	$8.10	$8.15	$8.15	$8.14	$8.13	$8.14
44	$9.21	$8.21	$8.07	$8.12	$8.12	$8.12	$8.11	$8.12
45	$9.21	$7.99	$8.05	$8.10	$8.10	$8.09	$8.09	$8.10
46	$9.21	$7.96	$8.02	$8.07	$8.07	$8.07	$8.06	$8.07
47	$9.21	$7.94	$8.00	$8.05	$8.05	$8.05	$8.04	$8.05
48	$9.21	$7.93	$7.98	$8.03	$8.03	$8.03	$7.80	$7.81
49	$9.21	$7.93	$7.97	$8.02	$8.02	$7.78	$7.78	$7.79
50	$9.21	$7.93	$7.96	$8.02	$7.80	$7.80	$7.81	$7.83

TABLE 4H
Africa/North Sea/Mediterranean and Middle East Direct Shipment Transportation Cost

Africa/North Sea/Mediterranean							
	40	45	46	47	48	49	50
70000	$16.04	$13.59	$13.19	$12.81	$12.81	$12.81	$12.81
75000	$15.40	$12.40	$11.95	$11.52	$11.13	$10.78	$10.44
80000	$14.29	$12.11	$11.75	$11.75	$11.75	$11.75	$11.75
85000	$14.21	$12.03	$11.66	$11.42	$11.42	$11.42	$11.42
90000	$14.00	$11.86	$11.50	$11.17	$11.04	$11.04	$11.04
100000	$13.57	$11.51	$11.18	$10.86	$10.55	$10.27	$10.21
105000	$13.84	$11.68	$11.32	$10.99	$10.67	$10.38	$10.09
110000	$13.70	$11.56	$11.21	$10.88	$10.58	$10.29	$10.01
120000	$13.60	$11.47	$11.12	$10.79	$10.49	$10.20	$9.92
135000	$13.48	$11.35	$11.00	$10.67	$10.37	$10.08	$9.80
150000	$13.55	$11.36	$11.00	$10.67	$10.36	$10.07	$9.79
165000	$13.55	$11.36	$11.00	$10.67	$10.36	$10.07	$9.79
Middle East							
	40	45	46	47	48	49	50
80000	$23.58	$19.93	$19.33	$19.33	$19.33	$19.33	$19.33
90000	$22.52	$19.10	$18.53	$18.00	$17.80	$17.80	$17.80
100000	$22.61	$19.09	$18.51	$17.96	$17.45	$16.96	$16.87
110000	$22.52	$18.95	$18.36	$17.81	$17.30	$16.82	$16.36
120000	$22.31	$18.75	$18.17	$17.63	$17.12	$16.64	$16.18
135000	$22.12	$18.55	$17.97	$17.42	$16.91	$16.43	$15.97
150000	$22.21	$18.55	$17.96	$17.40	$16.88	$16.40	$15.93
165000	$22.21	$18.55	$17.96	$17.40	$16.88	$16.40	$15.93
175000	$20.86	$17.33	$16.76	$16.23	$15.73	$15.26	$14.82
325000	$24.93	$20.04	$19.29	$18.59	$17.95	$17.36	$16.81

TABLE 4I
Mexico and Venezuela/Eastern South America Direct Shipment Transportation Cost

Mexico							
	40	45	46	47	48	49	50
70000	$3.17	$2.69	$2.61	$2.54	$2.54	$2.54	$2.54
75000	$3.20	$2.68	$2.59	$2.51	$2.44	$2.44	$2.44
80000	$2.86	$2.43	$2.36	$2.36	$2.36	$2.36	$2.36
85000	$2.81	$2.40	$2.33	$2.28	$2.28	$2.28	$2.28
90000	$2.77	$2.37	$2.30	$2.23	$2.21	$2.21	$2.21
100000	$2.79	$2.38	$2.31	$2.25	$2.19	$2.13	$2.11
105000	$2.78	$2.37	$2.30	$2.24	$2.18	$2.12	$2.06
110000	$2.78	$2.37	$2.30	$2.23	$2.17	$2.12	$2.06
120000	$2.80	$2.38	$2.31	$2.25	$2.19	$2.13	$2.08
135000	$2.76	$2.34	$2.27	$2.21	$2.15	$2.10	$2.04
150000	$2.78	$2.35	$2.28	$2.21	$2.15	$2.10	$2.04
165000	$2.78	$2.35	$2.28	$2.21	$2.15	$2.10	$2.04

Venezuela and Eastern South America							
	40	45	46	47	48	49	50
70000	$8.46	$7.18	$6.97	$6.76	$6.76	$6.76	$6.76
75000	$8.56	$7.14	$6.91	$6.70	$6.49	$6.49	$6.49
80000	$7.63	$6.46	$6.26	$6.26	$6.26	$6.26	$6.26
85000	$7.50	$6.36	$6.17	$6.04	$6.04	$6.04	$6.04
90000	$7.07	$6.04	$5.87	$5.71	$5.65	$5.65	$5.65
100000	$7.35	$7.18	$6.97	$6.76	$6.76	$6.76	$6.76
105000	$7.33	$6.20	$6.01	$5.84	$5.67	$5.52	$5.37
110000	$7.32	$6.18	$6.00	$5.82	$5.66	$5.51	$5.35
120000	$7.29	$6.15	$5.97	$5.79	$5.63	$5.47	$5.32
135000	$7.22	$6.07	$5.89	$5.71	$5.55	$5.40	$5.25
150000	$7.25	$6.08	$5.89	$5.71	$5.55	$5.39	$5.24
165000	$7.25	$6.08	$5.89	$5.71	$5.55	$5.39	$5.24

Table 4J presents the lightening cost for the Africa/North Sea/Mediterranean route. Lightening represents a less costly shipping method than direct shipment for Africa/North Sea/Mediterranean routing; however, it is less competitive than lightering. As noted in the Appendix (p. 197), lightening was historically the most common choice for Africa and the North Sea movements; however, it has become more common for this route in recent years due to structural changes in oil production off the coast of West Africa. For this reason, the Africa/North Sea/Mediterranean cost calculations reflect lightering for this routing (Appendix, Table 111, p. 197). Use of an average between lightering and lightening cost for this route may have been a more appropriate choice.

TABLE 4J
SNWW Crude Petroleum Lightening Cost

DWT: 165,000		Hourly Cost at Sea: $1,439 (Appendix, p. 148)				Transportation Cost Per Ton: $7.02 (Table 4A)	
Fully loaded cargo: 160,050 short tons		Hourly Cost in Port: $922 (Appendix p. 148)					
Channel Depth	40 ft	45ft	46ft	47ft	48ft	49ft	50ft
Maximum	88,690	106,894	110,535	110,535	114,176	121,458	117,817
Cargo	71,360	53,156	49,515	49,515	45,874	38,592	42,233
Shuttle DWT	77,500	60,000	56,667	58,000	50,000	42,500	47,500
Hourly at	$1,044	$952	$923	$923	$865	$816	$849
Hourly in Port	$682	$622	$599	$599	$554	$518	$542
Mother Vessel (MV) Unloading Cost Based on Standard Unloading Rate of 5,250 short tons/hr multiplied by the MV At Sea Cost, Offshore Lightened Cargo							
	$19,559	$14,570	$13,572	$13,572	$12,574	$10,578	$11,576
Mother Vessel (MV) Waiting Time and Associated Logistics							
4hrs Minimum	$34,536	$34,536	$34,536	$34,536	$34,536	$34,536	$34,536
8 hrs Most	$17,268	$17,268	$17,268	$17,268	$17,268	$17,268	$17,268
12 hrs	$51,804	$51,804	$51,804	$51,804	$51,804	$51,804	$51,804
MV Travel Cost from Offshore Lightering Zone to Dockside (Estimated Travel Time is 12 hours)							
	$34,536	$34,536	$34,536	$34,536	$34,536	$34,536	$34,536
Pilot Cost	$46,194	$50,282	$50,754	$51,225	$52,200	$53,174	$53,174
Tug Cost	$16,000	$16,000	$16,000	$16,000	$16,000	$16,000	$16,000

MV Unloading Cost for Remaining Cargo In Port (Based on Unloading Rate of 5,250, Hourly Port							
	$17,420	$20,617	$21,256	$21,256	$21,895	$23,174	$22,535
Total Cost for Mother Vessel (Sum of the Above Cost Divided by the Offshore Lightened Cargo)							
Minimum	$8.66	$8.40	$8.36	$8.36	$8.32	$8.25	$8.29
Most Likely	$8.72	$8.45	$8.41	$8.41	$8.37	$8.29	$8.34
Maximum	$9.11	$8.78	$8.72	$8.72	$8.68	$8.58	$8.63
Shuttle Vessel Transportation Cost to the Lightering Zone							
	$25,050	$22,848	$22,152	$22,152	$20,760	$19,572	$20,364
Shuttle Cost While Lightering							
	$14,187	$9,639	$8,705	$8,705	$7,558	$5,995	$6,826
Unloaded Cost in Port and Associated Logistics for Shuttle Vessel							
	$16,374	$14,928	$14,384	$14,384	$13,296	$12,420	$13,004
Pilot Cost	$27,795	$24,996	$24,594	$24,594	$23,508	$21,781	$22,337
Tug Cost	$8,000	$8,000	$4,000	$4,000	$4,000	$4,000	$4,000
Supply Vessel Transportation Cost to Lightering Zone							
	$11,864	$11,864	$11,864	$11,864	$11,864	$11,864	$11,864
Supply Vessel While Lightering							
	$13,659	$10,621	$10,014	$10,014	$9,406	$8,191	$8,799
Total Cost/Ton for Lightening Operation (Includes Mother Vessel, Shuttle, and Supply Vessel) a/ b/							
Minimum	$10.30	$10.34	$10.29	$10.29	$10.29	$10.42	$10.35
Most Likely	$10.36	$10.39	$10.34	$10.34	$10.34	$10.47	$10.40
Maximum	$10.75	$10.71	$10.65	$10.66	$10.65	$10.75	$10.69
a/ Maximum cost reductions occur at the 46-foot channel depth.							
b/ There are some differences between the costs per ton shown here and what is presented in the Economic Appendix (Table 112), with these costs being slightly less that those presented in the table; however, lightening was still found to be higher relative to lightering.							

The remainder of this comment response addresses uncertainty issues pertaining to the shipment of Venezuelan and new routes, specifically Brazil. Application of the FY2008 EGM costs and the lightering company operational expectations of optimal turnaround times indicated that the resulting costs per ton suggested uncertainties. This uncertainty increased based on the release of the FY2008 vessel operating cost release, which showed a 17 percent drop in hourly costs for foreign flag tankers; these costs are reflected in the Appendix. Uncertainties associated with the of the transportation cost application is particularly high for routings that include Venezuela and Brazil where the travel distance is relatively short compared to the Middle East. For the Middle East, the introduction of the relatively low FY2008 EGM costs showed no doubt that lightering is less costly than direct shipment. Additionally, the cost analyses for Africa crude also showed that lightering is less costly than direct shipment but by a comparatively smaller margin; however, the application for the Venezuelan routing revealed cost incentives to lighter not found based on higher vessel operating costs given the established optimal lightering turnaround time assumptions used in the analysis As indicated, the closeness of direct shipment cost to that for lightering specifically relates to the operational assumptions which were calculated for the analysis based on optimal turnaround times and seamless logistics using lightering company assumptions. At the same time, the lightering company and industry revealed that it is not cost effective to lighter Venezuelan.

Given the uncertainty associated with lightering logistics and associated transfer times, a sensitivity evaluating the effect of the range of time ranges in terms of minimum and maximum times. Table 4K displays both the mother vessel offshore unloading times and waiting times

*used for the analysis presented in the Economic Appendix. Also shown are the times included in this sensitivity prepared for IEPR. The times used in the Appendix are shown on the left side of the tables and the sensitivity times are on the right. The times used in the Appendix suggest that multiple shuttles would be loaded simultaneously and innovations over the 2010-2069 future could result in this occurrence; however, this was found not to be realistic for existing or future conditions. The offshore times on the left are reasonable given standard unloading time. For instance using a standard unloading rate of 5,250 tons per hour, it would take 60 hours to unload a 325,000 DWT tanker ((325,000 * 0.97 capacity)/(5,250 short tons per hour). The basis for including this sensitivity is due to concerns are that analytical assumptions based on optimal offshore turnaround time, optimal scheduling of shuttle arrivals, and perhaps lower than realistic vessel operating cost (the Corps' FY08 tanker vessel operating costs were 17 percent lower than the FY07 release) result in criteria that is unrealistically conservative for this aspect of the analysis. The sensitivity was found to be representative of actual conditions. In comparison, the times used for the base are not realistic.*

TABLE 4J
Mother Vessel Combined Time Offloading and Waiting Between Shuttles

	Mother Vessel Hours Offshore		Mother Vessel Offshore Hours		
Component	Lightering	Lightening	Lightering	Lightening	
Minimum (hrs)	8	8	60	24	
Most Likely (hrs)	12	12	60 *	31 *	
Maximum (hrs)	36	36	168	120	
Hours Used for Calculation	12	12	96 **	30 **	

*The most likely time for the mother vessel for lightering is based on a 325,000 DWT tanker, a cargo to short ton ratio of 0.97, and an unloading rate of 5,250 short tons per hour. The most likely time for the mother vessel for lightening is based on a 165,000 DWT tanker, a cargo to short ton ratio of 0.97, and an unloading rate of 5,250 short tons per hour. The hours used for calculation are based on a @risk triangular distribution using the minimum, most likely, and maximum values shown. The maximum values used as input into the @risk distribution are

An additional component modified for this sensitivity was to separate Venezuela from Brazil. While shipments of crude oil from Brazil to SNWW are presently less than 1 percent, future expectations are that this will change. The Appendix analysis included Venezuela and Brazil as one region. Table 4K displays the transportation costs from the Appendix (Table 111) and the resulting effect on total project benefits as shown in Table 141 of the Appendix. Table 4L displays the transportation cost with Brazil separated out from Venezuela. Table 4M displays the results of using the routing shown in Table 4L and the mother vessel sensitivity based times from Table 4J (i.e. 96 hours offshore for the lightering mother vessel and 30 hours offshore for the lightening mother vessels)

The concerns about commodity growth rates are addressed in response to comment 6.

TABLE 4K
SNWW Crude Petroleum Imports Transportation Cost ($1,000) by Channel Depth Alternative
(same as Table 111, Economic Appendix)

Trade Route and	40	45	46	47	48	49	50
Mexico	Direct	Direct	Direct	Direct	Direct	Direct	Direct
Cost/Ton	$2.76	$2.34	$2.28	$2.21	$2.15	$2.11	$2.07
Cost/Ton Port	$2.77	$2.37	$2.30	$2.23	$2.18	$2.14	$2.11
Venezuela & E South	Direct	Direct	Direct	Direct	Direct	Direct	Direct
Cost/Ton	$7.22	$6.09	$5.91	$5.73	$5.58	$5.45	$5.34
Cost/Ton Port	$7.28	$6.17	$5.98	$5.81	$5.67	$5.55	$5.47
Africa/North Sea	Lightered	Lightere	Lightere	Lightere	Lightere	Lightere	Lightere
Cost/Ton	$8.41	$8.18	$8.13	$8.12	$8.05	$8.01	$8.01
Cost/Ton Port	$8.46	$8.19	$8.13	$8.12	$8.12	$8.11	$8.08
Middle East	Lightered	Lightere	Lightere	Lightere	Lightere	Lightere	Lightere
Cost/Ton	$14.43	$14.20	$14.15	$14.13	$14.06	$14.03	$14.03
Cost/Ton Port	$14.48	$14.19	$14.13	$14.11	$14.11	$14.10	$14.06

TABLE 4K-1
SNWW Economic Summary Data
Average Annual Costs and Benefits, Net Excess Benefits and BCRs by Channel Depth Alternative
(As Included in Table 141, Economic Appendix)

Cost Component	45	46	47	48	49	50
Total Annual Cost ($1,000)	$70,217	$77,258	$84,299	$91,341	$96,626	$101,91
Average Annual Benefits ($1,000)	$83,841	$95,856	$104,30	$115,07	$122,87	$127,69
Net Excess Benefits ($1,000)	$13,624	$18,598	$20,004	$23,733	$26,249	$25,785
B/C Ratios	1.2	1.2	1.2	1.3	1.3	1.3

TABLE 4M
SNWW Crude Petroleum Imports Transportation Cost ($1,000) by Channel Depth Alternative
Separate Breakout of Venezuela and Brazil, with 100% of Brail Imports Lightered and
Sensitivity of Realistic Offshore Transfer Times

Trade Route and	40	45	46	47	48	49	50
Mexico	Direct	Direct	Direct	Direct	Direct	Direct	Direct
Cost/Ton Beaumont	$2.76	$2.34	$2.28	$2.21	$2.15	$2.11	$2.07
Cost/Ton Port Arthur	$2.77	$2.37	$2.30	$2.23	$2.18	$2.14	$2.11
Venezuela	Direct	Direct	Direct	Direct	Direct	Direct	Direct
Cost/Ton Beaumont	$4.87	$4.58	$4.44	$4.31	$4.20	$4.10	$4.02
Cost/Ton Port Arthur	$4.89	$4.60	$4.46	$4.33	$4.23	$4.14	$4.08
Brazil	Lightered	Lightere	Lightere	Lightere	Lightere	Lightere	Lightere
Cost/Ton Beaumont	$6.68	$6.50	$6.47	$6.46	$6.40	$6.37	$6.37
Cost/Ton Port Arthur	$6.72	$6.51	$6.47	$6.46	$6.45	$6.45	$6.42
Africa/North Sea	Lightered	Lightere	Lightere	Lightere	Lightere	Lightere	Lightere
Cost/Ton Beaumont	$8.41	$8.18	$8.13	$8.12	$8.05	$8.01	$8.01
Cost/Ton Port Arthur	$8.46	$8.19	$8.13	$8.12	$8.12	$8.11	$8.08
Middle East	Lightered	Lightere	Lightere	Lightere	Lightere	Lightere	Lightere
Cost/Ton Beaumont	$14.43	$14.20	$14.15	$14.13	$14.06	$14.03	$14.03
Cost/Ton Port Arthur	$14.48	$14.19	$14.13	$14.11	$14.11	$14.10	$14.06

TABLE 4L-1
SNWW Economic Summary Data
Average Annual Costs and Benefits, Net Excess Benefits and BCRs by Channel Depth Alternative Based on Inclusion of a Separate Breakout of Venezuela and Brazil, with 100% of Brail Imports Lightered

Cost Component	45	46	47	48	49	50
Total Annual Cost ($1,000)	$70,217	$77,258	$84,299	$91,341	$96,626	$101,91
Average Annual Benefits ($1,000)	$91,523	$105,28	$112,44	$126,83	$135,98	$142,32
Net Excess Benefits ($1,000)	$21,306	$28,029	$28,150	$35,489	$39,361	$40,412
B/C Ratios	1.3	1.4	1.3	1.4	1.4	1.4

Table 4M summarizes the data aggregated in response to the IEPR request and incorporates the critical sensitivities evaluated under Comment 3. It was found in preparation of the response to Comment 4 that the duration of the VLCC offshore times used in the Appendix analysis was unrealistically low. For this aspect of the analysis, the sensitivity was found to be representative of actual conditions.

In conclusion, the results of the data presented and the additional sensitivities presented provide sufficient justification that to reasonably conclude that the recommended plan for the 48-foot depth is economically justified.

TABLE 4M
SNWW Combined Analysis of LNG Market Sensitivity and Crude Oil Vessel Utilization Share

	Scenario Description					
	Economic Appendix (Table 141)	Half of the LNG Market And 50% of Crude Petroleum Loaded to Drafts Over 40 ft	Half of the LNG Market And 70% of Crude Petroleum Loaded to Drafts Over 40 ft	Half the LNG Market And 70% of Crude Petroleum Loaded to Drafts Over 40 ft	Economic Appendix LNG Market And 80% of Crude Petroleum Loaded to Drafts Over 40 ft	Economic Appendix LNG Market And 80% of Crude Petroleum Loaded to Drafts Over 40 ft (Same as Table 3J)
		Separate Breakout of Venezuela and Brazil, with 100% of Brail Imports Lightered	Separate Breakout of Venezuela and Brazil, with 100% of Brail Imports Lightered	Separate Breakout of Venezuela and Brazil, with 100% of Brail Imports Lightered and Inclusion of Sensitivity Realistic Offshore Transfer Time Sensitivity	Separate Breakout of Venezuela and Brazil, with 100% of Brail Imports Lightered and Inclusion of Sensitivity Realistic Offshore Transfer Time Sensitivity	Separate Breakout of Venezuela and Brazil, with 100% of Brail Imports Lightered and Inclusion of Sensitivity Realistic Offshore Transfer Time Sensitivity
Channel Depth (ft)	Average Annual Benefits Calculations ($1,000's) at 4.375% Based on Range of SNWW LNG Market Shares, 2019-2069					
45	$83,841	$64,936	$67,644	$80,944	$88,558	$91,523
46	$95,856	$74,458	$77,669	$93,737	$101,748	$105,287
47	$104,303	$81,033	$84,508	$100,576	$108,719	$112,449
48	$115,074	$89,251	$93,249	$113,762	$122,392	$126,830

49	$122,875	$95,196	$99,514	$122,248	$131,152	$135,987
50	$127,696	$98,699	$103,129	$128,154	$137,234	$142,323
Net Excess Benefits ($1000's) (The Average Annual Costs Used for the BCR Calculations are Shown at the top of Table 3G)						
45	$13,624	-$5,281	-$2,573	$10,727	$18,341	$21,306
46	$18,598	-$2,800	$411	$16,479	$24,490	$28,029
47	$20,004	-$3,266	$209	$16,277	$24,420	$28,150
48	$23,733	-$2,090	$1,908	$22,421	$31,051	$35,489
49	$26,249	-$1,430	$2,888	$25,622	$34,526	$39,361
50	$25,785	-$3,212	$1,218	$26,243	$35,323	$40,412
BCRs Based Range of SNWW LNG. Market Shares Range and Variation in Crude Petroleum Loaded Draft Utilization (The Average Annual Costs Used for the BCR Calculations are Shown at the top of Table 3G)						
45	1.2	0.9	.9	1.2	1.3	1.3
46	1.2	0.9	1.0	1.2	1.3	1.4
47	1.2	0.9	1.0	1.2	1.3	1.3
48	1.3	0.9	1.0	1.2	1.3	1.4
49	1.3	0.9	1.0	1.3	1.4	1.4
50	1.3	0.9	1.0	1.3	1.3	1.4

Panel Revised BackCheck Response to Comment 4:

Concur with comments.

The additional data and material presented above appear to demonstrate fairly convincingly that a least cost solution has been identified. The new detail regarding lightering versus lightening is more complete and the shuttle costing information is a good addition. The sensitivity analysis is quite complete and uses the variables that seem most critical to the findings of the report.

The support for the analysis and benefits calculation would be enhanced by a fuller description of the commodities and how they are currently handled, how they would be handled with the project, and the alternative costs of both scenarios. The substantial analysis that was provided in this response above should be added to the report.

Comment 5:

There is no comprehensive description of existing vessel operations.

Basis for Comment:

The report lacks detailed information on current SNWW vessel and barge operations, and the information that is presented is fragmented.

- The "historic(al) SNWW traffic data" (p. DFR VI-1) is not provided anywhere.
- The economic analysis refers to lightering and lightening practices but there is no explanation of which vessels are involved or where and how these operations take place.
- There is a confusing discussion of vessel convoys and turning basins, but there are no maps or diagrams and the report text itself indicates that more information is needed.
- There are references to barge operations on the GIWW where it coincides with the SNWW, but no complete description and no diagrams or data.

Significance – Medium:

In the absence of a clear explanation of SNWW vessel operations it is difficult to understand or validate the claimed benefits. It is also difficult to explain or analyze a No Action alternative without documenting current operations.

Comment Cross-referencing:

(2) Comment: The report does not present a strong analysis of the current and future vessel fleet, or of vessel dimensions.

(3) Comment: The crucial analysis of vessel design and sailing drafts is inadequately supported by data and appears questionable.

(7) Comment: The choice of project design vessel appears to drive the project design and benefits estimates, yet remains unjustified in the report.

(15) Comment: The presentation of data in maps, figures, and tables needs to be substantially improved.

Recommendations for Resolution:

The report and its appendices should be expanded to include:

1. Data on current and past vessel fleets, design drafts, and sailing drafts
2. A detailed description of the convoy system, the lightering/lightening process, and barge operations, with appropriate data and diagrams.

USACE Response to Comment 5:

EPR RECOMMENDATION:

The report and its appendices should be expanded to include:

1. *Data on current and past vessel fleets, design drafts, and sailing drafts*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Discussion of the current and past vessel fleets, design draft and sailing drafts (underkeel clearance) are located in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), Section 3.3 (Vessel Utilization and Operating Practices).*
- *FFR, Appendix 2, Section 3.5 (Port Arthur and Beaumont Vessel Fleets).*

EPR RECOMMENDATION:

The report and its appendices should be expanded to include:

2. *A detailed description of the convoy system, the lightering/lightening process, and barge operations, with appropriate data and diagrams.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Additional discussion and clarification is provided in the following locations:*

FFR, Appendix 2 (Economic Appendix), Section 3.5.1 (Methods of Shipment).

Panel BackCheck Response to Comment 5:

Concur with comments.

The reports add a significant amount of new information, but critical linkages are still not made.

As noted under Item 3, we could locate no data that relate loaded draft to design draft, so it is impossible to determine if the vessels are draft constrained and, if so, to what extent.

The IEPR Panel could likewise locate no information on the convoy process, or on barge operations. The Panel feels strongly that such information should be available in the industry and these data would be useful increasing the dependability of the study.

Comment 6:

The commodity discussions and forecasts are fragmented and incomplete, and do not adequately support the forecasts used for the benefits estimates

Basis for Comment:

The individual commodity forecasts have minimal documentation, and for most there is no documentation of how the forecast growth rate was chosen. In some cases the SNWW commodity outlook is expected to follow the U.S. growth rate and in other cases the SNWW outlook is expected to differ, but in neither case is the reasoning given or a sensitivity analysis performed. The complete commodity forecast is not shown anywhere in the report.

Most crucially, the crude petroleum imports forecast calls for a doubling of volume by 2030, but the comparison with refinery capacity is cursory and undocumented. According to EIA, domestic refining capacity is expected to increase at only 0.6% annually, raising serious questions about the ability of the Beaumont and Port Arthur refineries to accommodate the projected flows.

Per the abbreviated sensitivity analysis the LNG traffic appears to be crucial to project justification. The LNG analysis, however, relies on multiple assumptions that are not tested or verified, "in spite of obvious uncertainty" (DFR EA p. 22). The analysis assumes an even utilization rate across all LNG facilities despite data showing uneven utilization. The analysis assumes that SNWW LNG facilities will have 1/3 of US imports, without documentation.

Significance – Medium:

The forecasts may indeed be appropriate, but cannot be verified from the report as written. The analysis presented in the report does not create confidence in the reader or solid support for the benefits estimates.

Comment Cross-referencing:

(9) Comment: The report is written at a summary level and lacks proper documentation throughout.

(14) Comment: Risk and uncertainty are mostly ignored.

Recommendations for Resolution:

The commodity analyses and forecasts need to be redone to show clearly:

1. The history of each commodity
2. The chosen future growth rate, why that growth rate was chosen, and where it was obtained.
3. The steps taken to verify the realism of the forecasts and to identify any sensitivity to future events.

USACE Response to Comment 6:

EPR RECOMMENDATION:

The commodity analyses and forecasts need to be redone to show clearly:

1. *The history of each commodity*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Expanded presentations of commodity histories are provided in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), Sections 2 0. To 2.7 (Detailed Commodity Analysis).*
- *FFR, Appendix 2, Sections 4.0 to 4.17 (Commodity and Fleet Forecasts).*

EPR RECOMMENDATION:

2. *The chosen future growth rate, why that growth rate was chosen, and where it was obtained.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), Sections 2 0. To 2.7 (Detailed Commodity Analysis).*
- *FFR, Appendix 2, Sections 4.0 to 4.17 (Commodity and Fleet Forecasts).*

EPR RECOMMENDATION:

3. *The steps taken to verify the realism of the forecasts and to identify any sensitivity to future events.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Clarification on forecasts and results of sensitivity analyses are located in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), Sections 2 0. To 2.7 (Detailed Commodity Analysis) addressed all commodities evaluated for channel deepening benefits. Section 2.0 includes evaluation of refinery capacity for the regions served by regional refineries.*
- *FFR, Appendix 2, Sections 4.0 to 4.17 (Commodity and Fleet Forecasts).*
-

Panel BackCheck Response to Comment 6:

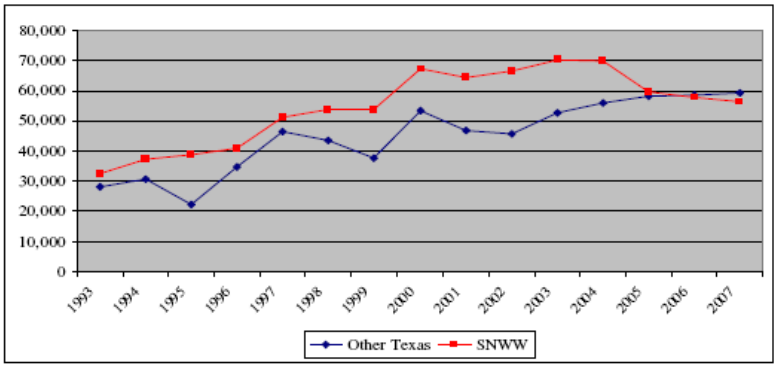
Based on materials and time available for review, Non-Concur.

The IEPR Panel was unable to review all the commodity forecasts in the time available. However, the crucial crude petroleum and LNG forecasts are clearly unacceptable. Review of the other commodity forecasts, which are less critical to the analysis, does reveal improvement in the discussion and justification.

Crude Petroleum Analysis. The SNWW Crude Petroleum import forecast shown in Table 55 (EA p. 100) is the basis for the estimate of project benefits from more efficient transportation of imported crude. The project benefits and the BCR depend heavily on benefits from crude petroleum, so this forecast is critical to project justification.

Figure 27 implies a declining share for SNWW. This decline is attributed to Hurricane Rita (EA, p.99), but no attempt was made to include newer data in the analysis. **Prior to the suggested "Rita" effect, the imports had been essentially stable for the previous five years, with little increase (Table 27).**

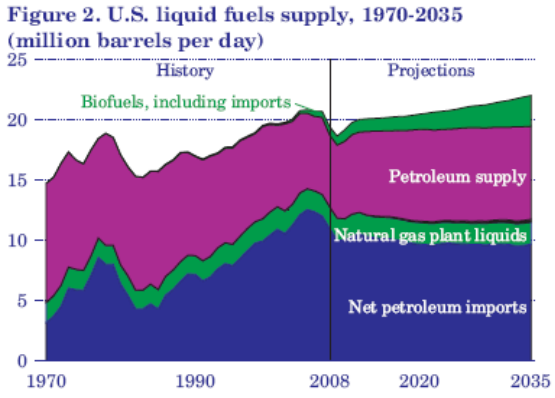
Figure 27
SNWW and Other Texas Ports
Crude Petroleum Imports (1,000s of short tons)



Source: U.S. Army Corps of Engineers, Waterborne Commerce of the U.S., 2005-2007, unpublished data.

Instead, *"Based on concerns from SNWW industry interests, the effect of excluding 2005-2007 data was examined."* (p.99) Exclusion of data past 2004 resulted in the estimates in Table 55, which were then apparently used as the basis of the final forecast in Table 57. There are no data past 2007, and Table 57 displays no actuals other than a 2002-20004 average.

Table 52 shows the latest official U.S. government forecast (AEO 2009), which anticipates a 13.6% drop in crude imports between 2015 and 2030. In Table 55, the report forecasts a 12.3% increase between 2015 and 2303, thus dramatically contradicting the EIA. The AEO 2010, which has just been released, shows declining crude imports between the present and 2035 (below).



U.S. Energy Information Administration / Annual Energy Outlook 2010, P. 3

By comparison, the previous version of the crude petroleum import forecast used the U.S. DOE forecast (Table 28 of the previous Economic Appendix).

In effect, based on the concerns of beneficiary interests, the report discards the most recent, unfavorable data and limits the analysis to older data that yield a more favorable

outcome. The report also appears to pick and choose among available forecasts to derive the desired result, thereby contradicting DOE. This is not an acceptable method for forecasting crude petroleum imports. It casts a shadow on subsequent analysis and benefit calculation that is difficult to ignore. At a minimum the major differences between the DOE forecast and this result have to explained and defended.

The Annual Energy Outlook (AEO) is the official Department of Energy forecast. The SNWW forecast cites AEO 2009 Table 20 as a major data source. The AEO 2009 forecast is in millions of barrels per day, while the SNWW forecast is in 1,000s of annual short tons. The table below was constructed to compare the AEO and SNWW forecast on the same terms.

AEO/SNWW Comparison

Year	AEO 2009 Table 20				SNWW Table 55			12% of
	MM BBL/Day	st/bbl	MM st/day	US 000 st/yr	US 000 st/yr	SNWW 000 st/yr	SNWW Share	AEO 2009
2003					528,703	63,417	12%	
2004					553,337	68,170	12%	
2005					553,923	68,283	12%	
2006					553,489	68,199	12%	
2007	**10.00**	**0.15**	**1.5000**	**547,500**	**547,958**	**67,132**	**12%**	**67,076**
2015	8.10	0.15	1.2150	443,475	614,522	88,704	14%	64,014
2025	6.66	0.15	0.9990	364,635				-
2030	6.95	0.15	1.0425	380,513	689,959	110,765	16%	61,087

The conversion factor of .15 st/bbl yields the same U.S. 2007 total from AEO 2009 Table 20 as shown in SNWW Table 55, which suggest that the conversion factor is consistent.

If so, it appears that the SNWW forecast greatly exceeds the AEO 2009 forecast.

Note that SNWW had a stable share of total U.S. Crude imports despite the intervention of Hurricane Rita. It therefore requires some additional documentation and analysis to accept Hurricane Rita as a reason for declining volume and as a reason to base the forecast on data only through 2004.

The SNWW forecast method yields a rising share between 2007 and 2030. Give the stable past share, this result requires much more support that simply a description of capacity additions to nearby refineries.

The combination of a more aggressive U.S. forecast and a rising market share yields a much higher estimate for SNWW crude imports than would otherwise be expected.

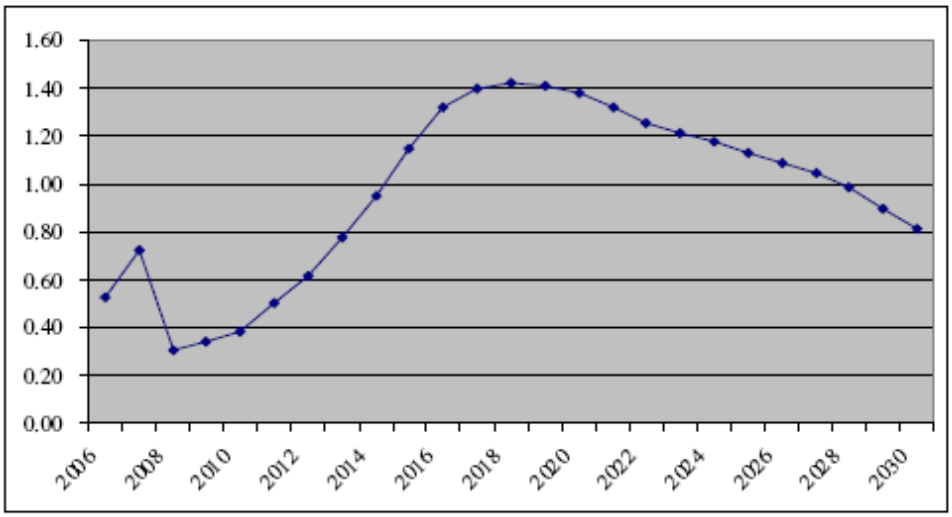
A stable SNWW share of 12% applied to the AEO 2009 forecast would yield 61,087,000 SNWW short tons in 2030, 55% of the SNWW Table 55 forecast.

A quick and dirty sensitivity analysis on Table V-73 shows that crude petroleum accounts for $61,081,000 of the $115,074,000 in benefits for the 48' project. If the crude benefits were reduced to 55% of $61,081,000 (or $33,595,000), the total average annual benefits would drop to $87,588,000. With average annual costs of $91,341,000 and average annual benefits of $87,588,000, the BCR would decline to 0.96.

LNG Forecast. As discussed earlier in this series of backcheck responses, the LNG forecast in Appendix 2, Section 4.15 (U.S. LNG Forecast) uses an arbitrary assumption that SNWW will get 20% of the US market. The actual market share forecast in Table 72 goes from 0% in 2015 to 15% in 2019 and 25% in 2020. Table 72 shows the SNWW gaining 3.6 million tons in 2019-2020 while total US imports decline. Table 72 then assumes a fixed SNWW tonnage against a

downward U.S. trend. Table 73 shows higher SNWW volumes than Table 72, without justification. The footnote to Table 73 states that "SNWW 2015–30 volumes are based on application of the EIA 2010–30 growth rates", but those growth rates are not provided or sourced, and the claim appears to be contradicted by other information in the report. . Figure 19 (below) shows a falling volume between 2018 and 2030. Between 2019 and 2030, the graph suggests a decline of about 43% (from about 1.4 to about 8.0 on the graph), whereas Table 72 shows an SNWW decline of only 4%.

Figure 19
U.S. LNG Imports 2006-2030
Trillion of Cubic Feet

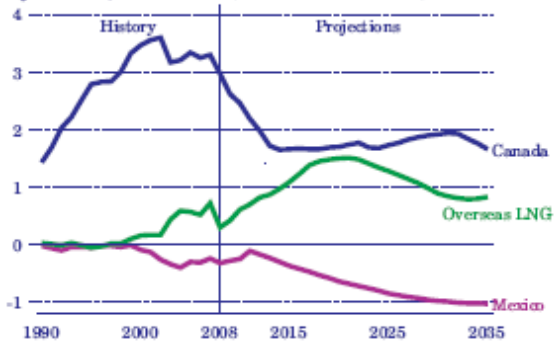


Source: U.S. Department of Energy, Updated Annual Energy Outlook 2009 Reference Case Reflecting Provisions of the American Recovery and Reinvestment Act and Recent Changes in the Economic Outlook, Table 13, SR/OIAF/2009-03

The claimed source, AEO 2009, states (p.78) "In the United States, LNG imports peak at 1.5 trillion cubic feet in 2018 before declining to 0.8 trillion cubic feet in 2030 (Figure 68), despite projected U.S. regasification capacity of 5.2 trillion cubic feet.**"** In other words, capacity will not generate growth**.**

AEO 2010 splits out the overseas LNG imports from Canadian and Mexican sources (below), showing the same declining pattern for waterborne LNG imports as AEO 2009.

Figure 77. U.S. net imports of natural gas by source, 1990-2035 (trillion cubic feet)



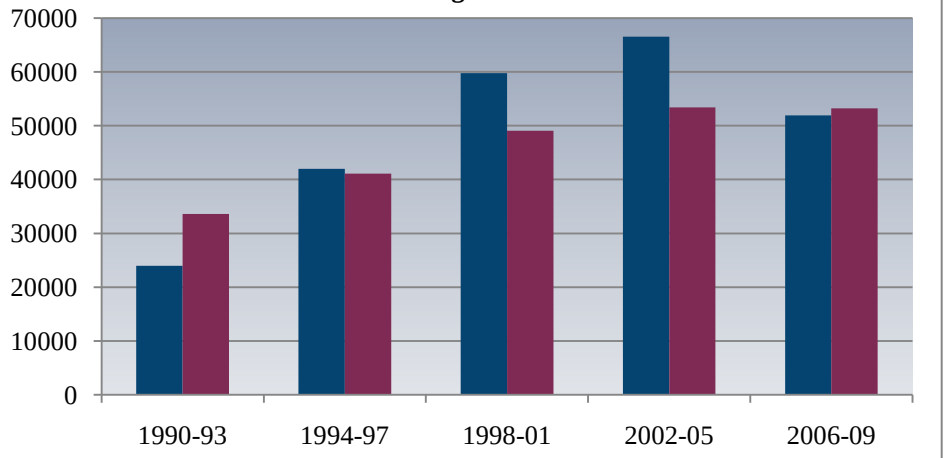
Source: AEO2010, p 74

Here again the report adopts a forecast that is far more aggressive and favorable to the project than would be suggested by official U.S. government sources. The SNWW forecast is dependent on an unjustified and unsupported assumption of rising market share in a falling market. This analysis in this response simply does not allow the IEPR Panel to concur with the response to our comments. Again, at a minimum, the discrepancy between these forecasts and the Federal Government has to be directly presented, analyzed and defended.

USACE Response to Panel BackCheck Response to Comment 6:

In overall terms and in spite of a recent decline in the SNWW share of the U.S. total, comparison of overall regional imports using 4-year averages from 1990-2009 shows that SNWW imports grew by 117 percent in comparison to a U.S. increase of 58 percent. During this same period (2004-2009), SNWW's refinery capacity increased from 6 percent to 6.5 percent (Economic Appendix, Table 10). Port Arthur refinery capacity in 2009 is nearly 13 percent higher than in 2004, with additional expansions scheduled. Motiva announced plans for a 325,000 barrel-per-day (BPD) refinery expansion in Port Arthur in December 2007. Additionally, expansion of the Motiva-Port Arthur refinery now taking place and expected to be complete by 2012. Motiva's current capacity of 285,000 BBD will be 610,000 BBD until completion.

FIGURE 6A
SNWW and U.S. Crude Oil Imports
4-Year Averages 1990-2009



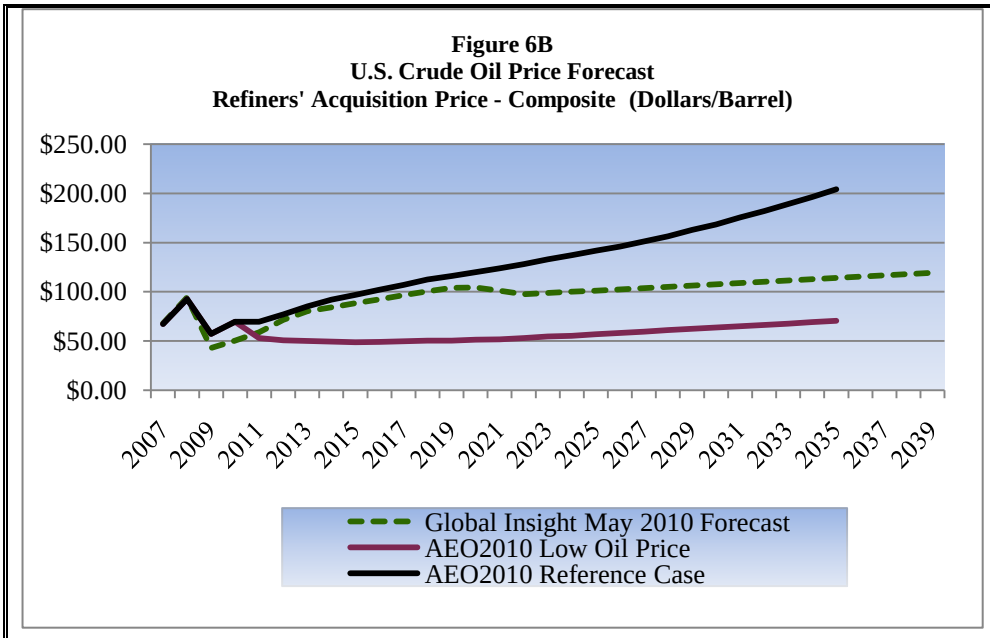
Source: Aggregated from U.S. Army Corps of Engineers, Waterborne Commerce of the U.S and U.S. Department of Energy, Energy Information Administration data.

In regard to expectations concerning the region's percentage share of the U.S. market, SNWW's relative share has been affected a combination of factors both regional and national. Regionally, it has been affected by hurricanes. Additionally, its relative share of the U.S. total has also been affected by the large influx of Canadian crude to the U.S. Midwest. Presently less than 1 percent of Canadian crude is transported to SNWW, with the majority of that being

transported by vessel. Expansion of the Keystone TransCanada Pipeline to the U.S. Gulf Coast ports that include Port Arthur and Houston remains uncertain. SNWW refinery representatives do not foresee increases in their receipt of Canadian crude. While industry is noncommittal, interest in current pipeline delivery and the TransCanada Pipeline Expansion was noted to be limited to the companies that buy excess oil for resale and transmittal to various SNWW, Texas City, and Houston refineries. It was also noted that this market is characteristically uncertain and small. It was added that Gulf Coast represents a relatively high transmittal cost in comparison to markets in the U.S. Midwest. Texas imports of Canadian crude for 2005-2009 by pipeline and vessel averaged 1.1 percent, with a low of 0.6 percent in 2008 and a high of 1.5 percent in 2008. The conclusion concerning this issue is that long-term expectations concerning the specific volume of Canadian crude that could be pipelined into the study region will remain uncertain in the short-term. Realization would depend upon high oil prices among other factors. But with falling demand, falling crude oil prices, and carbon emission concerns, forecasts of future Canadian oil sands production have declined, as have expectations of likely volumes to reach the Gulf Coast any time soon.

The U.S. Department of Energy's Annual Energy Outlook 2007 (AEO2007) forecast was used for the March 2007 Economic Appendix provided for Independent External Peer Review (IEPR). During the review period, the Galveston District continued to review new forecasts as they were released. The SNWW crude oil imports forecasts in the 2008 and 2009 draft reports reflect forecast modifications that are more conservative than the AEO2007. The AEO2008 showed a significant change from the AEO2007 and from Global Insight's 2008 forecast release. The AEO2008 release occurred at the same time that Motiva Port Arthur refinery expansion was announced. The Motiva expansion and SNWW's existing role as the largest waterway port of entry for petroleum suggested that Global Insight's slightly higher forecast was likely to be more reflective of long-term regional trends. Global Insight's 2008 forecast was subsequently used in the 2008 draft report and their 2009 forecast was used in current report.

In regard to differences between the AEO and Global Insight, the major difference between is that EIA forecasts much higher domestic crude oil production throughout the projection period than other noted forecasters. Additionally, EIA shows domestic production increasing rapidly instead of gradually. As noted in at the EIA website, their forecast not only shows higher domestic production, it also shows rapid increase in domestic production. Other differences pertain to the forecast price of crude oil. The figure below provides comparison of the AEO2010 Reference and Low oil price based forecast with Global Insight's May 2010 price forecast release.



Source: Global Insight, May 2010 and U.S. Department of Energy, 2010 Annual Energy Outlook.

Table 6A displays the U.S. oil import data evaluated during 2008-09 preparation of the Appendix and since its submittal.

TABLE 6A
SNWW Crude Petroleum Imports Forecast Projections
Millions of Barrels/Day

	AEO Reference			AEO 2010 Low Price	Purvin & Gertz			Global Insight		
Year	2008	2009	2010		2008	2009	2010	2008	2009	2010
2007	10.0	10.0	10.0	10.0	n/a	10.0	10.0		10.0	10.0
2015	10.2	8.1	8.9	10.1	n/a	n/a	11.8	12.0	11.1	9.7
2025	11.0	6.7		11.7	n/a	12.4	12.3	13.7	12.1	10.6
2030	11.9	7.0	8.7	12.7	n/a	12.7		14.5	12.5	11.7
2035	n/a	n/a	8.7	13.6	n/a	n/a	n/a	n/a	12.9	n/a

Source: U.S. Department of Energy, AEO2008, 2008, and 2010. Global Insight 2035 forecast value was obtained from non-published back-up data obtained from Global Insight

Table 6B presents regression equation outputs using the AEO2010 reference and low price case scenarios. The regression equations were prepared using 1990-2007 and 1990-2008 base data.

TABLE 6A SNWW Crude Petroleum Imports Forecast Projections Millions of Barrels/Day				
	1990-2008 SNWW as a Function of U.S. Imports Adjusted R Square: .28 F Statistic: 8.17 Standard Error of Y Estimate: 14046.6		1990-2007 SNWW as a Function of U.S. Imports Adjusted R Square: .88 F Statistic: 129.99 Standard Error of Y Estimate: 6020.9	
Year	AEO 2010 Reference	AEO 2010 Low Price	AEO 2010 Reference	AEO 2010 Low Price
2015	53,150	57,849	55,338	74,582
2019	52,680	60,355	54,080	82,689
2025	51,975	64,115	52,192	94,850
2029	52,132	65,681	52,612	99,917
2030	52,366	68,031	53,241	107,518
2035	52,366	71,555	53,241	118,919
Source: U.S. Department of Energy, AEO2008, 2008, and 2010. Global Insight 2035 forecast value was obtained from non-published back-up data obtained from Global Insight				

A comparison table of the BCRs, such as that prepared in response to comments 3-4, based on the alternative forecasts was not prepared. It is recognized that SNWW import forecast is higher than all of the AEO2009 and AEO2010 projections, with the exception of the AEO2010 low price scenario; however, the SNWW falls within the range of forecasts published by other recognized forecasters. As previously indicated, The Motiva expansion and SNWW's existing role as the largest waterway port of entry for petroleum suggested that higher forecast would most reasonably reflect long-term trends for the study area.

The LNG market share and growth rate IEPR issues are primarily addressed in response to Comment 3; however, the EIA notes that the reasons for variations between the AEO and other forecasters are due to differences among the assumptions that underlie the different projections. For example, the AEO2010 Reference case generally assumes that current laws and regulations will continue through the projection period as enacted, whereas some of the other projections assume the enactment of new public policy over the next 25 years. For the SNWW analysis, the AEO forecast was utilized. The sensitivities analysis included in response to Comment 3 address the effects of lower forecasts which could occur for a variety of reasons, some of which may include policy changes not explicitly discussed in the Appendix.

Panel Revised BackCheck Response to Comment 6:

Non-Concur.

Crude Petroleum Forecast

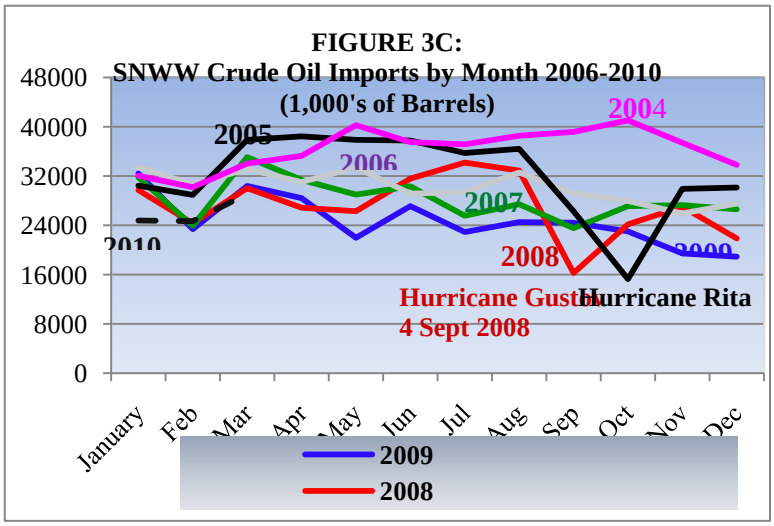
The material provided on 6/11/10 in response to the initial Comment 6 BackCheck does not resolve the issues with the crude petroleum forecast. Most basically, the assertion that

"The Motiva expansion and SNWW's existing role as the largest waterway port of entry for petroleum suggested that higher forecast would most reasonably reflect long-term trends for the study area"

may have some applicability to the study area share, but does not justify a U.S. total forecast that is much higher than that of the responsible U.S. Government agency, namely EIA.
The response includes discussions of refinery capacity and market share that are somewhat hard to follow, and would ultimately benefit from careful citation and editing were the material to be included as an addendum to the Feasibility Study. The panel has assumed for purposes of this review that the data and calculations are correct.

The additional data submitted continue to show a recent declining SNWW share of the US total (although the use of 4-year averages makes the decline less obvious). Figure 6A is difficult to interpret, but appears to show that SNWW total is declining faster than the US total between the 2002-2005 period and the 2006-2009 period. Showing the data year-by-year in a table similar to Table V-4 in the Feasibility Study should be done and would enhance the report's clarity.

The SNWW share declined despite the stated increase of SNWW's refinery capacity both in absolute and share terms. If nothing else, that recent experience shows that capacity increases do not necessarily translate to share increases. The declining share is attributed in part to the hurricanes in non-quantified references. The graph provided in response to Comment 3, reproduced below, suggests that the impact of the hurricanes was relatively short–lived, and does not explain the declining share. Hurricanes are endemic to the region, and are likely to reoccur from time to time over the project life. This graph also shows that 2009 data were available, and suggests that they should have been included in the forecast analysis.



The discussion on Canadian crude imports helps explain the declining share. This discussion is largely undocumented and may be somewhat speculative, but has been taken at face value for this review. The conclusion that Canadian crude is unlikely to come directly to SNWW, however, suggests that the SNWW share will remain low, not that the SNWW flow is somehow exempt from Canadian competition.

The USACE response appears to disagree with the AEO forecast regarding domestic production, but does not give any reasons for the disagreement or offer information that would justify the adoption of a more conservative domestic outlook..

Table 6A appears to be the U.S. forecast, not the SNWW forecast as labeled. The table which should have been 6B appears to have been mislabeled as 6A, and its meaning is unclear. There

are still no 2009 data included, though it is evidently available. The regression that included the 2008 data has an R-squared of only .28. If so, this poor fit suggests that the regression technique used is not a reliable basis for forecasting. Using less data (e.g. restricting the analysis to 1990-2007) to get a better R-squared is not an acceptable approach.

The response discusses the AEO Reference and Low Price forecasts, but ignores the High Price forecast, which would further reduce the SNWW crude outlook. The High Price case is just as valid as the Low Price case. The response also discusses the AEO's outlook for domestic crude production, but gives no convincing rationale for picking a more conservative domestic outlook (e.g. the Global Insight forecast) that better justifies the project.

The lack of a sensitivity analysis is a red flag. It is obvious that the BCR is highly sensitive to the crude petroleum forecast, and that sensitivity should be acknowledged and quantified.

LNG Forecast

The LNG discussion offered in response to Comment 6 refers back to the response for Comment 3.

As the LNG forecast appears to rest almost entirely on a report that the panel has not seen, it cannot be verified from the material presented to date. The referenced report by Alexander Aaron has not been provided for review, so the panel cannot verify the validity or use of the estimates therein. This type of source material should have been provided for the initial review. The meaning and interpretation of Table 3H is not clear.

The response does not explain how the SNWW volume remains constant in a declining market after 2029, as shown below for the data presented in Table 3G. Although the text says the analysis was based on a 20% share, the share in the table rises from 15% in 2019 to 27.68% in 2030. The transition from a 20% assumption to the shares shown in the table is still unclear.

Year	U.S. Waterborne LNG Imports	SNWW Waterborne LNG Imports	SNWW Share
2005	16,565,000		
2006	18,617,000		
2007	21,238,000	4,000	0.02%
2008	12,072,000	39,000	0.32%
2009	15,514,400		0.00%
2019	38,852,755	5,827,913	15.00%
2020	38,045,447	9,511,362	25.00%
2025	31,049,691	7,762,423	25.00%
2029	24,698,681	6,174,670	25.00%
2030	22,309,819	6,174,670	27.68%
2069	22,309,819	6,174,670	27.68%

The sensitivity analysis presented in Table 3I is helpful. It appears that cutting the LNG forecast in half would reduce the average annual benefits for the 48' project by $5.6 million, and reduce the BCR from 1.3 to 1.2, if the panel's reading is correct.

Comment 7:

The choice of project design vessel appears to drive the project design and benefits estimates, yet remains unjustified in the report

Basis for Comment:

There is no justification given for the choice of the project design vessel (899 feet long, 164 feet wide, with unspecified draft, corresponding to a 158,000 DWT Suezmax tanker), nor any sensitivity analysis performed on the choice. There is nothing in the report to indicate how common such vessels would be or how often they might be required to meet in the channels.

The vessel beam data reveal that vessels of wider than 155 feet constituted only 3% of the trips, and suggest that meets between these large vessels would be rare. This observation calls the selection of a 164' project design vessel into question. Why was the 164' standard chosen instead of a 144' standard, which would have accounted for 95% of the vessel trips? Is more recent data available?

- DFR, Section Section VI (Description of Recommended Plan), VI Table 46 indicates that 92% of the crude imports are carried in vessels of less than 115,000 DWT, much smaller than the project design vessel at 158,000 DWT.
- DFR, Section VI (Description of Recommended Plan), VI Table 47 shows that 95% of the piloted vessels in 2004 had beams of less than 145 feet versus a project design beam of 164'.
- DFR, SectionSection VI (Description of Recommended Plan). The design vessel actually corresponds only to the very largest vessels serving Beaumont (p. DFR VI-6).
- DFR, SectionSection VI (Description of Recommended Plan). The project design vessel at 899 feet would not be able to enter the Taylors Bayou complex, where the limit is 758 feet (VI-7).

By the Pilots' 50% guideline a meet of two 164' design vessels would require a 676' channel. If the design vessel was 145', however, the channel width could be just 580'.

The notes for the 2/9/01 pilots meeting state that the 164' design vessel was recommended by PE-Economics in a May 2000 design vessel paper. Given the critical role of the design vessel in the project design and benefits estimates, this paper should be presented in an appendix and reviewed. What steps were taken to insure that the May 2000 recommendation was still valid?

Significance – Medium:

Since the simulation analysis is not documented and there was no sensitivity analysis, the review panel cannot reliably determine the impact of design vessel choice on the findings.

Comment Cross-referencing:

(2) Comment: The report does not present a strong analysis of the current and future vessel fleet, or of vessel dimensions.

(3) Comment: The crucial analysis of vessel design and sailing drafts is inadequately supported by data and appears questionable.

(5) Comment: There is no comprehensive description of existing vessel operations.

Recommendations for Resolution

The report needs:

1. a detailed description of the justification for the project design vessel;
2. a review of the 2000 PE Economics report; and
3. a sensitivity analysis of the project design vessel choice (see below).

USACE Response to Comment 7:

EPR RECOMMENDATION:

1. *a detailed description of the justification for the project design vessel;*

DISCUSSION: *The design vessel is defined as the largest vessel expected to use the project on a regular basis. The design vessel is 158,000 DWT, 899 feet long, 164 feet wide, and has a maximum loaded draft of 56 feet. Given this definition the selection of the design vessel is justified as the design vessel is presently in use. Additionally, the historical trend towards larger and more efficient vessel selection indicates that the use of the design vessel will increase over the planning period. The design vessel provided input for the ERDC ship simulation study. At the present time, it is only used for Africa, North Sea, and Middle East tonnage. In 2001, there were no vessels of this size in use on SNWW. In 2005 a total of eight were used on the SNWW and in 2007 there were 21.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Appendix 2 (Economic Appendix), p. 4, Section 3.5, and p. 79.*

EPR RECOMMENDATION:

2. *a review of the 2000 PE Economics report;*

DISCUSSION: *The design vessel input was provided in 2000 as input for the ERDC ship simulation study. As noted in response to other EPR comments, SWG reviewed vessels-on-order and included those findings in the FFR. SWG also presented cost calculations based on the Corps' deep-draft vessel costs available at the time that the design vessel paper was prepared and more recently released costs to help determine whether this vessel is still a cost effective choice. These analyses indicated that it is.*

SWG ACTION TAKEN: *Additional information has been added in the following location:*

- *FFR, Appendix 2 (Economic Appendix), Section 3.5.*

EPR RECOMMENDATION:

3. *A sensitivity analysis of the project design vessel choice.*

DISCUSSION: *The design vessel was used by ERDC to help determine the necessary sizing of the project features. The transportation cost calculations were based on a range of vessels.*

SWG ACTION TAKEN: *None.*

Panel BackCheck Response to Comment 7:

Concur with comments.

The report still provides no sensitivity analysis on the choice of the design vessel (with no explanation as to why not), or any quantitative forecast of how often they would be used or required to meet. As noted elsewhere, the report does not consider the option of handling large vessels at LOOP. The choice of design vessel was apparently made 10 years ago. No data are presented indicating use of such vessels since 2007, when vessels of 150,000 – 175,000 DWT accounted for 3.6% of Port Arthur crude imports and 4.7% at Beaumont (Table 31 & 32). The PE Economics report has not been produced for review or described in any detail.

It is unclear whether the report conforms to USACE practice in the choice of design vessel and this, one way or the other, should be included in the report. Currently the IEPR Panel request is unfulfilled. The Panel believes that the lack of sensitivity analysis is risky, as USACE thus has no clear idea of whether a small difference in design vessel would result in different study conclusions. Such sensitivity analyses on the critical assumptions can be found in other studies and reports.

Comment 8:

The ERDC, HarborSym, and @risk models were used in crucial analyses, but the analyses lack documentation

Basis for Comment:

The report makes numerous general references to ERDC and HarborSym modeling, but details are not provided.

The ERDC vessel simulation is discussed on pages DFR V-5 but not in sufficient detail. This is a striking omission, since the ERDC modeling is given as the justification for the 700' channel width.

The Ship Simulation Study (ERDC) and Harbor Simulation (the widening analysis, not just the model itself) need to be available for the external review. The brief overview in the report is inadequate given how critically the economic analysis depends on these two studies. The "more detailed information" referenced on page DFR V-8 is not actually provided in the Economic Appendix.

The @risk model is mentioned on DFR EA page 4 but not thereafter. Much of the needed documentation and information likely resides in project files.

It is risky to use the results of HarborSym selectively, and difficult to defend. The report should explain more fully why and when HaborSym's findings are ignored and the opinions of the pilots are followed.

Significance – Medium:

In the absence of documentation the EPR panel cannot determine whether or not the modeling was done correctly, or how the result might be sensitive to assumptions and input choices. Model documentation itself is not the same thing, as it is not the models but the use of the models that is at issue.

Comment Cross-referencing:

(9) Comment: The report is written at a summary level and lacks proper documentation throughout.

Recommendations for Resolution:

The report needs detailed documentation of:

- where and why each model was used;
- how assumptions and input choices were made;
- how results were interpreted; and
- the sensitivity of model outcomes to assumptions and inputs.

USACE Response to Comment 8:

DISCUSSION: *None.*

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *FFR, Appendix 2, (Economic Appendix), Section 6.3 (Channel Widening Benefits)*
- *FFR, Appendix 2, Section 8.3 (Vessel Trip Reduction Due to Channel Widening)*

Panel BackCheck Response to Comment 8:

Concur with comments.

The Economic Appendix now contains a large volume of material relating to HarborSym, but many of the tables are only meaningful to those familiar with the model (e.g. Table 96). It is still difficult to tell:

- where and why each model was used;
- how assumptions and input choices were made;
- how results were interpreted; and
- the sensitivity of model outcomes to assumptions and inputs.

It is also not clear why the Harbor Sym outputs are all based on 2004 traffic, or what impact that choice had on the results.

The IEPR panel could locate no detailed information on the critical EDRC ship modeling (e.g. EA p. 164-165).

The Panel was thus unable to confirm that the modeling as done correctly. It may be that someone with expertise in the HarborSym and EDRC models needs to review the report. Subject to that review by someone knowledgeable on the models, this remains an issue that can be clarified.

Comment 9:

The report is written at a summary level and lacks proper documentation throughout.

Basis for Comment:

As noted under other comments, the analysis and conclusions are under-documented. Data behind the conclusions are not given, including several instances where the main report says the data are in the appendix. There are multiple references to other studies and analyses that are not presented or sourced. Most of the commodity analysis and forecasting is only described, not actually documented.

Throughout the DEIS, DFR and appendices, complex issues are addressed in ways that rely on existing knowledge, data and previous studies. This is an entirely reasonable approach; however the reports do not adequately reference these knowledge bases. The technical basis of the report is thus undermined as the reader cannot assess the adequacy or credibility of the knowledge resources used to support the analysis presented. Also many of the sources used in the reports are dated and may not reflect the current state of knowledge, e.g., only 60% of the 440 or so references that are cited in the DEIS are from the last decade.

These concerns cover all technical areas encompassed by the report with illustrative examples provided below:

With and without project conditions. It appears that there is more information on the differences between the with and without project conditions than is offered in this report. Recent auditing information on pilots meetings, etc. does provide some useful data and understanding. More of these sources need to be incorporated into the report for the public so searches of models, meeting notes and rationale for critical assumptions will not be necessary. This report should stand on its own, without a need to drill down in other information to analyze the results.

Other examples include:

- "Review of the historical transit data and vessel fleet trends resulted in detailed analyses for these groups." – *Where are the detailed analyses?*

  "The detailed analysis included examination of port depths and associated trade route constraints." – *Where are the port depths and trade route constraints documented and analyzed?*

- "The vessel fleet projections are based on analysis of existing fleet utilization and anticipated trends.." – *Where are those trends documented?*

- "The project benefits reflect consideration of risk-based evaluation parameters" – *How and where was this done?*

- "..indices developed from historical trend data and Global Insights forecasts." – *Where are the indices and how were they developed?*

- "Specific data on vessel trends is contained in the economic appendix". – *Actually, there are no such data in the appendix.*

Basis for Comment (Continued)

- "Vessel-on-order data was examined in order to help determine the likelihood of higher concentration and potential transitions to larger vessels for chemicals, iron ore, aggregate, and grain" – *Where are these data and how were they analyzed?* The section describing the future conditions of the without project is far too general, with no quantitative or systematic consideration of commodity changes, vessel sizes, loading values and even safety or environmental conditions.

Economic Analysis. The DEIS does not include any numbers to support either existing or future traffic volumes or specific future vessel characteristics, and the arguments for volumes of crude oil imports and rates of projected growth are not backed-up with references.

Given that safety is one of the key factors the channel improvement seeks to address, the DEIS assumes that increases in traffic are "…expected to increase overall congestion and result in an increase in the total number of accidents" but no studies or references are provided to support this important relationship.

The individual commodity forecasts have minimal documentation, and for most commodities there is no documentation of how the forecast rate was chosen. The expected trends in ship traffic and tonnage need substantiation and references.

Safety and accidents. In the Problems and Opportunities section the report claims concerns over safety and the existence of draft restrictions. Neither of these alleged problems are documented in the report. No analysis of safety and accidents is presented; this is particularly suspect since much of the project design relies on the Sabine Pilots' assertions about safety practices or rules. It is critical that documentation about the lack of accidents, the need for the rules and any safety savings be presented. If there is not safety issue, why the strident Pilot rules? These statements continue on page DFR II-37 with allegations of congestion, shipping delays, and inefficiencies due to draft restrictions. Here, too, none of these statements are supported with data.

In the Navigational Safety section the graphics appear to be reproductions of PowerPoint slides and are not an acceptable substitute for data on vessel operations, delays, and accidents.

The National Security section (p. DFR II-43) describes the role of Beaumont in military mobilization but does not contain any comparison of with and without project conditions. Again, there are no data relevant to the project.

The report says that costs and benefits were estimated for all the alternatives (DFR V p.9). These estimates should be provided in an appendix.

Environmental Analysis. Various issues in the economic analyses are poorly documented or referenced; some of these include:

The impact of vessel wakes on erosion and thus the relationship between the increase in vessel traffic and increase in erosion need to be supported by a reference.

The discussion of coastal restoration planning needs to be updated to include the efforts and authorities post-*Coast 2050*. These include the Louisiana Coastal Area (LCA) Ecosystem Restoration Study and Plan (authorized in WRDA 2007 as passed both the House and

Basis for Comment (Continued)

Senate), the State Comprehensive Master Plan (http://www.lacpra.org), and the ongoing LACPR planning.

The estimate that 50% of the dredged material used for beach nourishment that remains after placement will erode away by the end of the 6-yr cycle is not supported other than by brief reference to an unspecified project at Texas Point where 60% remained. Considerably more discussion and data are needed in this section of the report to assess the fate of material placed on the beach.

The biological effects of turbidity used in the No Action Alternative are based on studies that are 35 to 45 years old while other sections of the report (e.g., Aquatic Ecology) use more recent studies and data to evaluate the effects of TSS. Insofar as possible, the same quality of information needs to be used throughout the report to support each issue.

Citations to support the scientific and technical recognition of the WVA variables as important in overall habitat quality need to be provided.

The relationship between vegetative productivity and land loss used to support the WVA is apparently based on a single reference to a textbook (and a reference that implies that both salinity *and* inundation are important drivers of coastal habitat *distribution*). As V1 is such an important driver of the WVA models, this relationship must be more thoroughly substantiated based on a significantly larger literature.

***Dredging and sedimentation*.** The purpose and need for the project is also tied to transportation efficiency primarily for large volumes of crude oil imports and rates of projected growth for crude and LNG. The channel was designed for 40,000 DWT vessels and the project now serves 90,000 DWT vessels. The case looks compelling and import growth seems logical, but for the most part the arguments are not backed up with references.

Although the environmental setting is adequately presented, most of the references are very dated. A considerable amount of much newer scientific work has been done relevant to the study area. For example, the broad statement that the Chenier Plain has been eroding should be qualified (some sections have been accreting over the past two or more decades) as sediment discharge is now making its way west from the Atchafalaya Delta system. Also, storms can have an enormous impact on the study area (e.g. Hurricane Rita) and the section on climate should discuss magnitude and frequency of these events as well as continuing and possibly accelerated sea level rise. Although much of the work in the DEIS may predate the recent hurricane activity and estimates of sea level rise, it must be reviewed to the best of our knowledge.

***QA/OC Documents*.** No Quality Assurance or Quality Control documentation was included in the review material so we cannot tell if appropriate steps were taken to cross-check and validate the analysis.

Significance – Moderate:

The omission of supportive data causes lack of certainty and confidence in the analysis and findings. Until such time as the analysis is documented in sufficient detail, it cannot be verified or validated.

Comment Cross-referencing:

(3) Comment: The crucial analysis of vessel design and sailing drafts is inadequately supported by data and appears questionable.

(8) Comment: The ERDC, HarborSym, and @risk models were used in crucial analyses, but the analyses lack documentation.

(17) Comment: The analysis and conclusions are based on what appears to be over-reliance on the pilots or at least a lack of documentation of their opinions.

Recommendations for Resolution:

1. The report needs to be examined to provide enough information for the reader to follow the analysis. Data behind the calculations and referenced in the text should be displayed. Other studies and reports on which this report depends should be provided for review or reproduced in appendices.
2. Ideally, USACE should be able to document the source, derivation, and impact of every number, assumption, or analytic step that supports the benefit-cost analysis. Complete point-by-point documentation is impractical and analytic documentation in general is admittedly tedious, time-consuming, and expensive. Yet in today's contentious environment the USACE needs to do its homework thoroughly and be able to explain and document exactly what was done.
3. It is not sufficient to supply undocumented Excel spreadsheets or working papers, as an outside reader would be unable to understand or follow them. The HarborSym output provided in this project is a case in point. Absent a parallel written account of how the analysis was performed, what assumptions were made, where data were obtained, etc. it is impossible for an independent reviewer to understand what was done or determine if it was done correctly.
4. Adequate documentation should be submitted to capture the statistics on channel safety including collisions, sinkings, groundings and loss to life and injuries.
5. It is imperative that the data demonstrating the growth of traffic be adequately documented with suitable references and not just by referring to interviews with pilots and captains.
6. Update the references and evaluation of the environmental setting including the more recent estimates of sea level rise and the effect of recent hurricanes.
7. If no appropriate documentation can be found, the report will need to be revised to clearly acknowledge and identify the limited nature of the information on which the reports are based.

USACE Response to Comment 9:

EPR RECOMMENDATION:

1. *The report needs to be examined to provide enough information for the reader to follow the analysis. Data behind the calculations and referenced in the text should be displayed. Other studies and reports on which this report depends should be provided for review or reproduced in appendices.*

DISCUSSION:

The reports have been examined to ensure that sufficient information is provided for the reader to follow the analysis. In an effort to keep the FFR and FEIS a reasonable length, as required by CEQ regulations, data and analytical reports have been incorporated by reference and posted onto the SWG website.

Numerous sections of the FEIS and its appendices have been revised to include additional information on the environmental setting, an updated estimate of the rate of relative sea level rise, the effects of recent hurricanes, Gulf shoreline erosion, the proposed Gulf Shore BU Feature, the role of salinity in land loss estimates, and supporting documentation for the WVA model. In addition, references have been extensively updated throughout the FFR and FEIS. The relationship of the proposed SNWW CIP to other coastal restoration plans has also been updated to include the Texas Coastwide Erosion Response Plan, Louisiana Coastal Area (LCA) Ecosystem Restoration Study and Plan, the Louisiana State Comprehensive Master Plan, the Louisiana Coastal Protection and Restoration Study, and the North American Waterfowl Plan.

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *The FFR, Appendix 2 (Economic Appendix) was expanded in response to include more detailed documentation in response to the EPR comments*
- *FEIS, Section 2.5.3.2 provides a more detailed assessment of the fate of the dredged material in the Gulf Shoreline BU Feature.*

The reference supporting the impact of vessel wakes on erosion is provided in FEIS Section 4.10.2.2.1.

- *FEIS, Sections 7.23 through 7.30 discuss the relationship of the SNWW project and the following coastal restoration planning efforts and authorities: Texas Chenier Plain National Wildlife Refuge Complex Comprehensive Conservation Plan; Sabine National Wildlife Refuge Complex Comprehensive Conservation Plan; Texas Coastwide Erosion Response Plan; Louisiana Coast 2050; Louisiana Coastal Area Ecosystem Restoration Study and Plan; Louisiana's Comprehensive Master Plan, Louisiana Coastal Protection and Restoration, and the North American Waterfowl Management Plan.*
- *Additional references supporting the scientific and technical recognition of WVA variables were added to FEIS, Appendix C (Ecological Modeling Report), Section 2.6.*
- *Additional references supporting the relationship between vegetative productivity and land loss were added to FEIS, Appendix C, Section 4.1.2.1 (Productivity-Based Land Loss Projections).*
- *The following supporting reports are available on the District website (http://www.swg.usace.army.mil):*

  Brown, G.L., and J. Stokes. 2009. Numerical Model Study of Potential Salinity Impacts Due to Proposed Navigation Improvements to the Sabine-Neches Waterway, Texas (August 2009 draft report). U.S. Army Engineer Research Development Center – Coastal and Hydraulics Laboratory (ERDC-CHL), Vicksburg, Mississippi.

  Fagerburg, T. 2003. Field Data Collection Summary Report for the Sabine-Neches Waterway Study. U.S. Army Engineer Research and Development Center, Waterways Experiment Station (ERDC-WES). Vicksburg, Mississippi.

Gravens, M., and D.B. King. 2003. Shoreline impacts study for Sabine-Neches Project. U.S. Army Corps of Engineers, Engineer Research and Development Center, Coastal Hydraulics Laboratory (ERDCCHL), Vicksburg, Mississippi.

Heisey, Shana A. 2005. Determining Economic Efficiency in Harbors – HarborSym, An Application. IWR Report 05-NETS-P-02.

Louis Berger Group and Toxicological and Environmental Associates (LBG and TEA). 2008. Wetland Value Assessment Model Application in the Sabine-Neches Waterway Channel Improvement Project: Model Assessment Report. The Louis Berger Group and Toxicological & Environmental Associates.

Maynord, S. 2005. Ship effects before and after deepening of Sabine-Neches Waterway, Port Arthur, Texas. ERDC/CHL TR-03-15. U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.

Parchure, T.M., S. Maynord, and S. Sarruff. 2005. Desktop Study for Sediment-Related Problems at Sabine-Neches Project. U.S. Army Corps of Engineers, Engineer Research and Development Center, Coastal Hydraulics Laboratory, Vicksburg, Mississippi.

Wamsley, T.V. 2008. Memorandum from CEERD-HR-C to CESWG, Subject: CHL Response to

Galveston District Information Request Related to Sabine-Neches Waterway Channel Improvement Project, Draft Feasibility Report, External Peer Review Comments.

Wamsley, Ty V., Mary A. Cialone and Tate O. McAlpin. 2010. Sensitivity Analysis for Sabine Neches Waterway Navigation Project. USACE, ERDC-CHL, Vicksburg, MS.

Webb, D. 2003. Ship Simulation Study for Sabine Neches Improvement Project (Revised March 2007). Coastal and Hydraulics Laboratory, ERDC. Vicksburg, Mississippi.

EPR RECOMMENDATION:

2. *Ideally, USACE should be able to document the source, derivation, and impact of every number, assumption, or analytic step that supports the benefit-cost analysis. Complete point-by-point documentation is impractical and analytic documentation in general is admittedly tedious, time-consuming, and expensive. Yet in today's contentious environment the USACE needs to do its homework thoroughly and be able to explain and document exactly what was done.*

Discussion:

Many areas of the report have been improved by more complete citations of supporting analyses. However, some of the comments appear to relate to introductory sections of the reports where citations were not routinely used. The perceived lack of documentation in the reports does not mean that the economic, environmental and engineering decisions are unsubstantiated. The decisions described in the report are based on extensive technical analysis that have been referenced and presented in the FFR and FEIS.

SWG ACTION TAKEN: *The FFR, FEIS and appendices have been revised throughout to provide more complete citations of supporting documentation and analyses.*

EPR RECOMMENDATION:

3. *It is not sufficient to supply undocumented Excel spreadsheets or working papers, as an outside reader would be unable to understand or follow them. The HarborSym output provided in this project is a case in point. Absent a parallel written account of how the*

analysis was performed, what assumptions were made, where data were obtained, etc. it is impossible for an independent reviewer to understand what was done or determine if it was done correctly.

DISCUSSION: *SWG has included the requested information and documentation as appropriate.*

SWG ACTION TAKEN: *The appropriate level of documentation has been included into the FFR, FEIS and appendices. Some analyses are available on the District website while other supporting documentation is available upon request.*

- *FFR, Appendix 2 (Economic Appendix), Section 8.3.1 (HarborSym Model) provides documentation and application of the HarborSym Model.*
- *FFR, Appendix 2, Section 8.4 (Channel Deepening Benefits) provides channel deepening benefits documentation.*

EPR RECOMMENDATION:

4. *Adequate documentation should be submitted to capture the statistics on channel safety including collisions, sinkings, groundings and loss to life and injuries.*

DISCUSSION: *Accident data has been added; however, there are very few accidents.*

SWG ACTION TAKEN: *Clarification of the channel safety including accidents, etc has been made in the following locations:*

- *FFR, Section II.B (Safety) and Section IV.D (Second Screening of Non-Structural Alternatives) have been revised to include the number of accidents, including the type of vessels and cargo involved.*
- *FFR, Appendix 2, Section 3.1 provides information on vessel casualties.*

EPR RECOMMENDATION:

5. *It is imperative that the data demonstrating the growth of traffic be adequately documented with suitable references and not just by referring to interviews with pilots and captains.*

DISCUSSION: *Pilots and captains did not provide traffic forecast input data. As noted in the FFR, traffic forecasts were prepared based on historical trend lines and evaluation and the associated suitability of forecast indicators and published trends.*

SWG ACTION TAKEN:

FFR, Appendix 2 (Economic Appendix), Section 6 (Tonnage Projections). References utilized to develop traffic forecasts have been appropriately documented.

EPR RECOMMENDATION:

6. *Update the references and evaluation of the environmental setting including the more recent estimates of sea level rise and the effect of recent hurricanes.*

DISCUSSION:

The environmental setting has been updated to include more recent estimates of relative sea level rise (RSLR) and the effects of recent hurricanes. USACE issued new policy guidance concerning the incoporation of sea-level change considerations in Civil Works programs and activities (EC 1165-2-211, July 1, 2009) while this report was being finalized. The effects of relative sea-level rise (RSLR) on the impacts and design of the proposed SNWW CIP were evaluated by incorporating a projected RSLR into the evaluation of the FWOP and FWP

conditons. In particular, RSLR was incorporated into the hydrodynamic-salinity (HS) model and RSLR effects were considered in the WVA modeling. Discussions on the effect of recent hurricanes have also been added.

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *Discussions of the RSLR have been added to descriptions of the environmental setting in the FFR Sections II.C and IX.C, FEIS Sections 1.4.2, 2.2.1 and 2.3.3; and FEIS Appendix C, Sections 1.6.1.3, 1.6.2, 2.6.1 and 3.3.1.*
- *The effects of recent hurricanes are described in FEIS Section 2.5.2.6, and several sections of Section 3.5 Hydrology; and FEIS Appendix C Section 1.6.1.4.*

EPR RECOMMENDATION:

7. *If no appropriate documentation can be found, the report will need to be revised to clearly acknowledge and identify the limited nature of the information on which the reports are based.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Documentation that is limited in nature has been clearly acknowledged, as appropriate.*

Panel BackCheck Response to Comment 9:

Concur.

The USACE appears to have satisfactorily addressed the comment. The expanded clarification and referencing and documents posted to the District website should address information gaps. However, the existence of web-published materials should be made apparent to others readers of the studies, possibly by posting links to those documents wherever the main study documents are posted. The Panel has not seen the revisions that USACE comments indicate will be or have been made to address the panel's Comment 9. The panel's response of "Concur" is provided assuming that the revisions are made as indicated.

Comment 10:

Public involvement in the feasibility analysis process was carried out well.

Basis for Comment:

In general the review panel was impressed with the level of effort which had been devoted to public engagement. The outreach program seems to have been appropriately aggressive and engaged both the public and state and federal agencies. The comments are numerous indicating both good publicity concerning the opportunity for comment and input, and excellent participation. The report indicates that the list of 244 suggestions from workshop participants was transferred to electronic maps and supplied to the Galveston District. The panel identified two areas of concern which could be addressed to improve the report:

- There is no documentation of contacts with the Sabine Pilots Association or industry stakeholders. The Pilots are an especially important group so it seems likely that they were engaged but to nature of the contact and their comments is not clear.
- The report could do a better job of documenting how the public comments were incorporated into the plan.

Significance – Low:

If the two remaining issues identified above are addressed the overall quality of the report would be improved.

Comment Cross-referencing:

(17) The analysis and conclusions are based on what appears to be over-reliance on the pilots or at least a lack of documentation of their options.

Recommendations for Resolution:

To resolve the concerns raised relative to this comment, the report would need to be revised to:

1. Include documentation of the contacts with Pilots and a summary of their comments.
2. Include some cross reference between the comments included in the report and any modifications which were made as a result (e.g., a Table cross referencing major comments and text which was modified as a result of the comment).

USACE Response to Comment 10:

EPR RECOMMENDATION:

1. *Include documentation of the contacts with Pilots and a summary of their comments.*

DISCUSSION: *SWG will include the requested data in the FFR and/or Economic Appendix.*

SWG ACTION TAKEN: *Additional information regarding the coordination with and input from the Sabine Pilots Association is located in the following locations:*

- *FFR, Section IV (Formulation and Evaluation of Alternatives), Section IV. D (Second Screening).*
- *FFR, Appendix 2 (Economic Appendix), Section 6 (Tonnage Projections).*

EPR RECOMMENDATION:

2. *Include some cross reference between the comments included in the report and any modifications which were made as a result (e.g., a Table cross referencing major comments and text which was modified as a result of the comment).*

DISCUSSION: *Cross-references will be considered where appropriate and needed to emphasize public support for a particular project feature, but no systematic effort will be made to cross reference all beneficial use and mitigation measures in the initial screening with the list of 244 suggestions from public workshop participants.*

SWG ACTION TAKEN: *Revisions have been performed as required for USACE-HQ approval of the FFR and FEIS and/or where appropriate and needed to emphasize public input on a particular project feature.*

Panel BackCheck Response to Comment 10:

Concur. No comments**.**

Comment 11:

Need to conform to post-Katrina changes in policy and to incorporate changes in scientific understanding of the Gulf Coast.

Basis for Comment:

Major post-Katrina changes have occurred in USACE policy (e.g., the Chief's 12 Actions for Change) and in scientific understanding of the Gulf Coast environment. To a large extent these are not incorporated into the analysis. In the aftermath of Katrina, USACE policy with respect to systems approaches, risk-based decision making, sustainability, and public involvement has been significantly updated. Many, but not all, of these changes in USACE approach do not seem well represented in the current DFR or DEIS. Also, the scientific understanding of hurricane physics and coastal sediment regimes in the Gulf of Mexico has been profoundly increased, but this does not appear to be included in the engineering and environmental analysis.

Major points among the Chief's 12 Actions for Change do not appear to be addressed in the studies and report. The Chief's 12 Actions for Change include,

- Employ integrated, comprehensive and systems-based approach
- Employ risk-based concepts in planning, design, construction, operations, and maintenance
- Reassess and update policy for program development, planning guidance, design and construction standards
- Employ dynamic independent review
- Employ adaptive planning and engineering systems
- Focus on sustainability
- Review and inspect completed works
- Assess and modify organizational behavior
- Effectively communicate risk
- Establish public involvement risk reduction strategies
- Manage and enhance technical expertise and professionalism
- Invest in research

Some of these, such as stakeholder involvement and communication, are well represented in the analyses and reports, but others are notable missing. Those missing include, a systems-based approach, risk-based planning and analysis and adaptive planning.

Changes in understanding of the Gulf Coast environment. Regarding hurricanes, a tremendous amount of work following Katrina has been done by ERDC and the IPET projects on improved understanding of hurricane climates and physics in the Gulf. The increased understanding needs to inform the DFR and DEIS. One of the fundamental weaknesses in the DEIS and supporting documents is the absence of discussion on tropical storms and hurricanes. They are clearly of concern.

Regarding sediment, a considerable amount of much newer scientific work has been done (e.g. Texas Bureau of Economic Geology and the Louisiana Geological Survey), some immediately relevant to the study area. For example, the broad statement that the Chenier Plain has been eroding should be qualified (some sections have been accreting over the past

Basis for Comment (Continued)

two or more decades) as sediment discharge is now making its way west from the Atchafalaya Delta system. Also, storms can have an enormous impact on the study area (e.g. Hurricane Rita) and the section on climate should discuss magnitude and frequency of these events. Much attention has been focused on hurricanes over the past decade and the historical record is quite good. The section on erosion should be expanded to include, insofar as possible, new information from hurricanes over the past five years or so. The erosion rates are enormous already, but they may be impacted by the channel deepening, and may accelerate over the life of the project owing to an increased rate of sea level rise. Hurricanes are an important factor in long-terms erosion rates and should be discussed as a contributing component to the evolution of the coastal region.

The four accounts — NED, RED, EQ, and OSE — are not adequately addressed in the report. The inclusion of the four evaluation accounts is not apparent from the DEIS. The preferred alternative is stated to be the alternative that best satisfies the NED plan alone. This harkens back to an earlier period when economic benefit-cost consideration were the main driver of project evaluation.

Significance – Medium:

The lack of conformance to updated USACE policy with respect to engineering and economic analysis, and to planning is a significant shortcoming of the studies. However, in some aspects the studies appear to do a reasonably good job, for example in stakeholder involvement; but the reports do not comply with current policies for systems approaches and risk-based decision making.

Comment Cross-referencing:

(10) Comment: Public involvement in the feasibility analysis process was carried out well.

(14) Comment: Risk and uncertainty are mostly ignored.

Recommendations for Resolution:

1. Specific incorporation of systems engineering considerations, risk-based analysis, and adaptive planning and management in conformance with the 12 Actions for Change need to be in the DFR and DEIS.
2. The significant advancement in scientific understanding of (1) Gulf hurricane physics and (2) sediment regimes and processes resulting from the Interagency Performance Evaluation Taskforce studies need to be incorporated in the engineering and environmental modeling for the SNWW plan.
3. Considerations other than just NED need to be made in evaluating chosen alternatives. This is especially true given the significant ecological aspects of the project impacts, and the need to conform to a regional sediment management plan.

USACE Response to Comment 11:

EPR RECOMMENDATION:

1. *Specific incorporation of systems engineering considerations, risk-based analysis, and adaptive planning and management in conformance with the 12 Actions for Change need to be in the DFR and DEIS.*

DISCUSSION: *Processes and approaches prescribed by the Actions for Change initiative (now called the USACE Campaign Plan) were applied throughout the SNWW study. The FFR and FEIS have been revised to more clearly communicate how the Recommended Plan conforms to these requirements.*

The SNWW study complies with the directive to use a comprehensive systems approach to project planning. While most of the project construction footprint is located in Texas, the study analyzed potential effects over a 2,000 square mile area, incorporating the entire lower Sabine-Neches watershed. This systems-based approach included regional, interstate analyses and solutions. The value of dredged material for the entire system (both inland and offshore) was recognized and plans were developed that use the dredge material beneficially to the greatest extent possible, given the characteristics of the sediment and cost factors. A Risk and Uncertainty Section has been added to the FFR to provide a summary description of risk analyses that were implemented throughout the study process. A new mitigation monitoring and contingency plan has been added that incorporates adaptive planning and management tools.

SWG ACTION TAKEN: *Additional information has been added in the following locations:*

- *Specific revisions were made to address this comment in FFR Section III, Section VI.C, Section IX;*
- *FEIS Section 4, Appendix C, Section 9.0, and FEIS Appendix J.*

In addition, potential risks and uncertainties related to engineering, economic, and environmental analysis were evaluated throughout the FEIS alternatives analysis, and are discussed in the FEIS topic areas to which they relate.

EPR RECOMMENDATION:

2. *The significant advancement in scientific understanding of (1) Gulf hurricane physics and (2) sediment regimes and processes resulting from the Interagency Performance Evaluation Taskforce studies need to be incorporated in the engineering and environmental modeling for the SNWW plan.*

DISCUSSION: *SWG and ERDC reviewed the IPET report (USACE, 2007) sections on Gulf hurricane physics and sediment regimes to determine if this information would significantly change impact assessments resulting from the STWAVE, GENESIS and HS modeling of the SNWW CIP (Wamsley, 2008 – available on SWG website). It was determined that the IPET study does not make recommendations that would affect the application or conclusions of the STWAVE or GENESIS models used in this study*

The risk in the New Orleans area, the focus of the IPET study, is expected to be different from that in the Sabine-Neches Waterway area. Hurricane risk studies for the Sabine area are presently ongoing and would not affect the conclusions from the STWAVE and GENESIS application. The STWAVE and GENESIS study was forced with an hourly wave climate for the 10 year time period from 1990 to 1999, which includes a wide range of wave conditions. The hurricanes and tropical storms that impacted the study area during this time period include Dean

(1995), Josephine (1996), Charlie (1998), Frances (1998), and Bret (1999). Thus, hurricane and tropical storm waves were included in an appropriate way as a standard part of the hourly wave data set in the analysis.

A sensitivity analysis using the ADCIRC model was performed to determine what effect the proposed SNWW CIP might have on storm surge levels in the study area (Wamsley et al., 2010). ERDC's storm surge report and the HS modeling report are available on the SNWW CIP webpage at http://www.swg.usace.army.mil/pe-p/SNWW/studies.asp

***SWG ACTION TAKEN:** Additional information has been added in the following locations:*

- *A sensitivity analysis of potential storm surge impacts of the proposed project was conducted, and the results are described in FFR, Section IX; FEIS Section ES.4; FEIS Section 4.1.5; and FEIS, Section 4.6.2.1.*
- *After review, SWG and ERDC found no reason to revise the other engineering models conducted for this study.*

EPR RECOMMENDATION:

3. *Considerations other than just NED need to be made in evaluating chosen alternatives. This is especially true given the significant ecological aspects of the project impacts, and the need to conform to a regional sediment management plan.*

***DISCUSSION:** Considerations other than NED were included in evaluating alternatives; they are presented in FEIS Table 2.3-1, Alternatives Impact Comparison Summary Table. The four accounts were discussed in the FFR as required by Corps of Engineers guidance for planning studies. Potential effects to environmental, regional economic and socioeconomic resources were thoroughly considered in evaluating the environmental consequences of feasible alternatives. For clarification, the evaluation methodology has been expanded in both the FFR and FEIS to provide the reader with the assurance that all potential effects were considered in the formulation and screening of alternatives.*

***SWG ACTION TAKEN**: Additional information has been added in the following locations:*

- *FFR Sections IV.C, IV.D and IV.E.*
- *FEIS Sections 2.2, 2.3 and 2.5*

Panel BackCheck Response to Comment 11:

Concur. The USACE appears to have addressed the comment according to the response here.

It may be the case, however, that the USACE response to this comment is inconsistent with that given to Comment 14, suggesting that R&U analysis is mostly ignored. The response to that comment says that no risk and uncertainty or sensitivity analysis was performed of the STWAVE/GENESIS model runs under the theory that the assumptions made for those runs were so conservative as not to require either Monte Carlo or sensitivity assessment

Comment 12:

Many issues of significance regarding dredging and sedimentation are not thoroughly evaluated or analyzed (e.g., regional sediment management plan, potential for sea-level rise and its implications, improved understanding of hurricane storm surge in the Gulf, the effects of Hurricane Rita on shorelines and interior wetlands

Basis for Comment:

The basis for comments made here are rooted in (1) the disposal of 417 mcy of dredged material in ODMDS' without consideration of the regional littoral system response, regional sediment management considerations, and a full understanding of littoral processes and cumulative impacts, (2) an incomplete consideration of project alternatives and their impacts, (3) the use of inappropriate models to assess impacts of interior channel dredging and mitigation strategies, (4) apparent non-compliance with existing state Coastal Zone Management Plans.

Regional Sediment Management and Analysis. The DMMP, as presented, focuses primarily on the interior waters, marshes, and wetlands located north of the coastline and entrance to the Sabine Neches harbor channel. Little or no discussion was devoted in the plan presentation to the proposed placement of materials offshore, a discussion that was reserved primarily for DEIS Appendix B, Ocean Dredged Material Disposal Site Designation (ODMDS). Unfortunately, the material presented in this appendix addresses a very limited set of proposed alternatives, all of which include the use of designated (existing or proposed) ODMDSs, the selection of which was based almost entirely on least cost considerations arising from transport distances and handling considerations.

Nowhere in any of the USACE documents provided was there mention or indication that the recommended placement of dredged material in the eight ODMDSs was arrived at using accepted Corps guidelines for Regional Sediment Management (RSM). This omission becomes even more disturbing given the fact that both the DMMP and Ocean Disposal Plan propose the placement of 417 $\pm$ mcy offshore over the life of the project without any discussion or consideration of the expected cumulative impacts over the life of the project caused by the proposed action. This represents a very significant loss of valuable sediment from the active littoral system in this region of the Gulf of Mexico coast which historically has been sediment starved, with chronic shoreline recession and an ongoing loss of coastal wetlands.

RSM requires the consideration of sediment as a resource that is to be managed for the optimum benefit of the affected region. In the case of the SNWW project the region includes not only the interior watersheds, but also the offshore, nearshore, and coastal shorelines of both Texas and Louisiana that function as a littoral system. This requires the development of a regional context of historical coastal behaviors and framed in a sediment budget, or balance, for the area, including quantifiable sediment fluxes and pathways, and the sediment volume changes within designated major littoral components. Unfortunately, neither the DEIS nor the DFR provided sufficient information to develop a clear characterization of the historical behavior of the coast in the area of interest, its long term temporal and spatial patterns of erosion and accretion, and the impacts of storms.

Basis for Comments (Continued)

While limited information on littoral processes is provided in the DFR, it is based upon the supporting work of the ERDC Coastal Shoreline Impact Study, Gravens and King (2003). The primary focus of this study, however, was to examine the incremental impacts of littoral drift, shoreline response, and channel shoaling due to the incremental deepening of the entrance channel. This limitation in scope does not provide the needed understanding of the littoral behavior of the area.

Finally, the proposed DMMP and ODMDS DEIS include a relatively small placement of 1.5 mcy of sand on the Texas and Louisiana shorelines at alternative 6-year intervals. However, the rationale for quantities and frequencies of beach placement are not provided, nor was any attempt made to evaluate the suitability of the materials to be placed on the beach and the native beach material characteristics. Without this information, it is not possible to accurately predict the behavior of the beach fills and the fate of materials placed on the beach. This, in turn, raises questions regarding the adequacy of the proposed placement volumes and frequencies. What is the rationale for beach placement?

Incomplete Consideration of Project Alternatives. A rigorous analysis of littoral processes and sediment characteristics in a regional sediment management framework would facilitate the identification and evaluation of a more representative set of offshore, nearshore, and beach placement alternatives. The lack of such information coupled with an apparent mandate to restrict the alternative selection to least cost navigation project solutions, without consideration of other short and long term benefits associated the broader regional context, results in a limited and unimaginative set of alternatives. This represents a serious deficiency in both the DEIS and the DFR. For example, it is noted from DEIS Appendix. B (ODMDS) DEIS Appendix B Table 1-1 and the table shown in DEIS Appendix B Sect 3.1.1, the two closest ODMDSs, PA# and PA$, will receive a total of 205 mcy of maintenance and new construction material over the 50-year project life. This represents 50 percent of all maintenance material scheduled for placement in all eight ODMDSs, i.e. PAs 1,2,3,4,A,B,C, and D. With these sites located 7.8 and 4.8 miles offshore, respectively, the transport distances to place this material in shallow water, shore parallel placement areas in close proximity to the Texas and Louisiana coasts east and west of the channel merits further consideration.

The evaluation of the alternative designs to minimize or reduce future channel shoaling and maintenance requirements is not rigorously presented in the DEIS. The cumulative impacts in all areas are expected to be minimal to none according to the DEIS. However, the information here is not adequately convincing. The dredging of over 800 mcy over the life of the project will have cumulative impacts greater, in the readers' opinion, than presented in the conclusions. The studies have focused mostly on independent components and short time scales. The 50 year horizon fails to even identify the future growth in vessel size and traffic.

Basis for Comments (Continued)

The DEIS concludes that the Preferred Alternative would not create additional ballast water impacts because, even though the ship traffic will increase, there will be no changes in foreign ports of call. Is this a supportable statement for the 50-yr projected life of the project? Nevertheless an increase in ship traffic is expected to create more ballast exchanges and thereby a higher risk of impacts.

The study casually dismisses concerns in comments related to shrimp and fish being mobile enough to avoid high concentrations of pollutants and to birds being accustomed to noise of maintenance dredging. Moreover, the conclusions drawn about impacts on recreation and commercial fisheries seem to be little more than guesses and are not supported by rational analysis.

Inappropriate Models Used for Interior Waters Dredging Impacts and Mitigation. The WVA models, while widely accepted within Louisiana and the agency community, focus solely on wetland parts of the system. Specifically, they do not consider the value of open water areas, except those within wetland areas, and even then coverage with vegetation is considered the most desirable condition for the ecosystem. This bias results in the non-consideration of either negative or positive effects of a mitigation strategy in non-wetland areas. A good example of this would be the extensive dredging of Sabine Lake.

Non-compliance with Existing State Coastal Zone Management Plans. The removal of 417 +mcy of sediment from the active littoral system of the SNWW area appears to be in contradiction to the Coastal Zone Management Plans of both Texas and Louisiana. Specifically, the DEIS does not adequately address the following plan elements: Texas CZMP Section 501.25 (d), and Louisiana CZMP, Part 1, Section 7, Sections 700-729, Guideline 1.7 (i), Guideline 1.7 (s), Guideline 4.2.

Significance – High:

The removal of 417 $\pm$ mcy of sediment from the active littoral system of a sediment starved environment has very significant long term implications, none of which have been addressed.

Comment Cross-referencing:

(1) Comment: The Plan Formulation as described in DFR section IV appears questionable.

Recommendations for Resolution:

1. Adequate documentation of historical behaviors and littoral processes in the region, as well as an expanded documentation of regional characteristics, sediment characteristics, and climatology, including storms and their impacts on the area. Information obtained should be used to develop a sediment budget and regional sediment management plan for the study area. More specific actions in this area of concern are provided earlier in this Final Comment document.
2. Evaluation of expanded set of alternatives for offshore and beach disposal that returns more sediment to the active littoral system consistent with RSM principles. More specific actions in this area of concern are provided earlier in this Final Comment document.

3. Re-examination of appropriateness of WVA models to evaluate project effects on the ecosystem, given their treatment of open water areas. Justify model(s) selected and include discussion of model limitations and implications.
4. Justify compliance of offshore disposal actions vis-à-vis the Texas and Louisiana Coastal Zone Management Plans.
5. The design alternatives need to properly identify the effect of each alternative on the future channel shoaling and maintenance requirements.
6. Predictions of environmental consequences must be reviewed; the predictions must consider fundamental alterations that the FWP will make in the system.
7. Eliminate reliance upon professional opinion and instead rely on validating assumptions, supporting documentation and provide complete analysis summaries.

USACE Response to Comment 12:

EPR RECOMMENDATION:

1. *Adequate documentation of historical behaviors and littoral processes in the region, as well as an expanded documentation of regional characteristics, sediment characteristics, and climatology, including storms and their impacts on the area. Information obtained should be used to develop a sediment budget and regional sediment management plan for the study area. More specific actions in this area of concern are provided earlier in this Final Comment document.*

DISCUSSION: *The project documents have been revised to include information on historical sediment behavior, regional littoral processes, regional sediment characteristics and a storm surge sensitivity analysis. The results of a Sabine River sediment budget were applied in the analysis. Problems and opportunities related to sediment issues had been addressed throughout alternative evaluation, but the description of this process was improved.*

SWG ACTION TAKEN: *Reports have been revised to include recommended analyses and information in the following locations:*

- *FFR Section VII*
- *FEIS Section Section 2.5.*

EPR RECOMMENDATION:

2. *Evaluation of expanded set of alternatives for offshore and beach disposal that returns more sediment to the active littoral system consistent with RSM principles. More specific actions in this area of concern are provided earlier in this Final Comment document.*

DISCUSSION: *The FEIS and ODMDS FEIS (Appendix B) have been revised to expand the set of alternatives that were considered for the beneficial use of dredged material from the offshore channels.*

SWG ACTION TAKEN: *Reports have been revised to include recommended analyses and information in the following locations:*

- *FEIS Section 2.5.3.1*
- *FEIS, Appendix B Section 2.3.2*

EPR RECOMMENDATION:

3. *Re-examination of appropriateness of WVA models to evaluate project effects on the ecosystem, given their treatment of open water areas. Justify model(s) selected and include discussion of model limitations and implications.*

DISCUSSION *The WVA model is the most appropriate ecological model for the evaluation of the primary impacts of the proposed project. An independent assessment of the WVA model and its use for the SNWW study has been performed (Berger, 2008) and the WVA model has been approved for use in the SNWW application. The WVA Model Assessment (Berger, 2008) determined that the theoretical approaches behind the WVA's Emergent Marsh Community Model, the Swamp Community Model, and the Bottomland Hardwoods Model are valid. The model assessment confirmed that the assumptions of variables are appropriate.*

Furthermore, revisions to the mitigation plan subsequent to the IEPR have reduced the size of the proposed Sabine Lake borrow trench for marsh mitigation by more than half. One-time impacts of this borrow trench are temporary and local, and as such, a new model for the entire project does not need to be developed to address this impact. Impacts to this open water area can be and have been adequately evaluated without modeling, and the impacts have been fully evaluated and disclosed in the report.

SWG ACTION TAKEN: *Reports have been revised to include recommended analyses and information in the following locations:*

- *FEIS Section 3.1.3, and FEIS Section 5.1 have been revised to include a justification for the use of the WVA model, and discuss its limitations regarding evaluation of open water areas.*
- *Clarification of the evaluation and impacts associated with the dedicated dredging in Sabine Lake for the Willow Bayou mitigation has been made in the following locations:*
  - *FEIS, Executive Summary, Aquatic Ecology, page ES-8.*
  - *FEIS Section 4.3.2 (Physiography and Geology), discusses preferred alternative impacts to physiography.*
  - *FEIS, Section 4.4.2 (Water Quality), discusses preferred alternative impacts to water quality.*
  - *FEIS, Section 4.11.2 (Aquatic Ecology-Marine), discusses preferred alternative impacts to aquatic ecology (marine).*
  - *FEIS Section 4.11.2.3.2 discusses preferred alternative impacts to Essential Fish Habitat*
  - *FEIS Section 5.5.1 discusses all effects of the Willow Bayou mitigation areas.*

EPR RECOMMENDATION:

4. *Justify compliance of offshore disposal actions vis-à-vis the Texas and Louisiana Coastal Zone Management Plans.*

DISCUSSION: *This comment is related to the assertions of inadequate evaluation of offshore beneficial use alternatives and regional sediment management concerns. The proposed project is in compliance with the CZMPs. The documents have been revised as needed to include appropriate discussion of offshore disposal alternatives.*

SWG ACTION TAKEN: *The FEIS, Appendix I (Compliance with the Texas and Louisiana Coastal Management Programs) has been reviewed. The proposed project has evaluated a wide array of potential alternatives for beneficial use, and has adopted feasible alternatives to the greatest extent practicable. The SNWW CIP Recommended Plan is fully compliant with the enforceable policies of the Texas and Louisiana coastal management programs.*

EPR RECOMMENDATION:

5. *The design alternatives need to properly identify the effect of each alternative on the future channel shoaling and maintenance requirements.*

DISCUSSION: *The effect of future channel shoaling and maintenance requirements has been evaluated by SWG and minimized to the greatest extent possible by proposed adjustments to advance maintenance. Maintenance quantities for each alternative are compared in FEIS Table 2.3-1.*

SWG ACTION TAKEN: *The documents have been revised in the following locations to properly identify the effect of each alternative on future shoaling and maintenance quantities:*

- *FFR, Section VII Section II.D (Analysis of Sediment-Related Problems and Opportunities) and Section VII.G (Incremental Environmental Impacts and Benefits of the DMMP).*
- *FEIS, Table 2.3-1 (Alternatives Impact Comparison Summary Table), and Sections 2.5.3 and 2.5.4.*

EPR RECOMMENDATION:

6. *Predictions of environmental consequences must be reviewed; the predictions must consider fundamental alterations that the FWP will make in the system.*

DISCUSSION: *None.*

SWG ACTION TAKEN: *Evaluation of environmental consequences has been reviewed. All impacts, including those that make alterations to the estuarine system, are fully disclosed in FEIS Section 4 (Environmental Consequences).*

EPR RECOMMENDATION:

7. *Eliminate reliance upon professional opinion and instead rely on validating assumptions, supporting documentation and provide complete analysis summaries.*

DISCUSSION: *While we strive to the highest feasible level of validation and documentation, SWG must balance the amount and rigor of supporting scientific analysis, the risks of the proposed actions, and the cost and time required to prepare the report.*

It is neither possible nor advantageous to completely eliminate reliance on professional opinion. Field data has been used to validate assumptions to the greatest extent possible given time, money and scientific constraints. When the overall costs of obtaining supporting data would be exorbitant, the time required to obtain statistically valid data would be too long, or the means to obtain supporting data has yet to be developed, then the observations and expertise of resource agency experts with direct experience in the study area were used to make impact assessments. The involvement of these resource agency experts is required by regulation and policy, and is supported by recent guidance requiring collaborative planning. Furthermore, this approach is specifically allowed by CEQ regulations if qualifying statements regarding incomplete or unavailable data are provided in the report.

SWG ACTION TAKEN: *The FFR and FEIS has been reviewed to ensure that qualifying statements regarding incomplete or unavailable information are included as appropriate throughout the reports. Summaries of reports and analyses have already been included in the FFR and FEIS to the greatest extent possible. In an effort to keep the decision documents a reasonable length, supporting reports and analyses have been made available for review by posting them on the SWG website (http://www.swg.usace.army.mil):*

Panel BackCheck Response to Comment 12, #1:

1. **Concur**. The Corps response indicates that the project documents were revised to include additional information on historical sediment behavior, regional sediment characteristics, regional littoral processes, and a storm surge sensitivity analysis. This should represent an improvement in the project documents. However, the Corps response gives no indication of any changes or impacts resulting from this additional information on the proposed project or the selected alternatives, and it is not evident that there is adequate focus on a true regional management plan.

USACE Response to Panel BackCheck Response to Comment 12, #1:

Do Not Concur. The disposal of approximately 420 mcy of sediment remains a concern, and the Corps response to this recommendation is incomplete. While it is recognized that least-cost actions may be desirable or mandated, there appears to be under appreciation of sediment as a very valuable resource as well as the continuing need, as stated above, to build long-term approaches into regional management with high emphasis on sediment budget considerations. With no indication of what additional alternatives were considered, how they were evaluated, and what changes, if any, were made to the project plan to reduce the placement of 400+ mcy of dredged material offshore makes it impossible to evaluate the actions taken. One can only assume that the project plan remains the same as originally proposed.

USACE Revised Response to Panel BackCheck Response to Comment 12, #1:

Concur.

The following information is provided as additional background discussion for the IEPR panel:

We concur that the development and consideration of additional BU alternatives for the offshore dredged material was warranted. The FEIS and ODMDS FEIS (Appendix B) presented for IEPR Backcheck included an expanded set of alternatives that were considered for the beneficial use of dredged material from the offshore channels. To facilitate IEPR Backcheck, report sections discussing the added alternatives are provided verbatim below. USACE does appreciate the value of sediment as a regional resource, and that is why extensive efforts were made to identify and fully evaluate BU opportunities throughout the study. Although new offshore BU alternatives were developed and analyzed, the IEPR recommendation to adopt additional BU measures was not adopted. The recommended plan remained the same because no sponsor has been identified to share the incremental cost of the BU features that were determined to be feasible and implementable, as discussed in the sections below.

FEIS Section 2.5.3.1

Several features were evaluated that would return sediment normally placed in upland PAs or ODMDSs to the littoral zone. Conceptual plans were developed for shore nourishment at Texas and Louisiana Points using new work material from Section 5 or sections 5 and 6 of the Sabine Pass Channel. The features were found to be feasible but cost $6.6 and $19.5 million, respectively, more than upland placement in PA 5. Stockpiling dredged material in ODMDS 4 for later use was also investigated. Like all other SNWW ODMDSs, material placed at this site disperses quickly after placement. Although it is closest to shore, the dispersed material in ODMDS 4 is not likely to migrate into the littoral zone because it is located beyond the depth of closure. It is expected that any material stockpiled within ODMDS 4 would be unavailable for use within 3 months of placement. Since stockpiling assumes that the beneficial use need will not be immediate or short term, it was concluded that this feature is not a viable alternative. Transporting and discharging coarser-grained sediments from the new work dredging of the Extension Channel (Stations 117+000 to 146+000) into the littoral zone offshore of Texas or Louisiana Point was also evaluated. A hopper dredge with pump-out capability could be used to dredge the channel, move as close as possible to shore, and pump the material via a connecting pipeline to a discharge point within the 14-foot-depth contour. Discharging the material at or inshore of the depth of closure should guarantee the reintroduction of sediments within the littoral zone, where natural processes will beneficially distribute the sediments. It is estimated that the incremental cost of this action would be about $86.3 million. While feasible, this BU feature is much more costly than placement in the proposed ODMDS B and C. No sponsor has been identified to share the incremental cost of the feasible BU features discussed above.

FEIS Appendix B, Section 2.3.2.2

As a Regional Sediment Management (RSM) measure, two alternatives were considered potentially viable for utilizing the approximately 9.9 mcy of the coarser grained sediments to be generated by the New Work dredging of Sections "B" and "C" of the Extension Channel (or between Stations 114+000 to 150+500) to produce regional benefits. The two alternatives included (1) the transport and stockpiling of the coarser grained dredged sediments at ODMDS 4 (see Figure 2-2) for future beneficial use; and (2) the transport and discharge of the coarser grained dredged sediments into the littoral zone offshore of Texas Point.

2.3.2.2.1 RSM Stockpiling Alternative

ODMDS 4 is the nearest existing ODMDS to Texas Point and has been designated by EPA to receive maintenance dredged material from the SNWW Entrance Channel. ODMDS 4 is classified as a dispersive site and is located beyond the depth of closure (approximately –19 feet mean lower low water [MLLW]); therefore, any appreciable accumulation of dredged material placed within the site is typically short term, and the dispersed material would not migrate into the littoral zone to add to the sediment budget. The stockpiling of dredged material within the aquatic environment for future beneficial use is effective only if significant quantities of the stockpiled material remain in place for rehandling as the need arises. Stockpiling assumes that the beneficial use need would not be immediate but may be required beyond the foreseeable future, which may be defined as a period greater than 3 months. It is expected that a substantial amount of material, if stockpiled within ODMDS 4, would have dispersed within a period of three months. It was therefore concluded that stockpiling dredged material within ODMDS 4 is not a viable RSM alternative.

2.3.2.2.2 RSM Littoral Zone Discharge Alternative

This alternative entails the transport by hopper dredge of sediments dredged from Sections "B" and "C" of the Extension Channel to an upstream point adjacent to ODMDS 4 (approximately at

Station 3+000 or roughly ½ mile beyond the outer end of the jetties). The average one-way transport distance from Sections "B" and "C" of the Extension Channel to Station 3+000 ranges from 21 to 28 miles. Upon arrival at Station 3+000, the hopper dredge would pump out the dredged material via a connecting pipeline to a discharge point located on, or inshore of, the 14-foot depth contour offshore of the Texas Point shoreline, a pump distance of approximately 3 miles from Station 3+000. Discharging the material at or inshore of the 14-foot depth contour should guarantee the reintroduction of sediments within the littoral zone, where natural processes would beneficially distribute the sediments. The incremental cost to transport and pump approximately 9.9 mcy of dredged material within the littoral zone via a hopper dredge with pump out capabilities is estimated to be $86.7 million at October 2005 price levels and based on a fuel price assumption of $2.05 per gallon. The incremental cost for this RSM alternative would not be a project cost, and therefore would not be federally cost-shared, if implemented.

Panel BackCheck Response to Comment 12, #2-6, Continued:

2. **Concur.** The work referenced in Berger (2008) is a position addition to the assessment process for the WVA model, and the arguments for the validity in terms of emergent marsh, swamp, and bottomland hardwood seem appropriate. However, cumulative impacts offshore, which have not been modeled, remain a concern.
3. **Concur**. The reevaluation from the FEIS appears to indicate that compliance with the Texas and Louisiana Coastal Management Programs has been addressed.
4. **Concur**. No comments.
5. **Concur**. The environmental consequences are given a more thorough treatment in this DEIS.
6. **Do Not Concur**. There is still too much reliance on information costing too much as an excuse to rely on in-house professional opinion. There is not disagreement about the use of, and dependence upon, the experience of resource agency experts in reaching opinions and decisions. The IEPR Panel understands the issues of time and cost, and the need for balance in achieving answers. However, the default position, barring extenuating circumstances, must always be that analysis really needs to be driven by data with modern scientific methods.

USACE Revised Response to Panel BackCheck Response to Comment 12, #6:

Concur.

The following information is provided as additional background discussion for the IEPR panel:

SWG agrees that analysis needs to be data driven and utilize the best available scientific and technical information, as was done for the SNWW Feasiblity Study and EIS. We did not use the cost of acquiring data as an excuse to rely upon in-house professional opinion; rather, we conducted field studies and data collection to greatest extent possible given time and funding constraints, and relied upon other resource agency experts to augment in-house staff and provide independent data to the extent necessary to provide a credible scientific analysis. These efforts are documented in the FEIS.

Panel Revised BackCheck Response to Comment 12, #1, #6:

No comments.

Comment 13:

Wave transformation and sediment transport processes are inadequately evaluated using STWAVE and GENESIS models

Basis for Comment:

STWAVE and GENESIS are well-known, widely-used models that represent state of the practice in forecast modeling. However, little information is provided on the specifics of the model applications, and results are presented in a general summary format that is unacceptable. As presented, applications have not shown that the models are providing accurate information that will answer the fundamental questions about shoreline impacts due to channel modifications in the SNWW. Specific areas of deficiency include:

Model Assumptions. Assumptions and potential limitations in the application of STWAVE and GENESIS models have not been presented. Two offshore features, Sabine Bank and a prominent asymmetric bulge at 15 ft, add bathymetric complexity and significant challenges to the modeling effort. How robust are the models in this particular environment? What is the uncertainty in calculations? How sensitive is STWAVE to modest inaccuracies in bathymetry, and is the node size appropriate to capture the important bathymetric changes, including those at the shoreline. What are the implications of using 70-year old (1937) surveys to "fill gaps" in the bathymetry? How well does STWAVE handle dissipation over a relatively fine-grained, as opposed to sandy, substrate? The above information must be included in the Engineering Appendix so that the description of the study is not only rigorous but fully accessible.

Input Conditions. The 30 unique input conditions with different combinations of wave period and wave angle appear to have been run with a single input height of 1 m. This may be reasonable for fair-weather conditions at the 20 m outer edge of the study grid, but the single height fails to take into account storm waves. The northern Gulf of Mexico is subjected to ~15 cold fronts each winter that have associated wave heights much greater than the input wave. In developing the combinations of wave angle and period, the wave data were analyzed in angle bands (±5, 25, 90 degrees) symmetrically distributed about the shore normal azimuth from which mean direction and period values were derived from a 10-yr record of hindcast data. The angles of wave approach used for each of the sectors bounded by these angles were ±0, 15, 40 degrees relative to the shore normal. The results of this analysis are thus highly questionable because 1) the angular sectors that were used are relatively coarse, effectively two for each 90 degree quadrant on each side of the shore normal, 2) the sectors are not uniform which, when combined with the small number of sectors used, provides only a crude approximation of the actual wave climatology, and 3) the rate at which sediment is transported alongshore is very sensitive to angle of wave approach, particularly around the angle of 45 degrees.

Significance – Medium:

Given that the final combined output after running both models is determination of shoreline erosion and accretion, which in turn is transmitted through the DEIS as one of the environmental impacts, it is essential to have confidence that the numbers are correct. The level of confidence that the models have provided credible predictions of shoreline erosion and accretion, is low at the present time.

Comment Cross-referencing:

(14) Comment: Risk and uncertainty are mostly ignored.

Recommendations for Resolution:

The following steps need to be taken in order to provide the necessary level of background and credibility for the effective application of STWAVE and GENESIS.

1. Model assumptions and potential limitations in application must be clearly stated, together with an assessment of the impact of assumptions, simplifications and/or other model shortcomings. Uncertainty and sensitivity must be fully evaluated.
2. Model input scenarios must be re-evaluated and models re-run with particular reference to the role of storms, angle of wave approach, the influence of the 4.1 mile long jetties, and provisions in STWAVE for frictional effects that arise from the muddy offshore conditions.
3. Model output must be reconciled with shoreline features on the Texas side that indicate localized transport to the east. An expanded and more rigorous examination of littoral processes, including a sediment budget for the study area, must be undertaken.
4. Model results from STWAVE and GENESIS must be placed in a probabilistic or risk-based context as opposed to a simple deterministic framework. Effective application of results from these models will require that long-term fate of offshore ODMP material over the 50-yr life of the project be evaluated using LTFATE and incorporated into a sediment budget.

USACE Response to Comment 13:

EPR RECOMMENDATION:

1. *Model assumptions and potential limitations in application must be clearly stated, together with an assessment of the impact of assumptions, simplifications and/or other model shortcomings. Uncertainty and sensitivity must be fully evaluated.*
2. *Model input scenarios must be re-evaluated and models re-run with particular reference to the role of storms, angle of wave approach, the influence of the 4.1 mile long jetties, and provisions in STWAVE for frictional effects that arise from the muddy offshore conditions.*

DISCUSSION: *The modeling effort as originally conducted is fully defensible. ERDC has prepared a defense of the original modeling studies (Wamsley, 2008). It is too lengthy to reproduce in this document but is available for review on the SWG website (http://www.swg.usace.army.mil). The STWAVE/GENESIS modeling is adequate for identifying the potential impacts for which it was intended, specifically the wave-induced impacts on the adjacent shorelines due to potential changes in wave refraction and shoaling patterns. The modeling adequately and appropriately assessed the role of storms, the angle of wave approach, and frictional effects of offshore sediments. The jetties were deliberately not included in the modeling to maximize the wave refraction and shoaling influence of the proposed channel deepening, and thus provide a conservatively high estimate of the potential shoreline impacts. Uncertainty and sensitivity assessments cannot be produced by these models, but the need to perform a risk assessment is low because the impacts predicted by the modeling are very small. Applying a risk-based type of analysis would only yield order of magnitude variability within*

these extremely conservative minor results, which would add no additional practical value and could not be expected to change the specific STWAVE/GENESIS study conclusions.

SWG ACTION TAKEN: *The modeling report was not revised. The ERDC defense of these modeling efforts is available for review on the SWG website (http://www.swg.usace.army.mil).*

EPR RECOMMENDATION:

3. *Model output must be reconciled with shoreline features on the Texas side that indicate localized transport to the east. An expanded and more rigorous examination of littoral processes, including a sediment budget for the study area, must be undertaken.*

DISCUSSION: *None*

SWG ACTION TAKEN: *Reports have been revised to include recommended analyses and information in the following locations:*

- *FFR Sections VII.C (Existing Shoaling and Sediment Transport Conditions)*
- *FFR Section VII.D (Analysis of Sediment-Related Problems and Opportunities)*
- *FEIS Section 2.5 (Evaluation of Alternatives for Dredged Material Management)*

EPR RECOMMENDATION:

4. *Model results from STWAVE and GENESIS must be placed in a probabilistic or risk-based context as opposed to a simple deterministic framework. Effective application of results from these models will require that long-term fate of offshore ODMP material over the 50-yr life of the project be evaluated using LTFATE and incorporated into a sediment budget.*

DISCUSSION: *As presently developed and applied, placing STWAVE and GENESIS results into a risk-based context would require significant additional effort. Such additional work is not warranted, would not add practical value, and could not be expected to change the specific STWAVE/GENESIS study conclusions. The models calculated insignificant changes in the waves and longshore sediment transport rates within the study area. It is important to note that the STWAVE/GENESIS analysis was extremely conservative in nature and, as performed, the analysis overestimates any wave-induced impacts to the shoreline as a result of the channel deepening. As previously stated, the results are conservative since the wave dissipation due to the presence of mud and the sheltering effect of the jetties was purposely not included. Applying a risk-based type of analysis would only yield order of magnitude variability within these extremely conservative minor results.*

The model LTFATE can predict the rate and direction at which material would leave the immediate disposal site. However, it is well documented that the offshore disposal sites are dispersive, with transport predominantly to the south and west. The distance from shore of the current and proposed sites is such that material placed there is not expected to significantly enter the littoral zone. As such, it is not reasonable to expect that the model could be used to track material movement over hundreds of square miles to determine the small percentage that may affect the littoral zone. The Regional Sediment Management analysis in the FEIS has adequately evaluated the effect of the proposed project on the littoral zone.

SWG ACTION TAKEN: *The modeling report has not been revised and no additional modeling has been conducted.*

Panel BackCheck Response to Comment 13:

1. **Non-Concur**. The IEPR Panel previously identified inconsistencies and inadequacies in the STWAVE and GENESIS analyses. The District requested a response from ERDC. The response to the District from CHL stated "However, as suggested in EPR Comment 12, this [the STWAVE and GENESIS analysis] does not represent the comprehensive or complete analyses required to address this issue." Although this response does not satisfy the Panel's concerns that a more thorough analysis is needed, the comments about the complexity of coastal processes that have followed demonstrates a much better understanding of the coastal system than previously indicated in the draft reports.

USACE Response to Panel BackCheck Response to Comment 13, #1:

The "Galveston District Information Request to Comment 13A" on pages 5 and 6 of the Wamsley 2008 Memorandum (see attachment for full document) includes a detailed response to the original recommendations of the IEPR panel. Key model assumptions listed are the following:

STWAVE Model Assumptions:

- *Mild bottom slope and negligible wave refraction*
- *Spatially homogeneous offshore wave conditions*
- *Steady-state waves, currents, and winds*
- *Linear refraction and shoaling*
- *Depth-uniform coefficient*
- *Bottom friction is neglected*

GENESIS Model Assumptions:

- *Arbitrary but constant or unvarying beach profile shape*
- *Constant landward and seaward limits of beach profile movement (average berm elevation and depth of closure)*
- *Accretion and erosion are represented by a seaward and landward translation of the beach profile*
- *Sand transport is caused by waves breaking at an oblique angle to the shoreline*
- *Detailed nearshore circulation in the vicinity of coastal structures is ignored*

The review suggested that two offshore features, Sabine Bank and a prominent asymmetric bulge at 15 ft depth, add bathymetric complexity and significant challenges to the modeling effort. Although we agree that the mentioned bathymetric features are significant, both are well resolved with the 160 ft (48.8 m) square grid cell resolution used in this application of STWAVE and neither poses any significant challenge for the wave transformation calculations made by STWAVE.

STWAVE was used in this study to obtain estimates of wave transformation from the nominal 66 ft (20 m) contour to just prior to breaking (approximate 15 ft contour) for most wave conditions. Wave dissipation was not expected to be a significant factor in this analysis. It was recognized that a muddy seabed has the potential to increase wave dissipation compared to sandy bottoms. However, to determine the extent of dissipation and to include it in any type of realistic manner would require a major field data collection effort and greatly increase the cost of the study. This was clearly not justified. Including dissipation during wave transformation will reduce surfzone wave heights and longshore sediment transport rates. Thus including

dissipation will reduce the effect of wave refraction modifications due to changes in the channel bathymetry and reduce the already minor channel impacts on the adjacent shorelines. Thus, not including dissipation provided a conservative estimate of the potential shoreline impacts and was a justified approach.

Page 7 and tables on pages 8 and 9 address sensitivity analysis related to wave angle diffraction. In this analysis the coarsest band was divided into 5 sub bins and there was minimal change in wave refraction results using the finer resolution angle bands.

Panel BackCheck Response to Comment 13, Continued:

2. **Non-Concur**. The overarching statement that the models are "fully defensible" (with thus no attempt to revise the effort in any way) is in part predicated on the notion that the modeling shows low impacts and therefore further work is simply not warranted. This presupposes that the modeling work is in fact getting the right answers. We recognize that the publication that was recently prepared (Wamsley, 2008) provides an important addition and justification to the modeling effort. However, it is still not clear how the role of storms and angle of wave approach have been adequately addressed in the modeling runs. Moreover, there are lingering questions about bathymetric complexity at the project site and, while rationale for removal of the jetties and not including dissipation due to the presence of mud in the modeling efforts may (or may not) be acceptable, it is important to note that modeling efforts will always have shortcomings. Thus, modeling conditions must represent insofar as possible what exists at the project site in order to obtain meaningful responses. Finally, the incorporation of sensitivity analysis techniques in the evaluation and interpretation of model results is commonly used and would have been of great benefit to this project. Such an analysis is not to be confused with a risk based approach, which is not practical here.

USACE Response to Panel BackCheck Response to Comment 13, #2:

In STWAVE 30 unique input conditions were run with a single input height of 1 meter to produce a transformation coefficient and estimates and nearshore wave angle. However, in Genesis offshore wave heights over a 10-yr record of hindcast were statistically analyzed and transformed into nearshore wave heights using the transformation coefficient from STWAVE. Similarly, the wave angles of all waves in the 10-yr record were statistically analyzed. Under the "Input Conditions" section on page 6 of the Wamsley 2008 memorandum, this process is described in detail. The jetties were intentionally omitted from the STWAVE study in order to "provide a conservative estimate of potential shore line impacts." However, a gated (groin) boundary condition was applied in GENESIS at the inlet. Implementation of this boundary condition results in no sand transport across the jetties. Wave dissipation was not expected to be a significant factor in this analysis and thus frictional effects from muddy offshore conditions were not included as part of the analysis. Refer to the USACE Backcheck Response to Comment 13, #1 on why this rational is appropriate.

The IEPR Backcheck comment for Item 2 brings up sensitivity analysis techniques. This is addressed in the USACE Backcheck Response to Comment 13, #1.

Panel BackCheck Response to Comment 13, Continued:

3. **Concur.** This appears to have been adequately addressed and should help reconcile modeling work with shoreline features.
4. **Concur**. These appear to be acceptable arguments for not moving forward with risk-based assessment.

Panel Revised BackCheck Response to Comment 13:

1. Non-Concur:

Upon review of ERDC's technical response to the IEPR's original comments we find no substantial basis for changing the IEPR's position of Non-Concurrence on this issue. The fact remains that a major estuarine tidal entrance was subjected to a relatively superficial investigation of expected impacts due to the proposed channel deepening project. This is a stabilized inlet with a 4.1 mile long jetty in an area of the Gulf of Mexico characterized by subaqueous soils having significant amounts of cohesive muds and a high incidence of tropical storms and hurricanes. This together with the placement of over 4 million cubic yards of dredged material in existing and newly created offshore disposal areas in close proximity to the entrance channel demands a much more rigorous examination.

Deficiencies in the analysis that remain of concern to the IEPR include:

1. No modeling of tidal currents and surface water elevations was performed in the project vicinity to establish conditions having a direct impact on wave refraction, wave steepening and breaking and therefore a potentially significant indirect impact on shoreline response.
2. No effort was made to include in the analysis the effects of changed offshore bathymetry on wave refraction and shoaling due to the placement of dredged material. The analysis should have included both pre and post placement effects on the sediment transport.
3. The manner in which the STWAVE model was used did not take full advantage of the model's capabilities nor did it adequately represent conditions influencing shoreline response in the presence of the proposed project. STWAVE includes wave steepening and wave breaking, which are particularly relevant during periods of storm activity. In these conditions the use of a unit wave height is inadequate.
4. The use of three angles of wave incidence in the STWAVE model is also inadequate. ERDC argues that tests made with a higher resolution of wave angel incidence showed negligible differences in wave shoaling and refraction in terms of wave height and angle of approach the broad angular sector used in the model. However, the comparison made used the composite average of five angular sectors of 11 degrees each totaling 55 degrees to corresponding values obtained using one angular sector of 65 degrees. It should also be pointed out that each sector had its own assigned values of wave occurrence and bottom bathymetry. Moreover, the total angle of the five subset angular sectors was ten degrees less than the single sector used in the model. The fact that the averages obtained for wave height and wave angle of approach for the five sectors were close to the corresponding values for a single sector whose total angular value exceeded the composited five sectors by ten degrees or eighteen percent suggests that the comparison used to justify the use of the single sector was meaningless. Additionally, averaging the five sectors violates the

unique statistics of wave occurrence in each sector.

5. The justification to omit the existing jetty in the STWAVE modeling so that the effects of the deepened channel on shoreline response could be isolated is very difficult to understand. The presence of the jetty is a fact. It has a significant impact on area wave characteristics and shoreline stability without the channel deepening and it will have a significant impact on these same parameters with the channel deepening. To assume that the change in impacts would be the same with the jetty is not justifiable. As noted in 2 above, the dredged material disposal mounds should also have been incorporated in some way to demonstrate the difference between the before and after conditions.

2. Non-Concur: Based upon the expanded comments presented in 1 above the IEPR considers its previous responses to this Recommendation for Resolution to be appropriate.

Comment 14:

Risk and uncertainty are mostly ignored

Basis for Comment:

The plan formulation, engineering analyses, environmental assessments, and economic evaluations largely ignore the impact of uncertainty in underlying assumptions, models, and parameter values on the validity of the study conclusions. Risk and uncertainty considerations are mandated by the Chief's 12 Actions for Change.

Risk and uncertainty considerations may substantially affect the conclusions drawn by the study but are not systematically addressed. A critical weakness of the report is the lack of examination of the inherent risks and uncertainties of projections. The report and the analyses on which conclusions are based are principally reasoned from best estimates of models and parameter values. In some cases, positive benefit/cost projections are within the window of uncertainty and could easily become negative if adverse outcomes of the uncertainties are realized.

The economics sections lack meaningful sensitivity analysis, leaving the reliability of the findings in doubt. The current report falls critically short on sensitivity analysis. A major report weakness is the lack of examination of the inherent risks and uncertainties in projections. Sensitivity analysis is the appropriate vehicle for risk analyses, yet the sensitivity analysis in the Draft Feasibility Report and in the Economic Appendix is minimal.

The benefits estimates are based on numerous assumptions regarding commodity outlook, vessel fleets, vessel utilization, delay reductions, and other factors. USACE must determine the sensitivity of the benefit estimates (and thus the BCR) to each assumption and convention – otherwise it is not clear which are major factors and which are minor. Without a thorough sensitivity analysis the benefits estimate must be regarded as fragile and risky.

Sensitivity analysis also provides a means to identify critical variables or inputs. Where the project justification (e.g. the BCR) is found to be sensitive to key inputs, those inputs should be subjected to additional analysis and the sensitivities acknowledged. For instance:

- The Sensitivity Analysis for crude petroleum forecasts is not adequate as presented. The forecast numbers shown in DFR Table 100 do not match the forecast growth rates in DFR Table 26, and there is no explanation of the difference. The alternative forecast examined is a different U.S. forecast (actually an arbitrary midpoint of two forecasts, which minimizes the potential difference from the project forecast), not an alternate SNWW forecast. Moreover, the sensitivity analysis does not discuss the sensitivity of the benefits estimate to the crude import forecast.
- The LNG forecast is a prime example. There is a brief sensitivity analysis showing that the benefit/cost ratio is *very* sensitive to the LNG forecast. Yet the analysis does not delve further into the LNG outlook or examine the sensitivity to issues such as LNG vessel design.

Basis for Comment (Continued)

There is no sensitivity analysis of:

- Port commodity shares;

- Commodity forecasts from other sources;
- Future vessel specifications;
- Estimates of draft-constrained commodity shares;
- Estimates of post-project vessel loading;
- Estimates of time saved; or
- Pilots' passing and meeting rules or the prohibition on nighttime operations.

As a concrete example, the average annual savings for turning basin deepening is based on the midpoint of an un-weighted average of unverified ranges of time savings whose sole source is an email from the Pilots' Association. According to the spreadsheet the average annual savings are $8,967,354. If the average time savings were an hour less, the average annual savings would decline by $919,729 and the savings over the project life would decline by $17,120,058 or 10%. The project benefits and thus the BCR are clearly sensitive to this estimate of time savings, yet there is no indication of efforts to cross-check the estimates given in the Pilots' Association email or any sensitivity analysis.

Lack of consideration of uncertainties in hydraulic and other engineering modeling. The modeling of Gulf shoreline impacts, for example, used STWAVE to investigate the wave field offshore the entrance to the channel, and evaluated alternative channel modifications on adjacent shorelines due to waves and sediment transport. STWAVE is a well-known model that has been widely used and calibrated in the Gulf. The GENESIS sediment transport model was used to translate STWAVE output to coastal impacts. This is solid, state of practice modeling, but does not involve significant sensitivity analysis or risk and uncertainty calculations. Thus, the output can be seen as best estimates based on current information and conditions, but not the range of possible outcomes. The qualitative patterns of impact generated by the pair of models is likely to be as good a forecast as is possible without more detailed, design level data and further calculations.

Uncertainty about environmental consequences of dredging and sedimentation. The predictions of environmental consequences convey a false sense of certainty that is not supported by empirical data or the assumptions used. The primary way the system has been altered to this point is by hydrological modification that has affected, among other things, salinity distribution and the plant and animal communities so affected. The FWP will make addition fundamental alterations in that regard. Furthermore, likely environmental changes in the future (sea-level rise and potentially reduced precipitation and streamflow) may profoundly complicate the effects of the new geometry created by the CIP. These changes add to the aforementioned limitations to the modeling methodology and its assumptions and thereby create considerable uncertainty of the environmental consequences of the CIP that are not acknowledged in this section.

Significance – High:

The lack of risk and uncertainty considerations in plan formulation and economic and engineering modeling throws the whole conclusions of the study into questions, as variations in model and parameter assumptions from those best estimates used in the analysis may fundamentally change the conclusions. Also, the present DFR is non-conforming to current USACE guidance on the incorporation of R&U.

Comment Cross-referencing:

(11) Comment: Need to conform to post-Katrina changes in policy and to incorporate changes in scientific understanding of the Gulf Coast.

(13) Comment: Wave transformation and sediment transport processes are inadequately evaluated using STWAVE and GENESIS models.

(17) Comment: The analysis and conclusions are based on what appears to be over-reliance on the pilots or at least a lack of documentation of their opinions

(18) Comment: The prediction of salinity changes and their impact on plant and animal communities conveys a false sense of certainty about future conditions that result from cumulative impacts and physiographic and climatic changes that may take place over the project life.

Recommendations for Resolution:

To resolve the concerns described above, the reports would need to include:

1. At a minimum, sensitivity analyses of major modeling assumptions.
2. Better, uncertainty analysis using error propagation or Monte Carlo simulation of all important engineering, environmental, and economic forecasts.
3. Evaluation of the impact of the uncertainties in forecasts on chosen plan alternative and performance predictions.

USACE Response to Comment 14:

1. *At a minimum, sensitivity analyses of major modeling assumptions.*
2. *Better, uncertainty analysis using error propagation or Monte Carlo simulation of all important engineering, environmental, and economic forecasts.*
3. *Evaluation of the impact of the uncertainties in forecasts on chosen plan alternative and performance predictions.*

DISCUSSION: *Risk and uncertainty were considered throughout the performance of this study and the decision documents have been revised to more thoroughly document these analyses. The need for formal Monte Carlo simulations was evaluated, but it was determined that sensitivity analyses would be sufficient for evaluation of the impact of uncertainties on alternative selection and impact predictions. Sensitivity analyses have been performed for the economic benefit calculations, HS modeling of deepening impacts, including a sensitivity analysis of the affect of RSLR on shoaling rates (Brown and Stokes, 2009), effects of a range of RSLR predictions on project design considerations and environmental impacts, WVA modeling assumptions on salinity and marsh cover, and cost risk analyses.*

The FFR and Final Economic Appendix contain several sensitivity analyses. The sensitivity analysis of tonnage predictions holds tonnage constant at 2003-2005 levels. The results of this sensitivity analysis are contained in the BCR summary tables. In the Economic Appendix, the sensitivity of the modeling assumptions has been better outlined. It is presently stated in the FFR and Appendix 2 that future conditions are based on improved utilization of the existing fleet range. Other sensitivities, such as limiting the improved utilization of light-loaded vessels have been added. Additionally, an overall larger transition to larger vessels has been evaluated. The latter may, in fact, more accurately represent the historical trend.

The STWAVE/GENESIS modeling study showed that the proposed project has an extremely minimal impact on the wave-induced shoreline dynamics. The STWAVE/GENESIS application was extremely conservative and overestimates expected wave-induced changes. A wide range of wave conditions representing the wave climate was simulated. Impacts are extremely small in all cases, and small even though extremely conservative assumptions were made regarding wave dissipation to mud and wave sheltering due to the jetties. Applying a risk-based type of analysis would only yield order of magnitude variability within these extremely conservative minor results, which would add no additional practical value and could not be expected to change the specific STWAVE/GENESIS study conclusions.

For uncertainty in environmental consequences, the FEIS has been revised to acknowledge uncertainties in impact predictions as they relate to with-project salinity impacts on plant and animal communities.

***SWG ACTION TAKEN**: In response to the comments, the documents were revised as follows:*

- *Sensitivity analyses will not be performed for the ERDC modeling studies (STWAVE and GENESIS) because the studies were appropriately done and the predicted impacts are too small to warrant additional analysis.*
- *FFR Section IX summarizes evaluations of uncertainty and results of sensitivity analyses for all technical engineering and environmental studies.*
- *FFR, Appendix 2 (Economics), Section 8.0 presents sensitivity analyses conducted for the economic analysis.*
- *FEIS Section 4.2 summarizes sensitivity analyses conducted for significant WVA variables, and FEIS Appendix C Section 9 presents the detailed analyses.*
- *A new mitigation monitoring and contingency plan has been added as FEIS Appendix J that incorporates adaptive planning and management tools.*

Panel BackCheck Response to Comment 14:

Based on materials and time available for review, Non-Concur.

Regarding STWAVE/GENSIS analysis. The response that "Sensitivity analyses will not be performed for the ERDC modeling studies (STWAVE and GENESIS) because the studies were appropriately done … ," is non-responsive to the concern. The IEPR Panel presumed that the analyses were appropriately done. The question is "how seriously do uncertainties in assumptions and parameters affect the predictions coming out of that analysis?" See, also, Panel Backcheck Response to Comment 13(1).

USACE Response to Panel BackCheck Response to Comment 14:

Non-Concur.

Refer to sensitivity discussion in the USACE response to Backcheck Comment 13.

Panel Revised BackCheck Response to Comment 14:
Concur with comment. **Some level of sensitivity analyses was done on the STWAVE/GENEIS analyses, at least concerning wave angle diffraction. More could probably have been done to understand the impact of other assumptions and uncertainties in the modeling, but wave angle is argued to be the most important of these sensitivities.**
Panel BackCheck Response to Comment 14, Continued:
Concur. Regarding FFR and WVA analysis.

Comment 15:

The presentation of data in maps, figures, and tables needs to be substantially improved

Basis for Comment:

The DFR, DEIS, and engineering and environmental appendices include detailed spatial and temporal information. It is critical that these reports be supplemented by very high quality maps, graphics, quantitative charts, and easily understood tables. At present, this is not the case. Given the availability of CAD-GIS technology and other computer-enhanced graphics, it should be expected that data be clearly and well presented.

More and better maps are needed to show and explain data and predictions. The DFR and DEIS fundamentally treat geographic data, and these cannot be understood by most readers in purely text formats. Given the ready access to GIS, CAD, and other graphic capabilities, there seems reason to expect that these reports would be well supported by such maps and graphics, and yet that is not the case at present. The EPR panel was of the opinion that better maps are especially needed in order to clearly communicate technical issues and plans.

For example, there was a general frustration about the lack of clear maps and diagrams keyed to the geographic features and operational issues mentioned in the economic analyses: none of the maps show the Port Arthur or Beaumont port facilities; the various turning basins are not shown on any of the maps; the vessel limitations of Taylors Bayou are mentioned in several places but there are no maps or diagrams; the various channel width restrictions are not shown in a clear fashion on any of the maps..

The report lacks clear diagrams keyed to the geographic features and operational issues mentioned in the economic analyses. The existing maps and diagrams are inadequate and require improvement in detail and clarity. Several of the critical ports are not even identified or presented on those maps.

- None of the maps show the Port Arthur or Beaumont port facilities.
- The various turning basins are not shown on any of the maps.
- The vessel limitations of Taylors Bayou are mentioned in several places but there are no maps or diagrams.
- The various channel width restrictions are not shown in a clear fashion on any of the maps.

Most of the maps provided appear to have been prepared for the dredging and spoils disposal plans and are not very useful for understanding SNWW vessel movements or plan features.

Improved and more clearly organized data tables are needed throughout the documents. Many existing tables also require sourcing so that the origin of the data presented can be identified. Many tables are presented without a clear description of how the data were derived or where the data originated.

Significance – Medium:

The public and other stakeholders will not be able to understand technical descriptions and forecasts in the absence of high quality maps and graphics.

Comment Cross-referencing:

(1) Comment: The Plan Formulation as described in DFR section IV appears questionable.

(5) Comment: There is no comprehensive description of existing vessel operations.

Recommendations for Resolution:

1. Many more and better maps are needed throughout all the documents.
2. More and more clearly laid out data tables are needed to portray information.

USACE Response to Comment 15:

EPR RECOMMENDATION:

1. Many more and better maps are needed throughout all the documents.

DISCUSSION: *None.*

SWG ACTION TAKEN: *Maps in the FFR and FEIS have all been revised to better identify the aspects of the project being discussed in the text.*

EPR RECOMMENDATION:

2. More and more clearly laid out data tables are needed to portray information.

DISCUSSION: *None.*

SWG ACTION TAKEN: *FFR and FEIS tables have been reviewed and revised accordingly.*

Panel BackCheck Response to Comment 15:

Concur.

The USACE appears to have satisfactorily addressed the comment. The IEPR panel has not seen the revisions that USACE comments indicate will be or have been made to address the panel's Comment. The panel's response of "Concur" is provided assuming that the revisions are made as indicated.

Comment 16:

The report needs an extensive editorial review and detailed copy-editing.

Basis for Comment:

Many sections of the DFR, DEIS, and their appendices are desperately in need of copy editing. Large sections of text are repeated *verbatim* in separate parts of the reports, and clarity could be importantly increased by changes to English usage.

Much of the report and appendices is poorly written and redundant. Writing by committee is unfortunately part of such a study (and well understood by the EPR panel), but a serious editing must be undertaken before being released to the public. The editing would also have made the review easier. A brief outline of the Economic Appendix, early in the General section would improve the presentation. Also, the General section is really an Executive Summary and could be identified as such. Otherwise it appears as if many unsupported statements are being made when this review finds that some support is available within the appendix itself. Documentation of the correctness of input should be made available.

There is considerable overlap among the various sections of the documents. Material does not seem well organized in the current draft. Much of the needed support information and data may exist in other documents or in project files, but this is not clear in the current reports. Cross-referencing among different parts of the documents is poor.

The DEIS is far better written than the DFR but, more specifically, the DFR Economic Appendix is woefully in need of editing and clarification. The Economic Appendix duplicates most of the material in the DFR sectionsSections and would also benefit from better organization and editing, and better maps and diagrams. The "General" section at the beginning of the appendix is very difficult to follow and does not appear to reach any conclusion.

Significance – Low:

Readability is not a technical issue, but is important in clearly communicating findings to the public and other stakeholders. The EPR panel understands the impediments to producing a well-edited large report in a timely and cost-effective manner; but it is important.

Comment Cross-referencing:

This issue of copy-editing is addressed in the following consensus comments:

(15) Comment: The presentation of data in maps, figures, and tables needs to be substantially improved.

Recommendations for Resolution:

- Careful copy-editing by competent personnel.

USACE Response to Comment 16:
DISCUSSION: *None.* ***SWG ACTION TAKEN:*** *The FFR, FEIS and appendices have been revised and edited to ensure consistency and readability while reducing redundancy.*
Panel BackCheck Response to Comment 16:
Concur. The report appears to have been edited by a professional editor or someone with strong editing experience. Much of the duplication has been eliminated.

Comment 17:

The analysis and conclusions are based on what appears to be over-reliance on the pilots or at least a lack of documentation of their opinions.

Basis for Comment:

The analysis, project design, and chosen alternatives for the DFR relied heavily on the wisdom, knowledge or assertions of the Sabine River Pilots. Information from the Sabine River Pilots was not documented or subjected to critical review as part of the DEIS, the DFR, or in the DFR Economic Appendix.

Over-Reliance on River Pilots. The analysis that led to the changes between the "with" and "without" project conditions depended too heavily on information and opinions from the pilots. It appears that statements made by the Pilots, or sometimes even individual pilots, in the pilot meeting notes served as the "truth" for design when engineering analysis should have been done to support the statements. Indicative of the problem are statements such as "…pilots not comfortable…" or "…driven by pilot input…". Further, when the modeling disagreed with the Pilots statements regarding the time savings, as presented and discussed in the Economic Appendix, resolution in the DFR was unclear. Is the Pilots Association the final voice on operating rules and restrictions? If so, under what authority and can this be changed? Can the Sabine Pilots river rules be modified as a non-structural alternative?

As presented, safety concerns have been generally dismissed as an issue in the economic evaluation. They received no analysis and are not documented in the DFR. The channel widening analysis does not provide any data in support of the pilot safety rules. Yet, the justification for widening is based on the risk of vessels passing next to each other. This again suggests that Pilots Rules receive more attention and scrutiny, as to importance, possible modification and sensitivity of those changes. More information on the interaction and documentation of the Sabine River Pilots Association is required.

Lack of Documentation. The Sabine Pilots Association and its rules were mentioned frequently (DFR EA pp. 3, 4, 7, 10, 89, 97), but no documentation of contacts was provided. The pilots apparently indicated that the rules would change with the project, but there was no documentation and the results appeared to be highly uncertain (DFR EA pp. 10, 12, 13, 84, 95). Pilot estimates of times, costs and other factors were apparently accepted without verification (DFR EA pp. 95, 97, 98). It was not clear throughout the report whether the pilot logs were historical or developed for the study, nor was there any indication of whether the Pilots Association data were publicly available. Although recent auditing information on pilots meetings provides useful data and understanding, more of these sources needed to be incorporated into the report for the public so that searches of models, meeting notes and rationale for critical assumptions would not be necessary. This aspect of the report should stand on its own and not require that readers drill down into other information in order to analyze the results.

Basis for Comments (Continued)

Problems with Supplemental Information. On the basis of lack of documentation, the EPR panel requested additional information, noting that referenced discussions with the pilots appeared to be crucial but generally unavailable. Supplemental materials, provided by the USACE, were found to be useful in understanding the benefits analysis and the sources of information. The notes did, however, raise some additional questions concerning 1) anchorage and dock tie-up times, 2) vessel beam data, 3) vessel convoy times, 4) travel at night, 5) questions about Pilots Rules, 6) sensitivity analysis, and 7) project benefits from time savings. Even with the supplemental information, far too much analysis is "offline" and simply cannot be retrieved or verified.

Significance – High:

The lack of transparency, availability and verification of pilot's data is of high significance. This is a fundamental problem that could affect the justification for the project.

Comment Cross-referencing:

(9) Comment: The report is written at a summary level and lacks proper documentation throughout.

Recommendations for Resolution:

The following steps need to be taken to provide the necessary level of analysis and documentation for reaching rigorous conclusions as they relate to the pilot contacts:

1. The DFR should address and justify the role that the Pilots Association has played in the analysis and formulation of the plan. Any divergence of the pilot's assertions and the modeling analysis should be reconciled and fully explained. Reanalysis may be necessary in order to reach credible conclusions.
2. The DFR should provide documentation within the body of the report or in an accompanying appendix for the data that originated with the pilots. The report should discuss how the data were screened and verified.
3. The DFR should explicitly answer the questions concerning pilot contacts and working notes that have been presented previously by the EPR panel (August 6, p. 123-128). These questions are succinctly presented yet vitally important.

USACE Response to Comment 17:

EPR RECOMMENDATION:

1. *The DFR should address and justify the role that the Pilots Association has played in the analysis and formulation of the plan. Any divergence of the pilot's assertions and the modeling analysis should be reconciled and fully explained. Reanalysis may be necessary in order to reach credible conclusions.*

DISCUSSION: *The revised analysis relies considerably less on pilot input.*

SWG ACTION TAKEN: *The FFR and Economic Appendix have been revised to better explain the role of the Sabine Pilots Association in the waterway operations and the ultimate selection of a Recommended Plan. The FFR relies less on pilot input. For instance, while the pilots do not have confidence in the HarborSym results for the Neches River reach, the model results were*

used by the Corps for the baseline evaluation. A side analysis was prepared by SWG prior to the completion of the HarborSym modifications. The side analysis reflects how the pilots expect the Neches River anchorages and basins to function.

EPR RECOMMENDATION:

2. *The DFR should provide documentation within the body of the report or in an accompanying appendix for the data that originated with the pilots. The report should discuss how the data were screened and verified.*

DISCUSSION: *SWG addressed the comment in the FFR and Economic Appendix.*

SWG ACTION TAKEN: *In response to the comments, the documents were revised as follows:*

FFR, Appendix 2 (Economic Appendix), Sections 8.0 and 10.8 provide documentation on pilot input and expectations. See response above for more explanation.

EPR RECOMMENDATION:

3. *The DFR should explicitly answer the questions concerning pilot contacts and working notes that have been presented previously by the EPR panel (August 6, p. 123-128). These questions are succinctly presented yet vitally important.*

DISCUSSION: *SWG addressed the comment in the revised FFR and/or Economic Appendix.*

SWG ACTION TAKEN: *Clarification of the authority of the Sabine Pilots Association and additional discussion has been added to the FFR and Economic Appendix.*

Panel BackCheck Response to Comment 17:

1. **Concur.** The reviewers concur with the USACE responses. Specifically identifying the role of the harbor pilots leads to a higher level of confidence in the interpretations by the SWG. The additional information that has been placed in the FFR and Economic Appendix addresses questions about the data that originated with the pilots, and shortcomings in applications of the data to plan formulation. Although we believe that the role of the Sabine Pilots Association has been adequately addressed in the relevant documents, it is not entirely clear how divergence of the pilot's assertions and the modeling efforts were fully reconciled.
2. **Concur.** No further comments.
3. **Concur**. No further comments.

Comment 18:

The prediction of salinity changes and their impact on plant and animal communities conveys a false sense of certainty about future conditions that result from cumulative impacts and physiographic and climatic changes that may take place over the project life.

Basis for Comment:

This comment is based on the combined effects of 1) uncertainties in the prediction of salinity, 2) the sensitivity of plant and animal communities to changes in salinity, and 3) assumptions regarding the role of salinity in landscape change both in the past and in the future. These challenges for coastal planning are compounded here by the fact that the model used to predict salinity changes associated with the project does not consider future sea-level rise.

Future Predictions. The model used to predict salinity distributions for FWOP and FWP is a standard model for this type of application. However, a fundamental problem with its application to 50 year project lifespan in this case is its lack of consideration of future sea-level rise, even though projected increases in sea level of 1 to 1.5 feet over the project period are used in considerations of wetland land mitigation design. The model also fails to account for any future changes in precipitation and streamflow. On a macro-scale the model may predict variations due to the project well, but it is not clear that the model is precise for micro-scale salinity changes, especially in the upper reaches of the estuary where it tends to under-predict salinity. The reviewers recognize that the high degree of variability resulting from drought and freshwater inflows complicate any assessment of salinity, and the selection of hypothetical worst-case scenarios is thus a good approach for evaluating future changes. However, providing the output only for these conditions implies that the highest salinity impacts under the low or median flows (2-4 ppt) could persist for some time. Predictions which included temporal variability in the areas of highest salinity impacts based on knowledge of temporal variability of low and median flows would be more helpful in interpreting the ecological consequences of the salinity changes.

Salinity Tolerance. The use of the salinity model output to predict ecological changes must more explicitly consider the salinity tolerance of the vegetative communities relative to predicted salinity changes. In the upper reaches of the estuary where changes in salinity are small (and likely under-predicted - see comment above) the report assumes a negligible loss of function in swamps but this is assumed rather than demonstrated. Salinity is a key driver in the WVA models used in the report, however for the most part the salinity tolerance of vegetative communities is inadequately considered. For example, the V2 marsh relationship is based on the percent change in salinity with a change from 0.5ppt to 1ppt (a 100% increase) resulting in a 50% change in SAV coverage. It seems that the effect of salinity should take into account the salinity tolerance of SAV vegetative. Moreover, a change in salinity produces a change in productivity and thus land loss in V1 while the same change in salinity, it if stays within the optimal range for that marsh type, will cause no change in V5.

Basis for Comment (Continued):

Landscape Change. Predictions of how salinity changes associated with the project will impact the wetland landscape are largely based on implicit assumption in the text that much of the existing loss of wetlands in this area has been caused by saline intrusion and subsidence. However, little evidence is presented for this and the assumption greatly affects the use of historical loss rates to predict FWOP loss rates. Given that the major effect of the project, and thus the difference between FWOP and FWP, are changes in salinity, a clearer assessment of the role of salinity vs. other factors in the loss rates is needed. T his is especially true as many of the wetlands in this area have been subject to hydrologic management. The effect of periodic salinity incursions, e.g., during droughts or hurricanes, on marshes which are artificially isolated from normal salinity fluctuations by management structures is likely to be greater. The role of historic (and current) management of these marshes and how this affects their vulnerability to salinity is not considered.

The combined effect of these problems with the prediction of salinity changes and their implications is especially problematic for the report as the margin of mitigation compensation claimed (just over 1% in terms of AAHUs) is so close. A more detailed assessment of the implications of the assumptions and limitations the EPR panel found in the report regarding the prediction of salinity and its consequences may reveal that the mitigation plan is inadequate.

Significance – High:

This comment is of High Significance as it highlights some basic problems with the analysis on which the mitigation plan is based and this could substantially alter the justification for the project.

Comment Cross-referencing:

(9) Comment: The report is written at a summary level and lacks proper documentation throughout.

(14) Comment: Risk and uncertainty are mostly ignored.

Recommendations for Resolution:

To resolve the concerns raised by this comment, the report would need to include:

1. An estimate of the effects of future sea-level rise and freshwater delivery scenarios on the salinity impacts of the project.
2. A more detailed consideration of these predicted salinity changes, their spatial distribution and temporal variability, on the vegetative communities including an assessment of salinity tolerance.
3. A revised WVA analysis showing the AAHUs associated with the different sea-level rise scenarios and varying assumptions regarding the salinity tolerance of the vegetative communities and the role of salinity in future land loss.
4. A reexamination of the mitigation plan based on these analyses.

USACE Response to Comment 18:

EPR RECOMMENDATION:

1. An estimate of the effects of future sea-level rise and freshwater delivery scenarios on the salinity impacts of the project.
2. A more detailed consideration of these predicted salinity changes, their spatial distribution and temporal variability, on the vegetative communities including an assessment of salinity tolerance.
3. A revised WVA analysis showing the AAHUs associated with the different sea-level rise scenarios and varying assumptions regarding the salinity tolerance of the vegetative communities and the role of salinity in future land loss.
4. A reexamination of the mitigation plan based on these analyses.

DISCUSSION: The FFR and FEIS evaluations of salinity impacts of the project have been revised utilizing outputs from a revised HS model that incorporates an estimate of relative sea level rise and predictions of future freshwater inflows for the period of analysis. The FEIS has also been revised to more fully describe predicted salinity changes, their spatial and temporal variability and to include an assessment of salinity tolerance. The WVA model was rerun using the revised HS model output and the mitigation plan was reexamined based on these analyses. A sensitivity analysis has been performed to evaluate uncertainties in the salinity and land loss predictions.

SWG ACTION TAKEN: In response to the comments, the documents were revised as follows:

- The effects of RSLR were incorporated throughout the environmental analysis and design. FEIS Section 2.3.3 (Sensitivity of Project Alternatives to Relative Sea Level Rise) has added to address the requirements of recent Corps guidance (Circular No. 1165-2-211) to incorporate the effects of projected future sea-level change in planning projects.
- FFR Section VIII summarizes the revised modeling and mitigation plan; Section IX.C. summarizes the engineering and ecological sensitivity analyses.
- FEIS Section 3.1 describes the revised HS model, Section 4.1 describes the application of the revised HS model and WVA model, Section 4.2 presents a summary of the WVA sensitivity analyses, Section 4.6.3 and and 4.10 describe predicted salinity and land loss impacts (including spatial and temporal variability and an assessment of salinity tolerance), and Section 5.0 presents the mitigation plan. FEIS Appendix C presents the same information throughout.

Panel BackCheck Response to Comment 18:

Concur with comments.

Substantial additional analysis has been undertaken to address the IEPR Panel recommendations. The discussion of the consequences of sea-level rise and role of salinity in habitat change has been strengthened and the limitations of the analyses more clearly acknowledged. Extensive literature sources have been added. While there remains considerable uncertainty regarding this issue FEIS now presents a reasonable consideration of the issues given the current state of knowledge. However, some IEPR Panel concerns remain regarding the assumptions of the

analysis and interpretations regarding feasibility and environmental impacts. On page 2-25 of the FEIS, six RSLR scenarios are listed, but mislabeled. The 0.7 foot rate is Low (i.e. based on low eustatic SLR assumptions) based on basal peat, and not Intermediate, and the 1.1 feet rate is Intermediate based on basal peat (not tide gage rates as indicated). Thus the 1.1 feet rate is based on the very conservative basal peat estimation, not the recently observed tide gage observations. Use of the 1.5 feet rate would seem to be the "most likely" under USACE planning guidance, not 1.1feet. The interpretation of analyses of the consequence of sea level rise at this rate or higher (as emerging science suggests may be the case) tends to minimize the significance of this major environmental driver in the estuary. To draw an inference that marshes that are presently keeping up with 4.2 mm/yr in RSLR will sustain themselves at a RSLR of 9.1 mm/yr (both assuming tide gage subsidence rates) is unfounded. With the submergence/erosion that would result, the deteriorating fabric of wetland habitats in which mitigation would be undertaken would be very problematic. Also, the analysis of the impact of channel deepening on salinity and, thus vegetation, is based on simulating future salinity conditions under higher sea level with and without the project. Mean effects within a standard deviation are dismissed even though the salinity and vegetation would be greatly transformed by the higher sea level. The WVA modeling and sensitivity analysis (Section 4.2 of FEIS) assumes the present wetland types, when it is virtually certain that with any RSLR greater than the present salinity and wetland types will be very different. In a way, the interpretation takes the approach of focusing narrowly on the impacts of the presently designed preferred alternative on existing conditions and, now, on the effects of this alternative on salinity toward the end of the project period when the salinity is highly likely to have changed significantly because of RSLR, rather than a fundamentally different way of thinking about this as required for climate change adaptation: how could the project be designed to minimize the adverse impacts of accelerated SLR on this ecosystem?