

Final Independent External Peer Review Report Houston Ship Channel Expansion Channel Improvement Project, Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Deep Draft Navigation Planning Center of Expertise
Mobile District

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Executive Summary

PROJECT BACKGROUND AND PURPOSE

The Houston Ship Channel (HSC), Galveston Harbor and Channels, Galveston Entrance Channel, and the Texas City Ship Channel are integrally connected to the overall navigation system of the Galveston Bay area. However, this feasibility study focuses entirely on the HSC.

The HSC provides access to various private and public docks and berthing areas associated with Port Houston. It is the longest major navigation channel within the HSC system, spanning Harris, Chambers, and Galveston Counties, Texas. The HSC project consists of an existing 50-mile long deep-draft navigation channel, four deep-draft tributary channels, and one shallow draft tributary channel. Several other minor tributary channels also intersect the HSC, including South Boaters Cut, North Boaters Cut, and Five Mile Cut.

The HSC begins at Bolivar Roads at mile 0.0 (the seaward end of the project) and extends north through the Galveston Bay, past the San Jacinto River, and through Buffalo Bayou to the Main Turning Basin at Houston, Texas. From the Main Turning Basin, an approximately 6-mile long shallow draft channel (not included in the scope of the HSC Expansion Channel Improvement Project [ECIP] study), referred to as the (Buffalo Bayou) Light Draft Channel, extends upstream to the terminus of the Federal project.

From Bolivar Roads (mile 0.0) to Boggy Bayou (mile 38.5), the channel depth is -46.5 feet mean lower low water (MLLW) and the channel width is 530 feet. In the stretch between Bolivar Roads and Boggy Bayou, there are two side channels connecting to the HSC. These channels are the Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC). The BSC depth is -41.5 feet MLLW and the channel width is 300 feet. The BCC depth is -46.5 feet MLLW and the width is 300 feet. Between Boggy Bayou and Sims Bayou (mile 47.5), the channel depth is -46.5 feet MLLW and the channel width is 300 feet. From Sims Bayou to the Main Turning Basin (mile 50.2), the channel depth is -37.5 feet MLLW and the width is 300 feet. Additionally, barge lanes are located immediately adjacent to and on either side of the HSC from Bolivar Roads to Morgans Point (mile 26.0), a distance of approximately 26 miles. Each barge lane is at an approximate depth of -13 feet MLLW and at a width of 125 feet. Dredged material is typically placed in a variety of upland confined PA sites and beneficial use (BU) sites, but some material from the lower bay region has been placed offshore in the Ocean Dredged Material Disposal Site, historically referred to as placement area (PA) 1. In addition to the BSC and BCC, the HSC system also includes the following side or tributary channels: Jacintoport Channel and Greens Bayou Channel.

The study area has been divided into segments based upon the improvements evaluated. Beginning at the most seaward end of the HSC and terminating at Boggy Bayou (Segment 1), the study will examine possible anchorage areas or multipurpose moorings, meeting and/or passing lanes, and bend easing. Alternatives for Segment 2, the BSC, consist of anchorage area or multipurpose moorings, channel widening, flare easing, turning basin improvements, and a shoaling attenuation structure. For Segment 3, the BCC, channel widening, flare easing, and turning basin modifications will be examined. In Segment 4, Boggy Bayou to Sims Bayou, the study will examine channel widening, channel deepening, and turning basin modifications. In Segment 5, Sims Bayou to the Interstate-610 (I-610) Bridge, proposed improvements consist of channel deepening and turning basin modifications. Lastly, Segment 6, I-610 Bridge to the Main Turning Basin, the study will examine channel deepening and turning basin improvements. The BU of dredged material and/or modified or new upland confined PAs will also be considered for placement of dredged material.

The overall study goal is to provide an efficient and safe navigation channel while contributing to national economic development and protecting the nation's environment. The planning objectives are as follows:

- Reduce navigation transportation costs by increasing economies of scale for vessels to and from HSC over the period of analysis (starting in the base year for 50 years).
- Increase vessel efficiency and maneuverability at the HSC, Bayport Channel, and Barbour's Cut Channel for the existing and future fleet through the 50-year period of analysis.
- Establish environmentally suitable PAs, and maximize use of BU of dredged material for placement over the 50-year period of analysis.
- Increase channel safety for vessels utilizing study area channel segments.

Tentatively Selected Plan (TSP). The TSP has been selected based upon limited, detailed information; a general understanding of the transit restrictions that could be reduced by channel improvements (to increase transportation cost savings); the vessel fleet forecast; historical information regarding environmental conditions requiring mitigation; generalized assumptions about dredged material placement based upon historical placement practices, including beneficial use; and general assumptions regarding channel improvement design. Additional economic, engineering, and environmental evaluation is necessary to confirm the TSP. Ship simulation will be performed to confirm the engineering assumptions made; ship simulation will be conducted subsequent to the Agency Decision Milestone (ADM) meeting.

The TSP includes the following features. Features noted with an asterisk (*) are those considered necessary for safe and efficient navigation in the HSC.

- **Segment 1**
 - Main HSC - Four bend easings with relocation of associated barge lanes
 - Main HSC - Channel widening between Bolivar Roads and BCC
 - Main HSC - Addition of two new multipurpose mooring areas, one near Alexander Island and the other near San Jacinto State Park
 - *Main HSC - Minor widening of the channel in the bayou portion of the Hog Island stretch
 - *Main HSC - Channel widening from San Jacinto Monument to Boggy Bayou
- **Segment 2**
 - BSC - Flare expansion
 - BSC - Shoaling attenuation structure near the BSC Flare

- BSC - Addition of a turning basin at the mouth of the BSC land-cut
- BSC - Channel widening from 300 feet to 455 feet
- **Segment 3**
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 - Main HSC - Channel deepening from Boggy Bayou to Sims Bayou
 - Main HSC - Channel widening from Boggy Bayou to Greens Bayou
 - *Main HSC - Addition of a turning basin at Station 775+00
- **Segment 5**
 - Main HSC - Channel deepening from Sims Bayou to the I-610 Bridge
 - *Main HSC - Modification to the turning basin at Hunting Bayou
- **Segment 6**
 - Main HSC - Channel deepening from I-610 Bridge to the Main Turning Basin
 - *Main HSC - Improvements to an existing turning basin near Brady's Landing

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The U.S. Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP), Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) (hereinafter: HSC ECIP DIFR-EIS IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate this IEPR. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the decision documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: Civil Works planning/environmental (dual role), economics, hydraulic/coastal engineering, and geotechnical engineering. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the four-person Panel from this list.

The Panel received electronic versions of the decision documents (1,471 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2012) and OMB (2004), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference at the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct

communication between the Panel and USACE during the peer review process. The Panel produced individual comments in response to the charge questions.

IEPR panel members reviewed the decision documents individually. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, eight Final Panel Comments were identified and documented. Of these, two were identified as having medium/high significance, four had a medium significance, one had medium/low significance, and one had low significance.

Results of the Independent External Peer Review

The panel members agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2012; p. D-4) in the HSC ECIP DIFR-EIS review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel’s findings.

Based on the Panel’s review, the review documents are well-written, and the sequential layout, discipline by discipline, of the work that has been conducted and work that remains to be completed makes it an excellent, defensible decision document for this stage of the project. The report framed the alternatives screening metrics decision input factors and described what was known and what was unknown, but also described the strategy for collecting missing information that is required to confirm the feasibility of the Tentatively Selected Plan (TSP). Due to SMART Planning constraints, the Panel understands there will be less formal quantitative analysis to screen developed alternatives to select the TSP; however, the omission of data, documents, or sources of documents leads to greater risk at this stage of the project as a result of increased uncertainty. The Panel identified several elements of the project where additional analyses need to be leveraged or better characterized and places where clarification of future project actions and objectives need to be documented or revised.

Civil Works Planning: The Panel understands that the SMART Planning process encourages screening of alternatives to identify the TSP by leveraging available existing information, using “reasonable” assumptions, and collecting only that data deemed essential to screening and selecting a TSP. Detailed data collection and reducing project uncertainties associated with site characterization activities and subsequent analyses of aspects of the TSP has been deferred. The Panel has conducted their assessment based upon the information provided and the potential impact of invalid/omitted information on selection of the TSP. The Panel’s primary concern is that uncertainty is not propagated throughout the analyses to delineate the degree of “certainty” in the benefit-cost ratios (BCR) for the presented alternatives and the TSP. Project benefits and costs for the alternative plans and the TSP may be overestimated or underestimated because the full magnitude of uncertainty associated with the alternatives has not been characterized. The Panel suggests leveraging existing analyses/judgments to include a range for the presented BCRs that identifies the low bound, best guess, and high bound for each alternative, including the TSP, and documenting low-bound, best-guess, and high-bound margins in the DIFR-EIS.

During the Panel's review of the alternatives in regard to answering the project objectives, they noted that it is unclear how the alternatives address the USACE-identified problems of (1) very large crude carriers (VLCCs) requiring lightering, and (2) inefficient movement of barges due to the shallow draft of the barge lanes adjacent to the deep-draft channel. The disconnect between these two specific problem statements and how they were considered in formulating the array of alternatives to be considered in detail does not support the basis for selection of the TSP. The Panel suggests revising the decision document to further explain why lightering of VLCCs did not merit further consideration in this study, including a more robust explanation for why deepening was not considered further, and explaining how the problems identified with the barge lanes are considered in the formulation of the array of alternatives.

Engineering: The Panel noted geotechnical considerations included in the decision document screening criteria are limited with regard to impacts of the alternative plans on infrastructure. These limited geotechnical evaluations in the initial screening of alternatives may impact the completeness and acceptability of the presented alternatives and the subsequent TSP. This can be addressed, for example, by identifying and accounting for known (and suspected) infrastructure alignments in relation to proposed channel reconfigurations.

Additionally, the Panel is concerned the use of a generalized approach for a Dredged Material Management Plan (DMMP) for new work and maintenance materials requires many engineering assumptions that may have resulted in inaccurate cost estimates. It appears no attempt was made to separate the dredged material PA unit costs for new-work construction regarding the type of PA (open water, upland, beneficial use wetland creation, bird islands, island restoration, upland dike raising, offshore placement) to be used in a DMMP. The Panel suggests performing a DMMP study for the PA for new work and maintenance material for Segments 1 and 2, include the resulting PA and operation and maintenance (O&M) costs for the TSP, and add a discussion of a systems approach for Regional Sediment Management (RSM) that improves both navigation and coastal resilience for future rising seas in the final decision document.

Economics: Due to SMART Planning constraints, the Panel understands there will be less information; however, the omission of data, documents, or sources of documents leads to greater risk as a result of increased uncertainty at this stage of the project. Net transportation cost benefits are the critical determinant of the BCRs and National Economic Development (NED) results. A full understanding of the uncertainty magnitude of these benefits will better characterize the risk associated with each presented alternative and the selected TSP. The Panel suggests documenting the review and verification process for the spreadsheet models, providing the models and their output, and incorporating their findings in the report, and then comparing the average annual equivalent (AAEQ) results from the HarborSym analyses to the spreadsheet model results and discussing the comparative difference, if any, in the decision document. The Panel also noted the projection data in the decision document on the compositions of the world and local fleets were obtained from two outside sources, Global Insight, Inc. and Maritime Strategies, Inc., but the methodology they used to develop the estimates is not explained. This can be addressed by re-examining the process and sources used by the two companies in developing their fleet projections and including a description of the process used by both companies in the discussion of the world and local fleet composition parameters in the final decision document.

Environmental: The Panel found the approach and methodology for the cumulative effects analysis to be comprehensive, and the cumulative impacts analysis presented a sound approach and methodology. However, the Panel noted that without the full disclosure of the environmental effects of all the alternatives, including the TSP, the rationale supporting the selection of the TSP may be weakened or

compromised, further compounded by the significant uncharacterized uncertainties associated with the absence of ship simulation and a preliminary DMMP to more precisely define Alternative 8.

Table ES-1. Overview of Eight Final Panel Comments Identified by the HSC ECIP DIFR-EIS IEPR Panel

No.	Final Panel Comment
Significance – Medium/High	
1	Uncertainty magnitudes are not presented throughout the analyses to delineate the degree of “certainty” in the benefit-cost ratios (BCR) for the presented alternatives and Tentatively Selected Plan (TSP).
2	The use of a generalized approach for a DMMP for new work and maintenance materials requires many engineering assumptions that may have resulted in inaccurate cost estimates.
Significance – Medium	
3	Geotechnical considerations included in the HSC ECIP DIFR-EIS screening criteria are limited with regard to impacts of the alternative plans on infrastructure.
4	It is unclear how the alternatives address the USACE-identified problems of (1) very large crude carriers (VLCCs) requiring lightering, and (2) inefficient movement of barges due to the shallow draft of the barge lanes adjacent to the deep-draft channel.
5	The approach of assessing the environmental impacts of the TSP but not the other alternatives in the environmental consequences section does not follow the applicable National Environmental Policy Act (NEPA) regulation.
6	The use of AAEG from the HarborSym Economic Reports, rather than actual real-time simulations, weakens the analysis that leads to the TSP.
Significance – Medium/Low	
7	The projection data on the world fleet and local fleet compositions presented in the HSC ECIP DIFR-EIS were obtained from two outside sources, but the original sources’ methodology for developing the estimates is not explained.
Significance – Low	
8	The HSC ECIP DIFR-EIS does not adequately document that fish and wildlife resources have been given equal consideration in the planning process per the provisions of the Fish and Wildlife Coordination Act.

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LIST OF ACRONYMS

AAEQ	Average Annual Equivalent
ADM	Agency Decision Milestone
ATR	Agency Technical Review
BCC	Barbours Cut Channel
BCR	Benefit-Cost Ratio
BSC	Bayport Ship Channel
BU	Beneficial Use
COI	Conflict of Interest
DIFR	Draft Integrated Feasibility Report
DMMR	Dredged Material Management Plan
DDN	Deep-Draft Navigation
DrChecks	Design Review and Checking System
EC	Engineer Circular
ECIP	Expansion Channel Improvement Project
EIS	Environmental Impact Statement
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
FWCA	Fish and Wildlife Coordination Act
FWCAR	Fish and Wildlife Coordination Act Report
FWOP	Future Without-Project
HSC	Houston Ship Channel
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
LOOP	Louisiana Offshore Oil Point
MLLW	Mean lower low water
NED	National Economic Development
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
OEO	Outside Eligible Organization
O&M	Operation and Maintenance
OMB	Office of Management and Budget
PA	Placement Areas
PAL	Planning Aid Letter
PCX	Planning Center of Expertise
PDT	Project Delivery Team
P&G	Principles and Guidelines
RSM	Regional Sediment Management
SLM	Senior Leader Meeting
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Services
VLCC	Very Large Crude Carriers

1. INTRODUCTION

The Houston Ship Channel (HSC), Galveston Harbor and Channels, Galveston Entrance Channel, and the Texas City Ship Channel are integrally connected to the overall navigation system of the Galveston Bay area. However, this feasibility study focuses entirely on the HSC.

The HSC provides access to various private and public docks and berthing areas associated with Port Houston. It is the longest major navigation channel within the HSC system, spanning Harris, Chambers, and Galveston Counties, Texas. The HSC project consists of an existing 50-mile long deep-draft navigation channel, four deep-draft tributary channels, and one shallow draft tributary channel. Several other minor tributary channels also intersect the HSC, including South Boaters Cut, North Boaters Cut, and Five Mile Cut.

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The TSP includes the following features. Features noted with an asterisk (*) are those considered necessary for safe and efficient navigation in the HSC.

- **Segment 1**
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- **Segment 6**
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Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP), Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) (hereinafter: HSC ECIP DIFR-EIS IEPR) in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE), Engineer Circular (EC) *Civil Works Review* (EC 1165-2-214) (USACE, 2012) and the Office of Management and Budget (OMB), *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, and plan formulation analyses contained in the HSC ECIP DIFR-EIS review documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational conflict of interest form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the HSC ECIP DIFR-EIS IEPR.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review (ATR), as described in USACE (2012).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the engineering, economic, environmental, and plan formulation analyses of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the HSC ECIP DIFR-EIS was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-214). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan, and are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected four panel members to participate in the IEPR based on their expertise in the following disciplines: Civil Works planning/environmental (dual role), economics, hydraulic/coastal engineering, and geotechnical engineering. The Panel reviewed the HSC ECIP DIFR-EIS documents and produced eight Final Panel Comments in response to 15 charge questions provided by USACE for the review. This charge included two overview questions added by Battelle. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-214, Appendix D), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the HSC ECIP DIFR-EIS IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the review documents are well-written, and the sequential layout, discipline by discipline, of the work that has been conducted and work that remains to be completed makes it an excellent, defensible decision document for this stage of the project. The report framed the alternatives screening metrics decision input factors and described what was known and what was unknown, but also described the strategy for collecting missing information that is required to confirm the feasibility of the Tentatively Selected Plan (TSP). Due to SMART Planning constraints, the Panel understands there will be less formal quantitative analysis to screen developed alternatives to select the TSP; however, the omission of data, documents or sources of documents leads to greater risk at this state of the project as a result of increased uncertainty. The Panel identified several elements of the project where additional

analyses need to be leveraged or better characterized and places where clarification of future project actions and objectives need to be documented or revised.

Civil Works Planning: The Panel understands that the SMART Planning process encourages screening of alternatives to identify the TSP by leveraging available existing information, using “reasonable” assumptions, and collecting only that data deemed essential to screening and selecting a TSP. Detailed data collection and reducing project uncertainties associated with site characterization activities and subsequent analyses of aspects of the TSP has been deferred. The Panel has conducted their assessment based upon the information provided and the potential impact of invalid/omitted information on selection of the TSP. The Panel’s primary concern is that uncertainty is not propagated throughout the analyses to delineate the degree of “certainty” in the benefit-cost ratios (BCR) for the presented alternatives and the TSP. Project benefits and costs for the alternative plans and the TSP may be overestimated or underestimated because the full magnitude of uncertainty associated with the alternatives has not been characterized. The Panel suggests leveraging existing analyses/judgments to include a range for the presented BCRs that identifies the low bound, best guess, and high bound for each alternative, including the TSP, and documenting low-bound, best-guess, and high-bound margins in the DIFR-EIS.

During the Panel’s review of the alternatives in regard to answering the project objectives, they noted that it is unclear how the alternatives address the USACE-identified problems of (1) very large crude carriers (VLCCs) requiring lightering, and (2) inefficient movement of barges due to the shallow draft of the barge lanes adjacent to the deep-draft channel. The disconnect between these two specific problem statements and how they were considered in formulating the array of alternatives to be considered in detail does not support the basis for selection of the TSP. The Panel suggests revising the decision document to further explain why lightering of VLCCs did not merit further consideration in this study, including a more robust explanation for why deepening was not considered further, and explaining how the problems identified with the barge lanes are considered in the formulation of the array of alternatives.

Engineering: The Panel noted geotechnical considerations included in the decision document screening criteria are limited with regard to impacts of the alternative plans on infrastructure. These limited geotechnical evaluations in the initial screening of alternatives may impact the completeness and acceptability of the presented alternatives and the subsequent TSP. This can be addressed, for example, by identifying and accounting for known (and suspected) infrastructure alignments in relation to proposed channel reconfigurations.

Additionally, the Panel is concerned the use of a generalized approach for a Dredged Material Management Plan (DMMP) for new work and maintenance materials requires many engineering assumptions that may have resulted in inaccurate cost estimates. It appears no attempt was made to separate the dredged material PA unit costs for new-work construction regarding the type of PA (open water, upland, beneficial use wetland creation, bird islands, island restoration, upland dike raising, offshore placement) to be used in a DMMP. The Panel suggests performing a DMMP study for the PA for new work and maintenance material for Segments 1 and 2, include the resulting PA and operation and maintenance (O&M) costs for the TSP, and add a discussion of a systems approach for Regional Sediment Management (RSM) that improves both navigation and coastal resilience for future rising seas in the final decision document.

Economics: Due to SMART Planning constraints, the Panel understands there will be less information; however, the omission of data, documents, or sources of documents leads to greater risk as a result of

increased uncertainty at this stage of the project. Net transportation cost benefits are the critical determinant of the BCRs and National Economic Development (NED) results. A full understanding of the uncertainty magnitude of these benefits will better characterize the risk associated with each presented alternative and the selected TSP. The Panel suggests documenting the review and verification process for the spreadsheet models, providing the models and their output, and incorporating their findings in the report, and then comparing the average annual equivalent (AAEQ) results from the HarborSym analyses to the spreadsheet model results and discussing the comparative difference, if any, in the decision document. The Panel also noted the projection data in the decision document on the compositions of the world and local fleets were obtained from two outside sources, Global Insight, Inc. and Maritime Strategies, Inc., but the methodology they used to develop the estimates is not explained. This can be addressed by re-examining the process and sources used by the two companies in developing their fleet projections and including a description of the process used by both companies in the discussion of the world and local fleet composition parameters in the final decision document.

Environmental: The Panel found the approach and methodology for the cumulative effects analysis to be comprehensive, and the cumulative impacts analysis presented a sound approach and methodology. However, the Panel noted that without the full disclosure of the environmental effects of all the alternatives, including the TSP, the rationale supporting the selection of the TSP may be weakened or compromised, further compounded by the significant uncharacterized uncertainties associated with the absence of ship simulation and a preliminary DMMP to more precisely define Alternative 8.

[4.2 Final Panel Comments](#)

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

Uncertainty magnitudes are not presented throughout the analyses to delineate the degree of “certainty” in the benefit-cost ratios (BCR) for the presented alternatives and Tentatively Selected Plan (TSP).

Basis for Comment

SMART Planning (USACE 2014) “...reorients the planning process away from simply collecting data or completing tasks and refocuses it on doing the work required to reduce uncertainty to the point where the team can make an iterative sequence of planning decisions required to complete a quality study in full compliance with environmental laws and statutes” (p. 1).

USACE Principles and Guidelines (P&G) require that “Planners shall identify areas of risk and uncertainty in their analysis and describe them clearly, so that decisions can be made with knowledge of the degree of reliability of the estimated benefits and costs and of the effectiveness of alternative plans” (USACE, 1983, p. v).

Uncertainty magnitudes (e.g., coefficient of variation via explicit parameter distributions such as triangular, rectangular, and/or high-low-expected) would greatly aid in identifying how “certain” presented BCR values and assumptions are. Uncertainty magnitudes would also help identify areas where additional data collection/refinement would be warranted to reduce the uncertainty associated with the BCR estimates and improve decision-making.

For example, in the HSC ECIP DIFR-EIS Table 5-12 lists BCRs for the eight Alternatives. Alternative 8 (820') has a reported 'best guess' BCR of 1.5. This 'best guess' does not fully reflect the uncertainty associated with the assumptions required to generate the 'best guess' value. It is very possible that the actual BCR, once more detailed analyses are completed, is less than 1.0. Thus, not including the potential range of BCR may lead to selection of a plan that does not satisfy the four criteria (completeness, effectiveness, efficiency, and acceptability) described in the USACE P&G.

Listing the low-bound and high-bound margins of the BCR satisfies the requirement from SMART Planning and USACE P&G to identify associated uncertainty to inform responsible planning decisions. Delineating and documenting the low-bound, best-guess, and high-bound of BCRs at the planning stage will allow USACE to subsequently compare/contrast actual (as-constructed) costs of projects in relation to the estimate to determine 'model bias' and the degree to which the perceived uncertainty magnitudes capture the extent of the actual benefits and costs extents. This can then be used to improve/refine the SMART planning process for future projects.

Significance – Medium/High

The overall project benefits and costs for the alternative plans and the TSP may be overestimated or underestimated because the full magnitude of uncertainty associated with the alternatives has not been characterized.

Recommendations for Resolution

1. Leverage existing analyses/judgments to include a range for the presented BCRs that identifies the low bound, best guess, and high-bound for each alternative including the TSP.

Final Panel Comment 1

2. Document the low bound, best guess, and high-bound margins in the DIFR-EIS.

Literature Cited:

USACE (2014). Planning Bulletin No. PB 2012-02: Planning SMART Guide, Reissue #2, U.S. Army Corps of Engineers (reissued 04 March 2014).

USACE (1983). Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. March 10, 1983.

Final Panel Comment 2

The use of a generalized approach for a DMMP for new work and maintenance materials requires many engineering assumptions that may have resulted in inaccurate cost estimates.

Basis for Comment

A definitive Dredged Material Management Plan (DMMP) for new work and maintenance materials was not formulated for the HSC ECIP DIFR-EIS; rather, a generalized approach for the DMMP was used which relied on many engineering assumptions. For example, Appendix C p 11-6, states that “Due to the wide range of measure alternatives being evaluated for determination of the TSP without a definitive DMMP, there is no definable way to develop specific costs for PA construction...”

No attempt was made to separate the dredged material placement area (PA) unit costs for new-work construction regarding the type of PA (open water, upland, beneficial use wetland creation, bird islands, island restoration, upland dike raising, offshore placement) to be used in a DMMP. Table 11-3 of the HSC ECIP DIFR-EIS lists 14 previous projects, with unit costs for a variety of PA alternatives ranging from a low of \$0.45/cy to a high of \$10.01/cy. The average unit cost was calculated, adjusted (\$2.67/cy) to 2017 prices and employed in the PA cost analysis. Since 75% to 85% of the new-work dredging comes from Segments 1 and 2, a definitive DMMP for these segments of new work PA and unit costs for these PAs would provide more confidence in the new-work PA costs for the TSP. The new-work PA costs account for \$350 million to \$ 450 million (37% to 31%) of the total construction costs.

For life-cycle maintenance costs, the HSC ECIP DIFR-EIS (p 13-12) discusses a “generalized approach” to a DMMP stating “...it is assumed that the HSC and tributaries will be maintained in the same fashion as currently practiced”. The volume estimates for maintenance dredging quantities range from 79 million cubic yards (mcy) to 117 mcy over the 50-year planning period. As a result, the HSC ECIP DIFR-EIS states “However, it is expected that accounting for 50 years of maintenance of the TSP required by USACE planning policy will require new placement features”. Section 7-6 presents some elements of a planned, post-DIFR-EIS DMMP that, if implemented for the current HSC ECIP DIFR-EIS would have eliminated the unsupported engineering assumptions that underlie the study analyses and study costs.

The HSC ECIP review documents (Appendix C p 13-12, HSC ECIP DIFR p 7-24) did briefly mention the ongoing USACE-Galveston *Coastal Texan Protection and Restoration Feasibility Study* “...to find synergies for material usage for coastal storm protection and ecosystem restoration features of that project”. But details are not given. The HSC ECIP DIFR-EIS does not present any information on the possible synergies for material usage for coastal storm protection. The Executive Summary in the Final Integrated Feasibility Report/Environmental Impact Statement (FIFR-EIS) should clearly link the two ongoing feasibility studies in its final report to Congress. This is especially important since Hurricane Harvey (September 2017).

Furthermore, as defined by the USACE (<http://rsm.usace.army.mil>), Regional Sediment Management (RSM) is “A systems approach to **deliberately** manage sediments in a manner that maximizes natural and economic efficiencies to contribute to sustainable water resource projects, environments and communities.” RSM combines USACE responsibilities for navigation/dredging, flood risk management, and environmental restoration. The HSC ECIP DIFR-EIS does not mention USACE’s ongoing efforts for RSM in any decision documents.

Final Panel Comment 2

Significance – Medium/High

The lack of formulation of a definitive DMMP calls into question the accuracy of new work and maintenance materials costs for the TSP.

Recommendations for Resolution

1. Perform a definitive DMMP study for the PA for new work and maintenance material for Segments 1 and 2 and include the resulting PA and operation and maintenance (O&M) costs for the TSP.
2. Include in the final DMMP for the HSC ECIP DIFR-EIS a discussion of a systems approach for RSM that improves both navigation and coastal resilience for future rising seas.

Final Panel Comment 3

Geotechnical considerations included in the HSC ECIP DIFR-EIS screening criteria are limited with regard to impacts of the alternative plans on infrastructure.

Basis for Comment

The use of proxy geotechnical evaluations (use of sheet piles where dredged side slopes (3H:1V) would potentially impact shore side constraints) for widening and deepening for the presented alternatives ignores impacts to any existing submerged/subsea infrastructure.

Widening and deepening navigation channels will have impacts to adjacent infrastructure such as pipeline alignments, aids to navigation, shoreline structures, and bridges. This infrastructure may be ‘shore side’ or may be submerged/subsea.

The initial screening matrix developed to evaluate and screen the alternative plans (HSC ECIP DIFR-EIS, p. 5-15) included “sheet pile wall construction costs. Sheet piles were assumed to be used at locations where “dredged side slopes (3H:1V) would potentially impact shore side constraints (existing infrastructure, past development, wetlands, etc.)” (HSC ECIP DIFR-EIS Appendix C, p. 4-32).

HSC ECIP DIFR-EIS Appendix C states that the “existing channel slopes for this project range from 2.5 horizontal to one vertical (2.5H:1V) to 5H:1V” (p. 3-4). The “historic practice is to utilize a template with 3H:1V slopes” (HSC ECIP DIFR-EIS Appendix C, p. 3-4).

Appendix A (HSC ECIP DIFR-EIS Appendix A, pp. 1) states that each plan must be formulated to address the four criteria (completeness, effectiveness, efficiency, and acceptability) described in the USACE P&G. Not including an evaluation of potential impacts to submerged/subsea infrastructure may lead to selection of a plan that does not satisfy the four criteria (completeness, effectiveness, efficiency, and acceptability) described in the USACE P&G.

Significance – Medium

Application of limited geotechnical evaluation methods and analyses in the initial screening of alternatives may impact the completeness and acceptability of the presented alternatives and the subsequent TSP.

Recommendations for Resolution

1. Prepare a site plan that presents known (and suspected) infrastructure alignments in relation to proposed channel reconfigurations.
2. Prepare a site plan that delineates existing navigation channel side slopes (i.e., 2.5H:1V vs 3H:1V vs 4H:1V vs 5H:1V) with proposed sheet pile alignments (based on offset of 3H:1V).

Final Panel Comment 4

It is unclear how the alternatives address the USACE-identified problems of (1) very large crude carriers (VLCCs) requiring lightering, and (2) inefficient movement of barges due to the shallow draft of the barge lanes adjacent to the deep-draft channel.

Basis for Comment

The first specific problem statement identified by USACE (HSC ECIP DIFR-EIS, p. 4-1) was that "very large crude carriers (VLCC) require lightering in order to economically move products to Port of Houston refineries (Segment 1)." No specific potential structural measures (channel deepening) were identified to improve the channel in response to this identified problem. The HSC ECIP DIFR-EIS is essentially silent on consideration of any deepening options for the main channel, except for a brief narrative (p. 5-3) where the Louisiana Offshore Oil Port (LOOP) terminal was briefly described as an option to address the lightering problem for VLCCs and eliminated from consideration in the same paragraph. Risk register item # ECN-47 describes a deepening option as "determined impractical."

The second specific problem statement identified by USACE (HSC ECIP DIFR-EIS, p. 4-1) was that "barges have inefficient movement due to the shallow draft of the barge lanes." The HSC ECIP DIFR-EIS does not effectively describe the shallow-draft barge lanes, their relationship to the deep-draft navigation channel, or how the formulation of alternative plans for deep-draft navigation channel improvements would specifically address this identified problem and factor into the selection of the TSP.

These two problem statements were at the top of the list of problem statements in the HSC ECIP DIFR-EIS (p. 4-1), which implies that they are the most significant problems being encountered. Yet, the alternative plans that were developed either do not address the problem statement at all (as in the case of lightering) or do not describe in sufficient detail how the alternatives address the problem as stated (as in the case of the barge lanes).

Significance – Medium

The disconnect between these two specific problem statements and how they were considered in formulating the array of alternatives considered in detail does not support the basis for selection of the TSP.

Recommendations for Resolution

1. Revise the HSC ECIP DIFR-EIS to further justify why lightering of VLCCs did not merit further consideration in this study. Include a more robust explanation for why deepening was not considered further (e.g., excessive cost, lack of benefits, unacceptable environmental impacts, lack of sponsor support, etc.). Further, explain why a LOOP option would not be a reasonable course of action for further consideration to address lightering if the problem is as serious as implied in the problem statements.
2. Explain more fully in the HSC ECIP DIFR-EIS how the problems identified with the barge lanes are considered in the formulation of the array of alternatives and how the various alternatives address or satisfy the barge lane inefficiencies compared to the future without-project (FWOP) condition.

Final Panel Comment 5

The approach of assessing the environmental impacts of the TSP but not the other alternatives in the environmental consequences section does not follow the applicable National Environmental Policy Act (NEPA) regulation.

Basis for Comment

NEPA Regulation 40 CFR 1502.16(d) promulgated by the Council on Environmental Quality (CEQ) states that the Environmental Consequences section of an EIS shall include discussions of “the environmental effects of alternatives, including the proposed action” (40 CFR 1502.16(d)). The HSC ECIP DIFR-EIS (Section 7) discusses the environmental impacts associated with the TSP but not the impacts of the other alternatives. This approach is not consistent with the CEQ NEPA regulations. Without a discussion of the environmental impacts of the other alternatives compared to No Action, an informed, objective comparison of the reasonable alternatives cannot be made. 40 CFR 1502.14(a) states:

“Based on the information and analysis presented in the sections on the Affected Environment (§1502.15) and the Environmental Consequences (§1502.16), it (the EIS) should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public.”

Accordingly, the environmental impacts of the alternatives considered in detail in an EIS are an important consideration in determining the TSP that will be carried forward. (A matrix that clearly illustrates the impacts for each alternative can provide a simple means of comparison per 40 CFR 1502.14(a)). The environmental impacts of the alternatives considered in detail in the HSC ECIP DIFR-EIS vary widely, ranging from little overall impact to major impacts associated with dredging and placement of up to 53 million cubic yards (mcy) of dredged material from construction and 117 mcy of O&M dredged material over 50 years in both existing and likely new placement areas.

Without the full disclosure of the environmental effects of all the alternatives, including the TSP, the rationale supporting the selection of the TSP may be weakened or compromised, further compounded by the significant uncertainties associated with the absence of ship simulation and a preliminary DMMP to more precisely define Alternative 8. The draft EIS as written precludes a meaningful comparison of the environmental effects of alternatives and could be subject to preparation and circulation of a revised draft EIS per 40 CFR 1502.9.

Significance – Medium

The environmental effects of the alternatives considered in detail in the HSC ECIP DIFR-EIS is an important consideration in determining which plan to carry forward for authorization.

Recommendations for Resolution

1. Revise Section 7 of the HSC ECIP DIFR-EIS to include a discussion of the environmental impacts (by resource area) for all of the alternatives considered in detail. Excessive detail is not necessary for resource areas for all alternatives, but the relative level of impacts (or lack thereof) for each alternative compared to the FWOP conditions should be discussed.

Final Panel Comment 5

2. Develop an environmental impact matrix or table, to be included in both the Executive Summary and the main HSC ECIP DIFR-EIS that summarizes the expected impacts of each alternative for each environmental resource area evaluated.

Final Panel Comment 6

The use of AAEQ from the HarborSym Economic Reports, rather than actual real-time simulations, weakens the analysis that leads to the TSP.

Basis for Comment

Transportation cost benefits were estimated using the HarborSym Economic Reporter, a tool that summarizes and annualizes HarborSym results from multiple simulations. This tool collects the transportation costs from various model run output files and generates the transportation cost reduction for all project years, then produces an Average Annual Equivalent (AAEQ). It is stated on p. 4.29, Section 4.2 of the Economic Appendix that results and calculations were verified by referring to spreadsheet models from previous deep draft navigation analyses as well. However, no information is offered on these spreadsheet models and the verification process.

Significance – Medium

The net transportation cost benefits are the critical determinant of the BCRs and National Economic Development (NED) results. A full understanding of and confidence in the development of and the magnitude of these benefits will decrease risk and uncertainty.

Recommendations for Resolution

1. Provide documentation on the review and verification process followed concerning the spreadsheet models.
2. Provide the models, their output, and incorporate their findings in the report.
3. Compare the AAEQ results from the HarborSym analyses to the spreadsheet model results, and discuss the comparative difference, if any, in the report.

Final Panel Comment 7

The projection data on the world fleet and local fleet compositions presented in the HSC ECIP DIFR-EIS were obtained from two outside sources, but the original sources' methodology for developing the estimates is not explained.

Basis for Comment

The projected composition of the world fleet (Global Insight, Inc., as source) and the local harbor fleet (Maritime Strategies, Inc., as source) are critical inputs into the NED benefits and costs estimation. The development of the at-sea and in-port components of the benefits is presented in the HSC ECIP DIFR-EIS as point estimates, with no explanation of how Global Insight and Maritime Strategies developed their estimates. Without a clear understanding of the methods used to estimate the world and local harbor fleets, it is not possible to verify whether these projections are accurate.

Significance – Medium/Low

An explanation of the methodology used to fully develop the sourced projections would decrease the uncertainty of the world and local harbor fleet compositions used in the NED benefits and costs estimation.

Recommendations for Resolution

1. Re-examine the process and sources used by Global Insight, Inc., and Maritime Strategies, Inc., in developing their fleet projections.
2. Include a description of the process used by both companies in the discussion of the world and local fleet composition parameters in HSC ECIP DIFR-EIS Section 3.4.2.1 Design Vessel Selection.

Final Panel Comment 8

The HSC ECIP DIFR-EIS does not adequately document that fish and wildlife resources have been given equal consideration in the planning process per the provisions of the Fish and Wildlife Coordination Act.

Basis for Comment

The Fish and Wildlife Coordination Act (FWCA) requires that “wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs through ... effectual and harmonious planning ...” The FWCA established a process by which the U.S. Fish and Wildlife Service (USFWS) would provide input to USACE in the form of Planning Aid Letters (PALs) and Fish and Wildlife Coordination Act Reports (FWCARs) regarding the potential fish and wildlife resource impacts to fish and wildlife resources of a proposed water resource development project to ensure that equal consideration of those resources.

Appendix M of the draft HSC ECIP DIFR-EIS contains a 16-page USFWS PAL dated March 29, 2017 that offers general concerns and recommendations on the study. On p. 12 of the PAL, the USFWS acknowledges that not all modeling or surveys may be completed and reviewed in time for the final FWCA report for the study and stated that the USFWS “may not be able to appropriately comment and make recommendations on reducing environmental impacts or on mitigation measures.” The PAL makes 19 specific recommendations for USACE consideration in conducting and completing the study. However, there is no USACE response to the PAL in Appendix M or the HSC ECIP DIFR-EIS to indicate USACE agreement or disagreement with specific USFWS concerns or recommendations and to describe what actions USACE will or will not undertake in response to the PAL recommendations. Consequently, it is not clear to what extent the specific USFWS recommendations have been considered in the study and whether fish and wildlife resources have been given equal consideration in the planning process per the FWCA.

Significance – Low

Given the lack of documentation in the report as outlined above, it is not possible to ascertain that fish and wildlife resources have been given equal consideration in the planning process for the HSC ECIP DIFR-EIS in compliance with the FWCA.

Recommendations for Resolution

1. Amend the HSC ECIP DIFR-EIS to discuss ongoing and future coordination activities with the USFWS in accordance with the FWCA. Respond to specific concerns raised by the USFWS in the PAL and indicate what USACE actions have been taken (or are being taken) in response to USFWS recommendations to ensure equal consideration of impacts to fish and wildlife resources.

5. REFERENCES

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

USACE (2014). Planning Bulletin No. PB 2012-02: Planning SMART Guide, Reissue #2, U.S. Army Corps of Engineers (reissued 04 March 2014).

USACE (2012). Water Resources Policies and Authorities: Civil Works Review. Engineer Circular (EC) 1165-2-214. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. December 15.

USACE (1983). Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. March 10, 1983.

APPENDIX A

IEPR Process for the HSC ECIP DIFR-EIS Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the major milestones and deliverables of the HSC ECIP DIFR-EIS IEPR. Due dates for milestones and deliverables are based on the award/effective date listed in Table A-1. The review documents were provided by U.S. Army Corps of Engineers (USACE) on August 28, 2017. Note that the actions listed under Task 6 as well as the public comment review occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on February 1, 2018. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

Table A-1. Major Milestones and Deliverables of the HSC ECIP DIFR-EIS IPER

Task		Due Date
1	Award/Effective Date	8/25/2017
	Review documents available	8/28/2017
	Battelle submits draft Work Plan ^a	9/1/2017
	USACE provides comments on draft Work Plan	9/8/2017
	Battelle submits final Work Plan ^a	9/13/2017
2	Battelle submits list of selected panel members ^a	9/13/2017
	USACE confirms the panel members have no COI	9/18/2017
3	Battelle convenes kick-off meeting with USACE	9/14/2017
	Battelle convenes kick-off meeting with panel members	9/29/2017
	Battelle convenes kick-off meeting with USACE and panel members	10/3/2017
4	Panel members complete their individual reviews	10/23/2017
	Panel members provide draft Final Panel Comments to Battelle	11/2/2017
	Panel finalizes Final Panel Comments with exception of Public Comment Review	11/10/2017
	Battelle sends public comments to panel members for review ^b	11/21/2017
	Panel prepares and finalizes Public Comment Review Final Panel Comments, if necessary ^b	12/4/2017
5	Battelle submits Final IEPR Report to USACE ^a	11/20/2017
	Battelle submits Addendum to the Final IEPR Report ^a	12/7/2017
6 ^b	Battelle convenes Comment Response Teleconference with panel members and USACE	1/9/2018
	Battelle submits pdf printout of DrChecks project file ^a	2/1/2018
	Senior Leader Meeting (SLM) 1 (Agency Decision Milestone (ADM) meeting) ^c	12/13/2017
	Post-ADM Senior Leader Meeting (estimated date) ^c	7/11/2018
	Contract End/Delivery Date	11/12/2018

^a Deliverable.

^b Task 6 as well as the public comment review occurs after the submission of this report.

^c The SLM meetings were listed in the Performance Work Statement under Task 3 but were relocated in this schedule to reflect the chronological order of activities.

At the beginning of the Period of Performance for the HSC ECIP DIFR-EIS IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., terminology to use, access to DrChecks, etc.). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 15 charge questions provided by USACE, which included two overview questions added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge, as well as the review documents and reference/supplemental materials listed in Table A-2.

Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information

Review Documents	No. of Pages
HSC ECIP Draft Integrated Feasibility Report/DIFR-EIS	212
Appendix A: Plan Formulation	68
Appendix B: Economic Appendix	154
Appendix C: Engineering Design, Cost Estimates, and Cost Risk Analysis	231
Appendix D: Real Estate Plan	72
Appendix E: Public Coordination: Scoping	341
Appendix F: Agency and Tribal Coordination	48
Appendix G: Environmental Supporting Documentation	184
Appendix H: Clean Water Act Section 404(b)(1)	23
Appendix I: Coastal Zone Management Act Coordination – Consistency Determination	14
Appendix J: Clean Air Act General Conformity Determination	4
Appendix K: Endangered Species Act – Biological Assessment	24
Appendix L: Essential Fish Habitat Assessment	4
Appendix M: Fish and Wildlife Coordination Act Coordination Action Report	21
Appendix N: National Historic Preservation Act Coordination	12
Appendix O: Hazardous, Toxic, and Radioactive Waste Assessment	21
Appendix P: Habitat Functional Modeling Report	32
Appendix Q: Mitigation Plan and Cost Effectiveness/ Incremental Cost Analysis	6
Total Number of Review Pages	1,471
Reference Information ^a	
Public Comments ^b	100
Risk Register	10
Total Number of Reference Pages	110

^a Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.

^b USACE will submit public comments to Battelle upon their availability according to the schedule in Table A-1, who will in turn submit the comments to the IEPR Panel for review. A separate Addendum to the Final Report will be submitted if additional Final Panel Comments are necessary.

In addition to the materials provided in Table A-2, the panel members were provided the following USACE guidance documents.

- USACE guidance, *Civil Works Review* (EC 1165-2-214), December 15, 2012
- Office of Management and Budget, *Final Information Quality Bulletin for Peer Review*, December 16, 2004.

The Panel did not have any clarifying questions for USACE during the course of their review. Therefore, Battelle notified the Planning Center of Expertise (PCX) that a mid-review teleconference with the PDT was not necessary.

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response form provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. At the end of the review, Battelle summarized the individual comments into a preliminary list of overall comments and discussion points. Each panel member's individual comments were shared with the full Panel.

A.3 IEPR Panel Teleconference

Battelle facilitated a teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member should serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle distributed a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the HSC ECIP DIFR-EIS IEPR:

- **Lead Responsibility:** For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed a summary email detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel member as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
 1. Comment Statement (succinct summary statement of concern)
 2. Basis for Comment (details regarding the concern)
 3. Significance (high, medium/high, medium, medium/low, and low; see description below)
 4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
 1. **High:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.
 5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.
- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, eight Final Panel Comments were prepared and assembled. There was no direct

communication between the Panel and USACE during the preparation of the Final Panel Comments. The full text of the Final Panel Comments is presented in Section 4.2 of the main report.

A.5 Final IEPR Report

After concluding the review and preparation of the Final Panel Comments, Battelle prepared a final IEPR report (this document) on the overall IEPR process and the IEPR panel members' findings (this document). Each panel member and Battelle technical and editorial reviewers reviewed the IEPR report prior to submission to USACE for acceptance.

A.6 Conduct of the Public Comment Review

Battelle will complete the public comment review following the schedule in Table A-1. The public comment review for the IEPR panel members will take place after the Final IEPR Report (this document) has been submitted to USACE.

A.7 Comment Response Process

As part of Task 6, Battelle will enter the eight Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

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APPENDIX B

Identification and Selection of IEPR Panel Members for the HSC ECIP
DIFR-EIS Project

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B.1 Panel Identification

The candidates for the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP), Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement (hereinafter: HSC ECIP DIFR-EIS IEPR) Panel were evaluated based on their technical expertise in the following key areas: Civil Works planning/environmental (dual role), economics, hydraulic/coastal engineering, and geotechnical engineering. These areas correspond to the technical content of the review documents and overall scope of the HSC ECIP DIFR-EIS project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected four experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

Candidates were screened for the following potential exclusion criteria or conflicts of interest (COIs). These COI questions were intended to serve as a means of disclosure in order to better characterize a candidate's employment history and background. Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. Guidance in OMB (2004, p. 18) states,

“...when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects.”

Panel Conflict of Interest (COI) Screening Statements for the IEPR of the HSC ECIP DIFR-EIS

1. Previous and/or current involvement by you or your firm in the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP), Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) and related projects.
2. Previous and/or current involvement by you or your firm in deep draft navigation studies or work related to the Houston Ship Channel (HSC), Galveston Harbor and Channels, Galveston Entrance Channel, and the Texas City Ship Channel.

Panel Conflict of Interest (COI) Screening Statements for the IEPR of the HSC ECIP DIFR-EIS

3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in the HSC ECIP DIFR-EIS or related projects.
4. Current employment by the U.S. Army Corps of Engineers (USACE).
5. Previous and/or current involvement with paid or unpaid expert testimony related to the HSC ECIP DIFR-EIS.
6. Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups (*for pay or pro bono*):
 - Greater Houston Partnership
 - Greater Houston Port Bureau
 - Gulf of Mexico Fishery Management Council
 - Houston Port Authority (a.k.a. Port of Houston Authority)
 - Houston Pilots
 - Texas Coastal Management Program (TCMP) Coastal Coordination Advisory Committee
 - TCMP Coastal Coordination Council
 - TCMP Regional Fishery Management Councils
 - Texas Commission on Environmental Quality
 - Texas Department of State Health Services
 - Texas Parks and Wildlife Department
 - Texas Water Development Board
 - Texas General Land Office.
7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to HSC, Galveston Harbor and Channels, Galveston Entrance Channel, and the Texas City Ship Channel.
8. Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Galveston District.
9. Previous or current involvement with the development or testing of models that will be used for, or in support of, the HSC ECIP DIFR-EIS project (e.g., oyster/habitat modeling, hydrodynamic modeling, HarborSym, Mii).
10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Galveston District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Galveston District. Please explain.

Panel Conflict of Interest (COI) Screening Statements for the IEPR of the HSC ECIP DIFR-EIS

11. Any previous employment by USACE as a direct employee, notably if employment was with the Galveston District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
12. Any previous employment by USACE as a contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the Galveston District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning deep draft navigation and include the client/agency and duration of review (approximate dates).
14. Pending, current, or future financial interests in HSC ECIP DIFR-EIS related contracts/awards from USACE.
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.
16. Significant portion of your personal or office's revenues within the last three years came from Houston Port Authority contracts.
17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to HSC ECIP DIFR-EIS.
18. Participation in relevant prior and/or current Federal studies relevant to this project and/or HSC ECIP DIFR-EIS.
19. Previous and/or current participation in prior non-Federal studies relevant to this project and/or HSC ECIP DIFR-EIS.
20. Has your research or analysis been evaluated as part of the HSC ECIP DIFR-EIS?
21. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit. The term "firm" in a screening question referred to any joint venture in which a firm was involved. It applied to whether that firm serves as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. One panel member held a dual role serving as both the environmental and Civil Works planning expert. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

Table B-1. HSC ECIP DIFR-EIS IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Civil Works Planning / Environmental (Dual Role)					
Dennis Barnett	Tetra Tech	Atlanta, GA	M.S., Water Resources Planning	Yes	42
Economics					
Ken Casavant	Independent Consultant	Pullman, WA	Ph.D., Agricultural Economics	NA	40+
Geotechnical Engineering					
Rune Storesund	Independent Consultant	Kensington, CA	D.Eng., Civil Engineering	Yes	17
Hydraulic / Coastal Engineering					
Dave Basco	Independent Consultant	Norfolk, VA	Ph.D., Civil Engineering	Yes	45

Table B-2 presents an overview of the credentials of the four members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information for each panel member and his area of technical expertise is given in Section B.3.

Table B-2. HSC ECIP DIFR-EIS IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Barnett	Casavant	Storesund	Basco
Civil Works Planner / Environmental (Dual Role)				
Minimum 10 years of demonstrated experience in water resources planning for deep-draft navigation (DDN) projects	X			
Minimum M.S. degree or higher in a related field	X			
Demonstrated experience applying USACE plan formulation process, procedures, and standards to DDN channel improvement projects and dredged material management plans	X			

Table B-2. HSC ECIP DIFR-EIS IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Barnett	Casavant	Storesund	Basco
At least 15 years of experience directly related to water resource environmental evaluation or review and National Environmental Policy Act (NEPA) compliance for DDN channel improvement and dredged material management projects	X			
Demonstrated expertise in Gulf Coast environmental issues	X			
Familiar with USACE environmental analyses including a general knowledge of environmental statutes and compliance processes	X			
Experience with Hazardous, Toxic, and Radioactive Waste regulations and compliance processes, including a general knowledge of Comprehensive Environmental Response, Compensation, and Liability Act/Superfund compliance processes	X			
An expert in compliance with additional environmental laws, policies, and regulations, including compliance with Fish and Wildlife Coordination Act and Endangered Species Act	X			
Economics				
Minimum 15 years of demonstrated experience or combined equivalent of education and experience in DDN economics, specifically with containerized and tanker trade		X		
Demonstrated experience in applying USACE procedures and standards for DDN economic analyses and in formulating and evaluating alternative plans for those projects		X		
Knowledge of tools employed for economic analysis, risk analysis, and trade/fleet forecasts is required		X		
Experience directly working for or with the USACE in applying Principles and Guidelines to Civil Works project evaluations is highly recommended		X		
Active participation in related professional societies is encouraged		X		
Geotechnical Engineer				
Minimum of 15 years of demonstrated engineering experience or combined equivalent of education and experience in geo-civil design and geotechnical evaluation of DDN projects			X	
Licensed Professional Engineer			X	
Minimum M.S. degree or higher in geotechnical engineering			X	
Demonstrated experience related to USACE geotechnical practices for design and construction of DDN channels and dredged material management (upland and beneficial use areas)			X	

Table B-2. HSC ECIP DIFR-EIS IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Barnett	Casavant	Storesund	Basco
Experience in geotechnical risk analysis			X	
Active participation in related professional engineering and scientific societies is encouraged			X	
Hydraulic / Coastal Engineer				
Minimum 15 years of demonstrated experience or combined equivalent of education and experience in DDN channel design				X
Licensed Professional Engineer				X
Minimum M.S. degree or higher in coastal or hydraulic engineering				X
Familiar with the application of USACE risk and uncertainty analyses and coastal engineering requirements for feasibility studies (including channel design and effects of navigation channels on currents, sedimentation, and water quality)				X
Specialized experience in the design of dredged material placement areas (upland and beneficial use)				X
Familiar with standard USACE hydrologic and hydraulic computer models and has 5-10 years of experience working with numerical modeling applications for navigation projects.				X

B.3 Panel Member Qualifications

Detailed biographical information on each panel members’ credentials and qualifications and areas of technical expertise are summarized in the following paragraphs.

Name	Dennis Barnett, P.E.
Role	Civil Works Planner / Environmental
Affiliation	Tetra Tech

Mr. Barnett is a civil engineer with 42 years of experience in water resource and environmental planning. Prior to joining Tetra Tech in 2009, he had a 34-year career with USACE as a water resource and environmental planner covering both the South Atlantic Division and the Mobile District. Mr. Barnett has extensive experience applying planning principles and procedures to address water resource problems and opportunities, including plan formulation, public involvement, trade-off analysis, and environmental impact assessment. He is a recognized expert in developing and coordinating environmental assessments and impact statements in accordance with the National Environmental Policy Act (NEPA). His experience includes addressing substantive and procedural requirements of relevant environmental laws and regulations and working collaboratively with local, state, and Federal agencies, environmental

organizations, and other interest groups on complex and controversial water resource projects. He was responsible for successful implementation of NEPA for USACE activities in the South Atlantic region as well as compliance with applicable environmental laws, regulations, policies, and executive orders. He is knowledgeable of USACE regulations and policies governing the presence of hazardous, toxic, and/or radioactive wastes on Civil Works projects and has effectively applied that knowledge in the successful completion of planning and post-authorization reports, or in the review of these reports.

As a senior USACE environmental planner for 25 years, Mr. Barnett performed, or provided oversight for, planning and environmental activities in support of large- and small-scale water resource projects across the southeastern United States, Puerto Rico, and Virgin Islands. He facilitated the resolution of complex and controversial planning and environmental issues necessary to the successful completion of numerous large and small water resource studies and projects addressing deep- and shallow-draft navigation channel improvements, coastal storm damage reduction, flood risk management, and ecosystem restoration. He participated in the development and evolution of policies and procedures for Civil Works reviews, including agency technical reviews and independent external peer reviews, and facilitated the implementation of those reviews in the USACE South Atlantic region.

Following his career with USACE, Mr. Barnett has continued to be involved with USACE Civil Works projects as a consultant with Tetra Tech, including such activities as lead planner for a watershed study for the Detroit District; a principal author of a major EIS for a controversial update of the master water control manual for several reservoirs in the Mobile District; and team leader for completion of cultural resource, wetlands, and endangered species surveys and the assessment of potential impacts on these resources in support of the engineering and design for two significant environmental mitigation features for the Savannah Harbor Expansion Project.

Name	Ken Casavant, Ph.D.
Role	Economics
Affiliation	Independent Consultant

Dr. Casavant is a professor and economist at the School of Economic Sciences at Washington State University, Director of the Freight Policy Transportation Institute, and adjunct professor at North Dakota State's Upper Great Plains Transportation Institute. He earned his Ph.D. in agricultural economics from Washington State University in 1971. Dr. Casavant has nearly 50 years of experience as an economist, with expertise in transportation economics and planning, particularly the evaluation and comparison of alternative plans for numerous navigation studies. He has served as an economic consultant detailing the tradeoffs necessary on several multi-objective public works projects, most recently on studies of the deep-draft national and international maritime industry. In this capacity, he has become a recognized expert in applied economics related to transportation economics, with specific experience with financing transportation infrastructure and national and international logistics and transportation requirements. For example, he has aided in the design of a physical distribution system for limestone in Portugal, the wheat transportation system in Mali and Bolivia, and other domestic and international assignments.

Dr. Casavant is familiar with USACE plan formulation processes, procedures, and standards. He has more than 15 years of experience in plan formulation, evaluation, and comparison of alternative plans for numerous navigation studies (lock replacement), ecosystem restoration projects, and feasibility studies, including his technical reviews of the Lower Columbia River Channel Deepening Project, the Upper

Mississippi and Illinois Navigation Study, the Barataria Basin Barrier Shoreline Restoration Study, and the Mississippi River Gulf Outlet Ecosystem Restoration Plan, many of which included deep draft navigation requirements. The Mississippi-Illinois system project was a navigation lock system replacement project, including coastal inland waterway system needs. For the Lower Columbia River project, Dr. Casavant analyzed the costs of deep-draft shipping and the impacts on the costs of the project. The supply chains and alternative movements of the maritime steam ships were a focal point of the analyses. For the Delaware River Main Channel Deepening Project, he assessed and documented the benefits of the project. For the Upper Mississippi and Illinois Navigation Study, he examined alternative shipping flows, including shallow and deep draft, and benefits calculations as part of the economic evaluation.

Dr. Casavant has worked with USACE methodologies for cost effectiveness/incremental cost analysis (CE/ICA) and has a detailed knowledge of USACE standards and procedures, including the Institute for Water Resource (IWR) Planning Suite. As an economist or a combined Civil Works planner/economist for USACE IEPRs, he has studied and evaluated alternative plans for navigation lock replacement projects as well as navigation/dredging projects, such as the Savannah Harbor Expansion Project General Re-evaluation Report. Over the last 10 years, he has worked on 13 USACE projects where he has had to apply USACE standards and procedures, including the IWR Planning Suite methodologies, with a focus on effective and efficient ecological and natural sustained output per dollar of relevant expenditure for alternative project formulations. He has applied the USACE six-step planning process, which is governed by Engineer Regulation (ER) 1105-2-100, *Planning Guidance Notebook*, during his work as a technical reviewer and peer reviewer on more than 20 projects, such as the Port of Iberia Channel Deepening Project in 2006 for USACE, the External Independent Economic Opinion on Identifying and Measuring NED Benefits: Navigation Shipping, and the Morganza to the Gulf IEPR study, a hurricane protection and storm damage risk project.

Dr. Casavant has experience identifying, reviewing, and evaluating impacts on environmental resources from structural flood risk and impacts related to hurricane and coastal storm damage risk reduction projects. From risk assessment in Monte Carlo evaluations to traditional risk models in the IWR Planning Suite, he has broad and applied experience working with risk-informed approaches to decision making. The six most recent projects he has contributed to had critical components concerning the impacts of environmental resources from flood risk and coastal storm damage. He has also been a plan formulator expert on Louisiana Water Resources Council (LWRC) IEPRs; several of the projects under review had a specific objective to evaluate the damage reduction and the risk associated with achieving benefits from flood risk management and one project focused specifically on the impact on shorelines.

Dr. Casavant has published more than 70 journal articles and has contributed to hundreds of written documents, including chapters in books, books, abstracts, proceedings, professional materials, conference papers, and research bulletins, circulars, and reports. He is a member of numerous professional associations, such as the Transportation Research Board - National Research Council, the International Agricultural Economics Association, and the Logistics and Physical Distribution Association.

Name	Rune Storesund, D.Eng, P.E., G.E.
Role	Geotechnical Engineering
Affiliation	Independent Consultant

Dr. Storesund is the Principal Engineer at Storesund Consulting and the Executive Director of the University of California (UC), Berkeley Center for Catastrophic Risk Management. He also serves as an on-call expert geotechnical engineer (G.E.) to the State of California's Department of Consumer Affairs for its annual examination. He earned his doctorate (D.Eng) in civil engineering from UC Berkeley; is a registered civil engineer in California, Louisiana, Hawaii, and Washington; and is a registered G.E. in California. He has 17 years of experience in planning, design, operation and maintenance (O&M), construction, and decommissioning of Civil Works structures and has worked on a variety of projects throughout the United States and internationally.

Dr. Storesund is familiar with large, complex Civil Works projects with high public and interagency interests. Following Hurricane Katrina in 2005, he participated in a review of the performance of the Hurricane Defense System for the greater New Orleans area, the largest and most complex flood protection project in the United States. He completed a study evaluating the improved Hurricane Protection System from a holistic systems-based perspective, using the modeling tool "Systems Modeling Language" (SysML) to synthesize and integrate disparate system elements. He has also worked on the Louisiana Coastal Restoration initiative (with the Environmental Defense Fund) and the National Science Foundation-sponsored Resilient and Sustainable Infrastructures project, evaluating Interconnected, Interrelated, Interactive Critical Infrastructures in the California Delta.

Dr. Storesund has demonstrated experience performing geotechnical evaluations and geo-civil design for USACE flood risk management projects with dredged material disposal sites and utilizing dredged material for ecosystem restoration. His most recent experience (2002 through 2014) was with the Hamilton Wetland Restoration project in Novato, California, which involved the deepening of the Port of Oakland, transporting the material via barge to an off-coast pumping station, then pumping the dredged materials into a former Army airbase to create constructed beneficial wetland and upland habitats. He performed site characterization, engineering analyses (e.g., settlement, static/dynamic slope stability, seepage, wave runup), construction oversight, and post-project monitoring (terrestrial light detection and ranging [LiDAR]).

Dr. Storesund has experience related to structural and geotechnical practices associated with levee and flood risk management structures' design and construction, including static and dynamic slope stability, seepage through earthen embankments, and underseepage. He has been an active participant in American Society of Civil Engineers (ASCE) committees on the local and national level since 1998.

Throughout Dr. Storesund's career, he has applied his experience in geo-civil design and geotechnical evaluation on numerous deep draft navigation projects including:

- **Brooklyn Basin Dredging Study, Oakland, California:** Dr. Storesund served as the project engineer for this maintenance dredging study commissioned by the San Francisco U.S. Army Corps of Engineers. The project involved performing a cost/benefit analysis for deepening the Brooklyn Basin at the south end of the Oakland Estuary. The study encountered contaminated

soils during the field exploration sampling and formal finalization of the study was put on hold while USACE evaluated how to address these findings.

- Port of Oakland Inner Harbor Turning Basin Study, Oakland, California:** Dr. Storesund served as a project engineer (while at Land Marine Geotechnics) for the Inner Harbor turning basin geotechnical study, part of the Oakland Harbor Navigation Improvement project. The study entailed submarine slope stability, sheet pile retaining walls, and dredging operation evaluation.
- Port of Oakland Middle Harbor Turning Basin Study, Oakland, California:** Dr. Storesund served as a project engineer (while at Fugro Consultants and Land Marine Geotechnics) for the Middle Harbor basin dredged fill placement and settlement monitoring to confirm/refute design assumptions associated with dredge spoils disposal to create beneficial ecosystem habitat.
- Oakland Harbor Navigation Improvement (-50 Foot) Project, Port of Oakland, Oakland, California:** Dr. Storesund served as a geotechnical project engineer (while at Subsurface Consultants) to analyze geotechnical aspects for this deepening project at the Port of Oakland to extend the shipping channel depth from 42 feet to 50 feet, with a 2 feet overdredge allowance depth.
- Dow Chemical Wharf, Pittsburg, California:** Dr. Storesund was the project manager and a project engineer for the evaluation of an existing wharf to evaluate its ability to accommodate larger supply ships. The study evaluated channel deepening, wharf expansion, and placement of anchoring buoys. This project was located adjacent to the Port of Stockton and Port of Sacramento shipping channels.
- Nelson’s Marine Shoreline Stabilization, Alameda, California:** Dr. Storesund served as the project manager and project engineer for this shoreline stabilization and remediation project at an abandoned boat yard within the Oakland Estuary adjacent to the Alameda Channel. The project required an alternatives analysis (approach and cost estimate), decision matrix, development of remediation plans, specifications, and estimates.
- Port of Richmond, Operable Unit 2:** Dr. Storesund provided geotechnical design on this environmental remediation and restoration project within the Port of Richmond and adjacent to the deep draft navigation channel approach to the Port of Richmond. The mitigation consisted of a subaqueous cap (comprised of Bay Mud) in the inlet, installation of rip-rap along the shoreline revetment zone, and installation of a concrete facing and asphalt concrete cap to isolate in place sediments.

Name	Dave Basco, Ph.D., P.E.
Role	Hydraulic / Coastal Engineering
Affiliation	Independent Consultant

Dr. Basco is a registered P.E. in Virginia with 45 years of experience in hydraulic and coastal engineering. He has a Ph.D. in civil engineering in the specialty area of coastal engineering. He was the Assistant Director of the Center for Dredging Studies at Texas A&M University for 10 years and taught the graduate course "Dredging and Beach Engineering" at Old Dominion University for 28 years. Dredging and the environment is the primary aspect of this course. Topics covered were beneficial uses, creation of

wetlands using dredged material, capping and removal of contained sediments, and water quality aspects. He has also taught graduate-level courses in open channel flow and tidal hydraulics. Dr. Basco is well versed in non-structural alternatives and is familiar with HEC and ADCIRC computer models as well as storm risk management uncertainty analysis and studies. He is also very knowledgeable of the structural analysis of solutions for storm risk management for levees and floodwalls in urban environments.

Dr. Basco has conducted dredged material disposal research in Galveston Bay, his latest consulting effort in 2008 examining USACE dredge material disposal and oyster reefs. He also has also served as technical reviewer of numerous USACE reports, such as *Dredged Material Transport Systems for Inland Disposal and/or Productive Use Concepts* for USACE's U.S. Waterways Experiment Station and *Assessment of the Factors Controlling the Long-Term Fate of Dredged Material Deposited in Unconfined Subaqueous Disposal Area* for USACE's Dredged Material Research Program.

Dr. Basco co-authored the textbook *Computational Fluid Dynamics: An Introduction for Engineers* (Abbott and Basco, 1989) and is currently writing the textbook entitled *Design of Coastal Structures*, which is scheduled for publication in 2018. He is also the author of Part V, Chapter 3, "Design of Shore Protection Projects," for the USACE Coastal Engineering Manual (CEM, 2000). In 2016, he was selected as the 2016 International Coastal Engineer of the Year by the ASCE.

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APPENDIX C

Final Charge for the HSC ECIP DIFR-EIS IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Houston Ship Channel Expansion Channel Improvement Project, Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement

This is the final Charge to the Panel for the HSC ECIP DIFR-EIS IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on September 13, 2017.

BACKGROUND

The Houston Ship Channel (HSC), Galveston Harbor and Channels, Galveston Entrance Channel, and the Texas City Ship Channel are integrally connected to the overall navigation system of the Galveston Bay area. However, this feasibility study focuses entirely on the HSC (Figure 1).

The HSC provides access to various private and public docks and berthing areas associated with Port Houston. It is the longest major navigation channel within the HSC system, spanning Harris, Chambers, and Galveston Counties, Texas. The HSC project consists of an existing 50-mile long deep-draft navigation channel, four deep-draft tributary channels, and one shallow draft tributary channel. Several other minor tributary channels also intersect the HSC, including South Boaters Cut, North Boaters Cut, and Five Mile Cut.

Figure 2 depicts the channels and existing placement areas (PAs) for the HSC system. The HSC begins at Bolivar Roads at mile 0.0 (the seaward end of the project) and extends north through the Galveston Bay, past the San Jacinto River, and through Buffalo Bayou to the Main Turning Basin at Houston, Texas. From the Main Turning Basin, an approximately 6-mile long shallow draft channel (not included in the scope of the HSC ECIP study), referred to as the (Buffalo Bayou) Light Draft Channel, extends upstream to the terminus of the Federal project.

From Bolivar Roads (mile 0.0) to Boggy Bayou (mile 38.5) the channel depth is -46.5 feet mean lower low water (MLLW) and the channel width is 530 feet. In the stretch between Bolivar Roads and Boggy Bayou, there are two side channels connecting to the HSC. These channels are the Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC). The BSC depth is -41.5 feet MLLW and the channel width is 300 feet. The BCC depth is -41.5 feet MLLW and the width is 300 feet. Between Boggy Bayou and Sims Bayou (mile 47.5), the channel depth is -41.5 feet MLLW and the channel width is 300 feet. From Sims Bayou to the Main Turning Basin (mile 50.2), the channel depth is -37.5 feet MLLW and the width is 300 feet. Additionally, barge lanes are located immediately adjacent to and on either side of the HSC from Bolivar Roads to Morgans Point (mile 26.0), a distance of approximately 26 miles. Each barge lane is at an approximate depth of -13 feet MLLW and at a width of 125 feet. Dredged material is typically placed in a variety of upland confined PA sites and beneficial use (BU) sites, but some material from the lower bay region has been placed offshore in the Ocean Dredged Material Disposal Site, historically referred to as PA 1 (Figure 2). In addition to the BSC and BCC, the HSC system also includes the following side or tributary channels: Jacintoport Channel and Greens Bayou Channel.

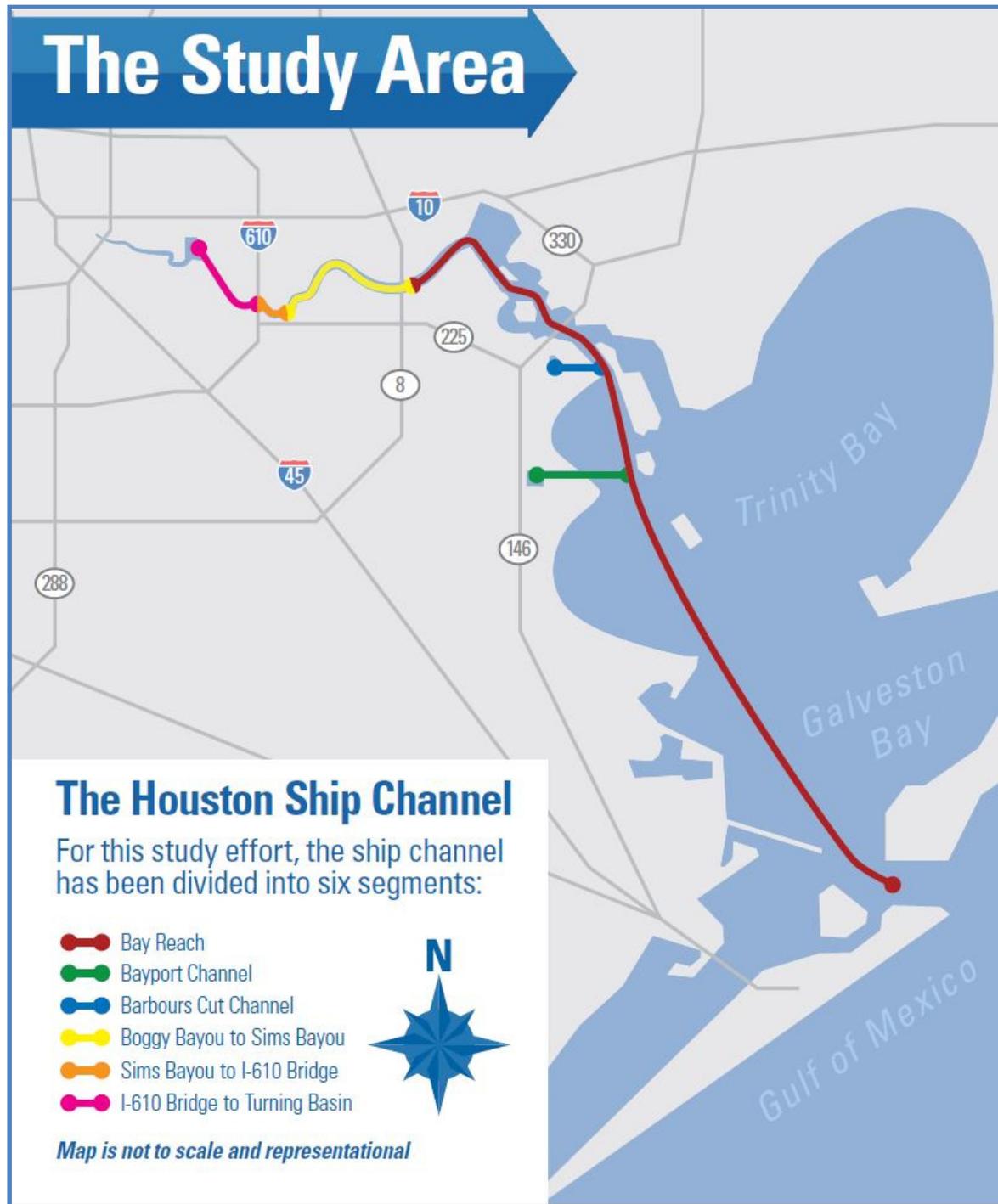


Figure 1 - Study Segments or Reaches for the HSC ECIP Feasibility Study

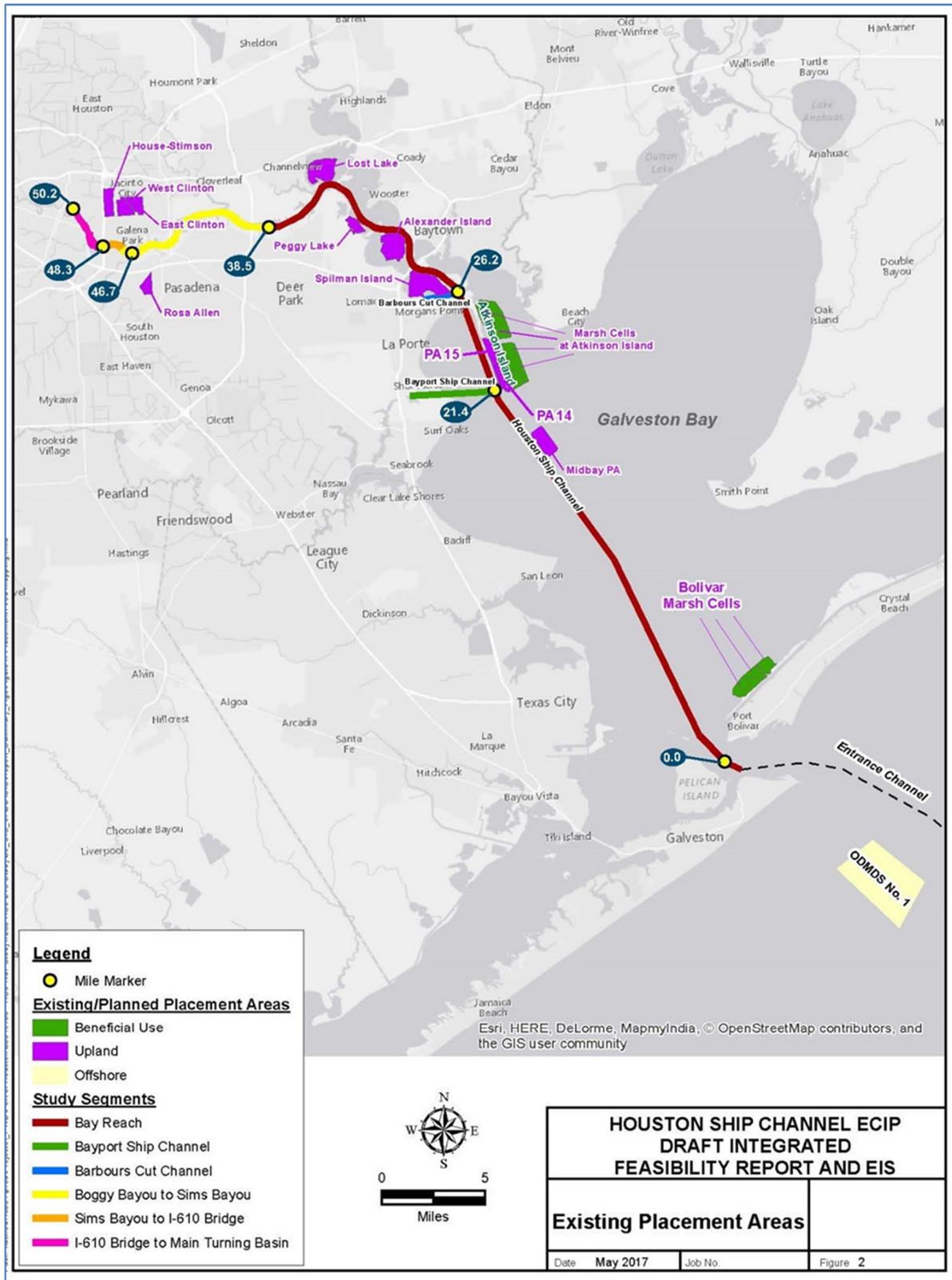


Figure 2 - Channel Location and Placement Areas

The study area has been divided into segments based upon the improvements evaluated. Beginning at the most seaward end of the HSC and terminating at Boggy Bayou (Segment 1), the study will examine possible anchorage areas or multipurpose moorings, meeting and/or passing lanes, and bend easing. Alternatives for Segment 2, the BSC, consist of anchorage area or multipurpose moorings, channel widening, flare easing, turning basin improvements, and a shoaling attenuation structure. For Segment 3, the BCC, channel widening, flare easing, and turning basin modifications will be examined. In Segment 4, Boggy Bayou to Sims Bayou, the study will examine channel widening, channel deepening, and turning basin modifications. In Segment 5, Sims Bayou to the Interstate-610 (I-610) Bridge, proposed improvements consist of channel deepening and turning basin modifications. Lastly, Segment 6, I-610 Bridge to the Main Turning Basin, the study will examine channel deepening and turning basin improvements. The BU of dredged material and/or modified or new upland confined PAs will also be considered for placement of dredged material.

The overall study goal is to provide an efficient and safe navigation channel while contributing to national economic development and protecting the nation's environment. The planning objectives are as follows:

- Reduce navigation transportation costs by increasing economies of scale for vessels to and from HSC over the period of analysis (starting in the base year for 50 years).
- Increase vessel efficiency and maneuverability at the HSC, Bayport Channel, and Barbour's Cut Channel for the existing and future fleet through the 50-year period of analysis.
- Establish environmentally suitable PAs, and maximize use of BU of dredged material for placement over the 50-year period of analysis.
- Increase channel safety for vessels utilizing study area channel segments.

Tentatively Selected Plan (TSP). The TSP has been selected based upon limited, detailed information; a general understanding of the transit restrictions that could be reduced by channel improvements (to increase transportation cost savings); the vessel fleet forecast; historical information regarding environmental conditions requiring mitigation; generalized assumptions about dredged material placement based upon historical placement practices, including beneficial use; and general assumptions regarding channel improvement design. Additional economic, engineering, and environmental evaluation is necessary to confirm the TSP. Ship simulation will be performed to confirm the engineering assumptions made; ship simulation will be conducted subsequent to the Agency Decision Milestone (ADM) meeting.

The TSP shown in Figure 3 includes the following features. Features noted with an asterisk (*) are those considered necessary for safe and efficient navigation in the HSC.

- **Segment 1**
 - Main HSC - Four bend easings with relocation of associated barge lanes
 - Main HSC - Channel widening between Bolivar Roads and BCC
 - Main HSC - Addition of two new multipurpose mooring areas, one near Alexander Island and the other near San Jacinto State Park
 - *Main HSC - Minor widening of the channel in the bayou portion of the Hog Island stretch
 - *Main HSC - Channel widening from San Jacinto Monument to Boggy Bayou
- **Segment 2**
 - BSC - Flare expansion
 - BSC - Shoaling attenuation structure near the BSC Flare
 - BSC - Addition of a turning basin at the mouth of the BSC land-cut
 - BSC - Channel widening from 300 feet to 455 feet

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP), Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS) (hereinafter: HSC ECIP DIFR-EIS IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, dated December 15, 2012), and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004). Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the decision documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) who meet the technical criteria and areas of expertise required for and relevant to the project.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-214, Appendix D, review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review.

Documents for Review

The following is a list of documents, supporting information, and reference materials that will be provided for the review.

Review Documents	Subject Experts				
	No. of Review Pages	Economics	Civil Works Planner/ Environmental	Geotechnical Engineer	Hydraulic /Coastal Engineer
HSC ECIP Draft Integrated Feasibility Report/DIFR-EIS	212	212	212	212	212
Appendix A: Plan Formulation	68	68	68	68	68
Appendix B: Economic Appendix	154	154			
Appendix C: Engineering Design, Cost Estimates, and Cost Risk Analysis	231	231		231	231
Appendix D: Real Estate Plan	72	72	72		

Review Documents	Subject Experts				
	No. of Review Pages	Economics	Civil Works Planner/ Environmental	Geotechnical Engineer	Hydraulic /Coastal Engineer
Appendix E: Public Coordination: Scoping	341	341	341		
Appendix F: Agency and Tribal Coordination	48		48		
Appendix G: Environmental Supporting Documentation	184		184		
Appendix H: Clean Water Act Section 404(b)(1)	23		23		
Appendix I: Coastal Zone Management Act Coordination – Consistency Determination	14		14		14
Appendix J: Clean Air Act General Conformity Determination	4		4		
Appendix K: Endangered Species Act – Biological Assessment	24		24		
Appendix L: Essential Fish Habitat Assessment	4		4		
Appendix M: Fish and Wildlife Coordination Act Coordination Action Report	21		21		
Appendix N: National Historic Preservation Act Coordination	12		12		
Appendix O: Hazardous, Toxic, and Radioactive Waste Assessment	21	21	21	21	21
Appendix P: Habitat Functional Modeling Report	32		32		
Appendix Q: Mitigation Plan and Cost Effectiveness/ Incremental Cost Analysis	6	6	6		
Total Number of Review Pages	1471	1105	1086	532	546
Reference Information*					
Public Comments**	100	100	100	100	100
Risk Register	10	10	10	10	10
Total Number of Reference Pages	110	110	110	110	110

* Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.

** Page count for public comments is approximate. USACE will submit public comments to Battelle, who will in turn submit the comments to the IEPR Panel.

Documents for Reference

- USACE guidance *Civil Works Review*, (EC 1165-2-214, December 15, 2012)
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004)
- Foundations of SMART Planning
- SMART Planning Bulletin (PB 2013-03)
- SMART – Planning Overview
- Planning Modernization Fact Sheet.

SCHEDULE

Note that dates presented in the schedule below could change due to panel member and USACE availability.

Task	Action	Due Date
Attend Meetings and Begin Peer Review	Subcontractors complete mandatory Operations Security (OPSEC) training	10/27/2017
	Battelle convenes kick-off meeting with USACE	9/14/2017
	Battelle sends review documents to panel members	9/28/2017
	Battelle convenes kick-off meeting with panel members	9/29/2017
	Battelle convenes kick-off meeting with USACE and panel members	10/2/2017
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	10/11/2017
Prepare Final Panel Comments and Review Public Comments	Panel members complete their individual reviews	10/23/2017
	Battelle provides talking points for Panel Review Teleconference to panel members	10/25/2017
	Battelle convenes Panel Review Teleconference	10/26/2017
	Battelle provides Final Panel Comment templates and instructions to panel members	10/27/2017
	Panel members provide draft Final Panel Comments to Battelle	11/2/2017
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	11/3/2017 - 11/9/2017
	Panel finalizes Final Panel Comments	11/10/2017
Prepare Final Panel Comments and Review Public Comments ¹	Battelle receives public comments from USACE	11/16/2017
	Battelle sends public comments to Panel	11/20/2017
	Panel completes its review of public comments	11/27/2017
	Battelle and Panel review Panel's responses to the public comment charge question	11/28/2017
	Panel drafts Final Panel Comment for public comments, if necessary	11/30/2017
	Panel finalizes Final Panel Comment regarding public comments, if necessary	12/4/2017
Review Final IEPR Report	Battelle provides Final IEPR Report to panel members for review	11/14/2017
	Panel members provide comments on Final IEPR Report	11/16/2017
	*Battelle submits Final IEPR Report to USACE	11/20/2017
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	11/29/2017

Task	Action	Due Date
Review Final IEPR Report Addendum	Battelle provides Addendum to Final IEPR Report to panel members for review	12/5/2017
	Panel members provide comments on Addendum to Final IEPR Report	12/6/2017
	Battelle submits Addendum to Final IEPR Report to USACE*	12/7/2017
	USACE Planning Center of Expertise (PCX) provides decision on Addendum to Final IEPR Report acceptance	12/14/2017
Comment/Response Process	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	12/1/2017
	Battelle convenes teleconference with USACE to review the Comment Response process	12/1/2017
	Battelle convenes teleconference with Panel to review the Comment Response process	12/1/2017
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	12/19/2017
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	12/27/2017
	USACE PCX provides draft PDT Evaluator Responses to Battelle	12/28/2017
	Battelle provides draft PDT Evaluator Responses to panel members	1/2/2018
	Panel members provide draft BackCheck Responses to Battelle	1/5/2018
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	1/8/2018
	Battelle convenes Comment Response Teleconference with panel members and USACE	1/9/2018
	USACE inputs final PDT Evaluator Responses to DrChecks	1/17/2018
	Battelle provides final PDT Evaluator Responses to panel members	1/19/2018
	Panel members provide final BackCheck Responses to Battelle	1/24/2018
	Battelle inputs panel members' final BackCheck Responses to DrChecks	1/31/2018
*Battelle submits pdf printout of DrChecks project file	2/1/2018	
SLM 1	Senior Leader Meeting (SLM) 1 – Agency Decision Milestone (ADM) Meeting	12/13/2017
SLM 2	Senior Leader Meeting 2 – Post-ADM (Estimated no later than)	7/11/2018

* Deliverables

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the decision documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-214; Appendix D).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Project Manager (Lynn McLeod; mcleod@battelle.org) or Program Manager (Rachel Sell; sellr@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Rachel Sell (sellr@battelle.org) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to Lynn McLeod, mcleod@battelle.org no later than 10 pm ET by the date listed in the schedule above.

Independent External Peer Review of the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP), Harris, Chambers, and Galveston Counties, Texas, Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR-EIS)

Charge Questions and Relevant Sections as Supplied by USACE

The following Review Charge to Reviewers outlines the objectives of the Independent External Peer Review (IEPR) for the subject study and identifies specific items for consideration for the IEPR Review Panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR Review Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the Review Charge. The Review Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the Review Charge. The Review Panel can use all available information to determine what scientific and technical issues related to the decision document may be important to raise to decision makers. This includes comments received from agencies and the public as part of the public review process.

The Panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on whether a particular alternative should be implemented or present findings that become “directives” in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances the Review Panel would have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment.

The Review Panel is asked to consider the following items as part of its review of the decision document and supporting materials.

Broad Evaluation Review Charge Questions

1. Is the need for and intent of the decision document clear?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical issues?
3. Given the need for and intent of the decision document, assess the adequacy and acceptability of the project evaluation data used in the study analyses.

4. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, and engineering assumptions that underlie the study analyses.
5. Given the need for and intent of the decision document, assess the adequacy and acceptability of the economic, environmental, and engineering methodologies, analyses, and projections.
6. Given the need for and intent of the decision document, assess the adequacy and acceptability of the models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives.
7. Given the need for and intent of the decision document, assess the adequacy and acceptability of the methods for integrating risk and uncertainty.
8. Given the need for and intent of the decision document, assess the adequacy and acceptability of the formulation of alternative plans and the range of alternative plans considered.
9. Given the need for and intent of the decision document, assess the adequacy and acceptability of the quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans.
10. Given the need for and intent of the decision document, assess the adequacy and acceptability of the overall assessment of significant environmental impacts and any biological analyses.
11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.
13. Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?

Battelle Summary Charge Questions to the Panel Members¹

Summary Questions

14. Please identify the most critical concerns (up to five) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.
15. Please provide positive feedback on the project and/or review documents.

¹ Questions 14 and 15 are Battelle supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the final Work Plan submitted to USACE.

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APPENDIX D

Conflict of Interest Form

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Eric Thor
USACE, Institute for Water Resources
July 26, 2017
C-1

Conflicts of Interest Questionnaire
Independent External Peer Review

**Houston Ship Channel 45-Foot Expansion Channel Improvement Project, Harris and
Chambers Counties, Texas
Integrated Feasibility Report and Environmental Impact Statement**

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: **Battelle Memorial Institute Corporate Operations**
REPRESENTATIVE'S NAME: **Courtney M. Brooks**
TELEPHONE: **614-424-5623**
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**
EMAIL ADDRESS: **brooksc1@battelle.org**

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) **No** Yes (if yes, briefly describe):

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? **No** Yes (if yes, briefly describe):

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? **No** Yes (if no, briefly describe the difficulty in identifying outside reviewers):

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? **No** Yes (if yes, briefly describe):

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

No additional information to report.

Courtney M. Brooks

Courtney M. Brooks

July 26, 2017

Date

Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal

BATTELLE

It can be done