Battelle
The Business of Innovation

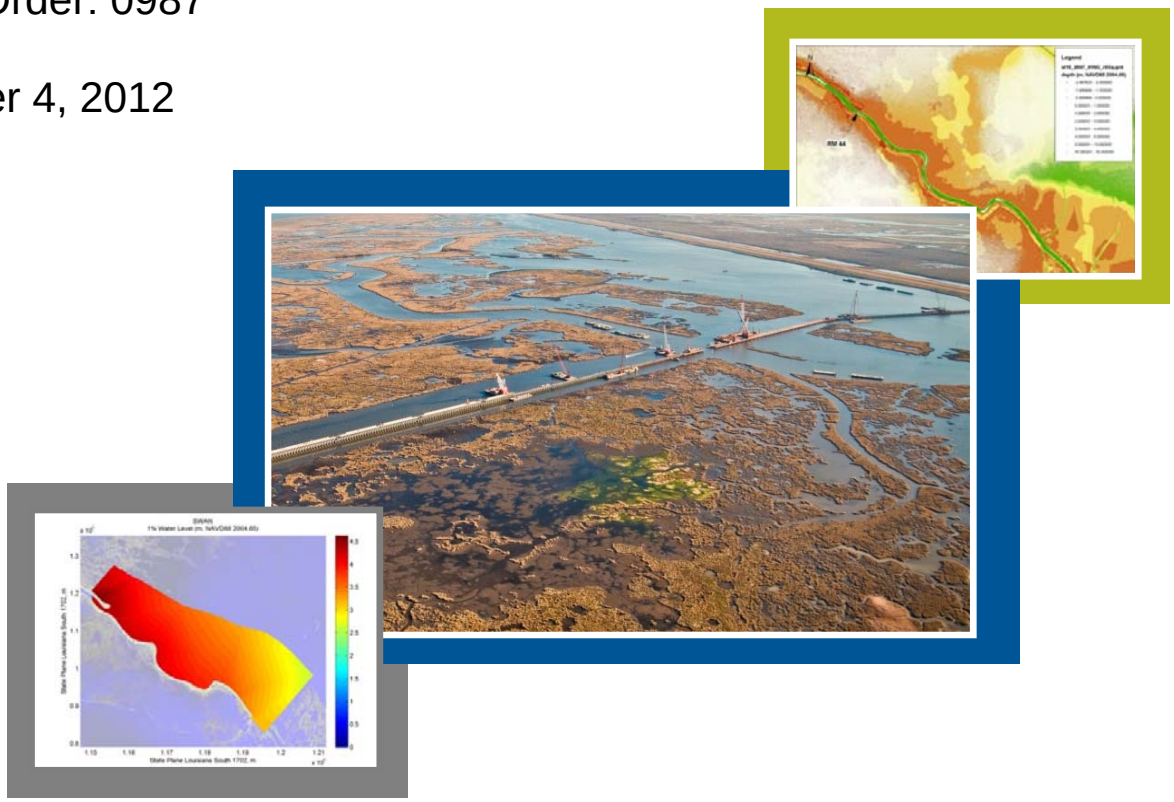
Final Independent External Peer Review Report for the Hurricane and Storm Damage Risk Reduction System – Design Elevation Report Addendum

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Damage Reduction Planning Center of Expertise
Baltimore District

Contract No. W911NF-07-D-0001
Task Control Number: 10-205
Delivery Order: 0987

September 4, 2012



SHORT-TERM ANALYSIS SERVICE (STAS)

on

Final Independent External Peer Review Report Hurricane and Storm Damage Risk Reduction System – Design Elevation Report Addendum

by

Battelle
505 King Avenue
Columbus, OH 43201

for

Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Damage Reduction Planning Center of Expertise
Baltimore District

September 4, 2012

Contract Number W911NF-07-D-0001
Task Control Number: 10-205
Delivery Order Number: 0987

Scientific Services Program

This page is intentionally left blank.

FINAL
INDEPENDENT EXTERNAL PEER REVIEW REPORT
for the
Hurricane and Storm Damage Risk Reduction System – Design Elevation Report Addendum

EXECUTIVE SUMMARY

The Hurricane and Storm Damage Risk Reduction System (HSDRRS) – Design Elevation Report (DER) is a compendium of initial hydraulic design performed for the HSDRRS Lake Pontchartrain and Vicinity (LPV), West Bank and Vicinity (WBV), Mississippi River Co-Located, and New Orleans to Venice projects. The first version of this report, "Elevations for Design of Hurricane Protection Levees and Structures – Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project and West Bank and Vicinity, Hurricane Protection Project," was completed in October 2007. The HSDRRS DER has recently been updated to include Mississippi River Levee co-located work, New Orleans to Venice project features, and a supporting Addendum (DER Addendum).

As a result of the update, an Independent External Peer Review (IEPR) of the HSDRRS DER and its supporting Addendum was requested by the U.S. Army Corps of Engineers (USACE). Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to coordinate the IEPR of the HSDRRS DER and Addendum. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2010), USACE (2007), and OMB (2004). The review of the HSDRRS DER was conducted from September through November 2010 with a Final IEPR Report being prepared in December 2010. This final report describes the IEPR process followed for the DER Addendum, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel) regarding the DER Addendum.

The same two panel members were selected for the IEPR of the DER and its Addendum. Battelle followed the criteria for selecting the candidate panel members specified in the USACE Statement of Work to (1) contact candidate panel members to evaluate technical skills, potential conflicts of interest (COIs), availability, and hourly rates; and (2) identify two experts from the pool of candidates on existing Task Force Hope task orders to serve on the IEPR Panel. Based upon these criteria the final panel members were selected for their technical expertise in the following key areas: hydraulic engineering and civil engineering. Battelle chose the experts from a pool of ten experts under the previously conducted Design Guidelines Task Force Hope task order for this review, as they were deemed most knowledgeable on the Design Guidelines, which the Design Elevation Review report supplemented. Although the Panel was disclosed to USACE, Battelle made the final decision on selecting the panel members.

IEPR of DER Addendum

The Panel received electronic versions of the DER Addendum including its associated appendices, totaling 462 pages (with approximately 1,500 supplemental pages of information), along with a charge that solicited comments on specific sections of the documents to be reviewed. The charge was prepared by Battelle to assist USACE in developing charge questions to guide the peer review, according to guidance provided in USACE (2010) and OMB (2004). USACE was given the opportunity to provide comments and revisions, and subsequently approved the final charge questions.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference in September 2010, prior to the start of the HSDRRS DER review under this project. Other than this teleconference and a teleconference in January 2011 to discuss Final Panel Comments developed by the Panel for the HSDRRS DER review, there was no direct communication between the Panel and USACE during the peer review process. For the review of the DER Addendum (including appendices), the Panel produced 40 individual comments in response to 20 charge questions.

IEPR panel members reviewed the DER Addendum individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, 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, or low); and (4) recommendations on how to resolve the comment. Overall, five Final Panel Comments with low significance were identified and documented. There were no Final Panel Comments identified as having high or medium significance.

Table ES-1 summarizes the Final Panel Comments. Detailed information on each comment is contained in Appendix A of this report.

Table ES-1. Overview of Five Final Panel Comments Identified by the HSDRRS Design Elevation Report Addendum IEPR Panel

No.	Final Panel Comments
Significance – Low	
1	The computed wave overtopping rates for the Seabrook Sector Gate Complex presented in the DER Addendum exceed the design criteria.
2	The redundancy associated with the interfaces between structures, materials, members, and project phases is not discussed in the DER or the Addendum.
3	The DER and Addendum do not specifically address how the various HSDRRS components work as an effective system.
4	The model analysis for surge levels does not include an update on quantification of the differences with the Federal Emergency Management Agency (FEMA) flood insurance study for the 100-year return period.

No.	Final Panel Comments
	Significance – Low
5	The DER Addendum does not discuss HSDRRS resiliency and robustness to the extent warranted given their importance to system performance.

USACE (2010) guidance states that the final report will contain the Panel's "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used." However, for the DER Addendum IEPR, the Panel focused solely on the coastal and hydraulic engineering analysis of the project; no economic or environmental assessment was conducted. The Panel agreed on its assessment of the adequacy and acceptability of the engineering methods, models, and analyses used in the DER Addendum and appendices. The assumptions that underlie the engineering analyses and planning methods appeared sound. The Panel was generally satisfied with the DER Addendum and appendices. The DER Addendum and appendices were technically defensible for their purpose to update the HSDRRS DER, which is now at Version 4.0a (dated 12 December 2011), and document the analyses performed to develop the resulting preliminary design elevations. Appropriate further analyses were identified that would remedy deficiencies noted in the current analysis (e.g., the overtopping exceedances at the Seabrook Closure Gate, SBRK-G). The Addendum Appendix A discussion and analysis of relative sea level rise (RSLR) in the context of the HSDRRS design elevations were appropriate. The Panel believes that the DER Addendum and appendices that update Version 4.0a of the HSDRRS DER represent a clear and significant improvement over the original HSDRRS DERs of 2007 and 2010.

The Panel believes that the technical quality of the DER Addendum could be improved by providing a more explicit and unified discussion of the key issues of resilience, redundancy, robustness, and system performance. These aspects of the HSDRRS relate to its overall effectiveness to reduce real-world risk and uncertainty, and should be clearly explained in the DER Addendum.

Battelle posted the Final Panel Comments from the DER Addendum IEPR into the Design Review and Checking System (DrChecks) on March 6, 2012. The USACE PDT evaluated and reviewed the IEPR Final Panel Comments and provided draft Evaluator Responses to Battelle (using a template provided by Battelle) on July 24, 2012. Battelle immediately provided the draft Evaluator Responses to the IEPR Panel and directed the panel members to develop draft BackCheck Responses. Given USACE's concurrence with the Final Panel Comments, and their Evaluator Responses, the Panel determined that there was no need for a teleconference to discuss the Evaluator Responses. Therefore, USACE uploaded the final Evaluator Responses into DrChecks on August 8, 2012. Battelle downloaded these responses, provided them to the Panel, and directed the Panel to prepare final BackCheck Responses. The panel members considered the final Evaluator Responses and concurred with the USACE PDT on all five Final Panel Comments. The final BackCheck Responses were uploaded to DrChecks and the comments were closed on August 13, 2012.

This page is intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ACRONYMS

A/E	Architecture/Engineering
ASCE	American Society of Civil Engineers
ATR	Agency Technical Review
CERP	Comprehensive Everglades Restoration Program
COI	Conflict of Interest
cfs/ft	Cubic feet per second per foot
DER	Design Elevation Review
DrChecks	Design Review and Checking System
EAM	Engineering Alternative Measures
EC	Engineering Circular
ERDC	Engineer Research and Development Center
FEMA	Federal Emergency Management Agency
HEC-HMS	Hydrologic Engineering Center – Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HSDRRS	Hurricane Storm Damage Risk Reduction System
IEPR	Independent External Peer Review
IPET	Interagency Performance Evaluation Task
JPM	Joint Probability Method
JSS	Joint Surge Study
LPV	Lake Pontchartrain and Vicinity
NRC	National Research Council
NTP	Notice to Proceed
OMB	Office of Management and Budget
PDT	Project Delivery Team
RSLR	Relative Sea Level Rise
SOW	Statement of Work
U.S.	United States
USACE	United States Army Corps of Engineers
WBV	West Bank and Vicinity

1. INTRODUCTION

The Hurricane and Storm Damage Risk Reduction System (HSDRRS) – Design Elevation Report (DER) is a compendium of initial hydraulic design performed for the HSDRRS Lake Pontchartrain and Vicinity (LPV), West Bank and Vicinity (WBV), Mississippi River Co-Located, and New Orleans to Venice projects. The first version of this report, "Elevations for Design of Hurricane Protection Levees and Structures – Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project and West Bank and Vicinity, Hurricane Protection Project," was completed in October 2007. The HSDRRS DER has recently been updated to include Mississippi River Levee co-located work, New Orleans to Venice project features, and a supporting Addendum (DER Addendum).

As a result of the update, an Independent External Peer Review (IEPR) of the HSDRRS DER and its supporting Addendum was requested by the U.S. Army Corps of Engineers (USACE). Battelle, as a 501(c)(3) non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to coordinate the IEPR of the HSDRRS DER and Addendum. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. The IEPR was external to the agency and conducted in accordance with procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE) Engineer Circular *Civil Works Review Policy* (EC No. 1165-2-209) (USACE, 2010), USACE CECW-CP memorandum *Peer Review Process* (USACE, 2007), and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004).

The review of the HSDRRS DER was conducted from September through November 2010 with a Final IEPR Report being prepared in December 2010. This final report describes the IEPR process followed for the DER Addendum, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel) regarding the DER Addendum.

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 (2010) and USACE (2007).

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 economic, engineering, and environmental analysis 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 DER Addendum was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization under Section 501(c)(3) of the U.S.

Internal Revenue Code with experience conducting IEPRs for USACE. In this instance, an assessment of the engineering analysis was conducted. Economic and environmental analyses were not conducted.

3. METHODS

This section describes the method followed in selecting the members for the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (2010) and in accordance with USACE (2007) and OMB (2004) guidance. 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).

3.1 Planning and Schedule

After receiving the notice to proceed (NTP), 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., clarify expertise areas needed for panel members). Revisions to the schedule were submitted as part of the final Work Plan and as separate deliverables as the project proceeded.

Table 1 defines the schedule followed in executing the IEPR of the DER Addendum. Due dates for milestones and deliverables are based on receipt of the Addendum documents on November 22, 2011 and December 12, 2011, as well as receipt of responses on the Final Panel Comment from the USACE Project Delivery Team (PDT).

Table 1. HSDRRS Design Elevation Report Addendum IEPR Schedule

TASK	ACTION	DUE DATE
1	Notice to Proceed (NTP)	August 4, 2010
	Final Addendum Review documents available	November 22, 2011; December 12, 2011
	Battelle submits draft charge for Addendum Review [1]	December 11, 2011
	USACE provides comments on draft charge for Addendum Review	December 22, 2011
	Battelle submits final charge for Addendum Review [1]	December 23, 2011
7-8	Addendum Review documents sent to panel members	December 26, 2011
	IEPR panel members complete their Addendum Review	February 10-13, 2012
	Convene panel review teleconference	February 16, 2012
	Panel provides draft Final Panel Comments to Battelle	February 24, 2012
	Battelle inputs Final Panel Comments to DrChecks; Battelle provides Final Panel Comment response template to USACE	March 6, 2012
	USACE provides draft responses to Battelle	July 24, 2012
	Final Panel Comment Teleconference between Battelle, Panel, and USACE to discuss Final Panel Comments,	Not conducted as it was not necessary to close

TASK	ACTION	DUE DATE
	draft responses, and clarifying questions	the comments
	USACE inputs final Evaluator Responses in DrChecks	August 8, 2012
	Battelle inputs BackCheck Responses in DrChecks	August 13, 2012
	Battelle submits pdf printout of DrChecks to USACE [1]	August 16, 2012
9	Battelle submits Final Addendum IEPR Report to USACE[1]	September 4, 2012
	Project Closeout	September 15, 2012

[1] Deliverable

3.2 Identification and Selection of IEPR Panel Members

The candidates for the Panel were evaluated based on their technical expertise in the following key areas: hydraulic engineering and civil engineering. These areas correspond to the technical content of the HSDRRS DER.

To identify candidate panel members, Battelle followed the criteria specified in the USACE Statement of Work (SOW) to (1) contact candidate panel members to evaluate technical skills, potential COIs, availability, and hourly rates, and (2) identify two experts from the pool of candidates on existing Task Force Hope task orders to serve on the IEPR Panel. Battelle chose experts from the previously conducted Design Guidelines Task Force Hope task order for this review, as they were deemed most knowledgeable on the Design Guidelines, which the Design Elevation Review report supplemented.

Battelle chose two of the most qualified candidates from the original ten Design Guidelines task order experts and confirmed their interest and availability. Both candidates were proposed as primary reviewers. Information about the candidate panel members, including brief biographical information, highest level of education attained, and years of experience, was provided to USACE for feedback. The two proposed primary reviewers constituted the final Panel.

The candidates were screened for the following potential exclusion criteria or COIs.[a] These COI questions were intended to serve as a means of disclosure, and to better characterize a potential candidate's employment history and background. 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

[a] Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "….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."

review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

- Financial or litigation associated with USACE, "The State" (defined as the State of Louisiana and Local governing entities, including Southeast Louisiana Flood Protection Authority), the Design A/E, their engineering teams, subcontractors, or construction contractors.
- Current employment by USACE.
- Current employment by any federal or state government organization.
- Current personal or firm involvement as a cost-share partner on USACE projects. If yes, provide description.
- Participation in developing the HSDRRS project.
- Involvement in producing any USACE guidance documents, including, but not limited to: the Design Guidelines, the Armoring Backslope Design Manual, or the Deep Soil Mixing Design Guidelines.
- A publicly documented statement made by you or your firm advocating for or against any HSDRRS project.
- Paid or unpaid participation in litigation related to USACE work.
- Current or future interests in the subject project or future benefits from the project.
- Current personal or firm involvement with other USACE projects. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.) and position/role.
- Previous employment by USACE as a direct employee or contractor (either as an individual or through your firm) within the last 10 years. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous direct employment by USACE, New Orleans District. If yes, provide title/description, dates employed, and position/role.
- A significant portion (i.e., greater than 50%) of personal or firm revenues within the last 3 years from USACE contracts.
- Repeatedly serving as a peer reviewer for Task Force Hope projects (please list).
- Other USACE affiliation [Scientist employed by the USACE (except as described in National Academy of Science criteria, see Engineering Circulars 1105-2-4 section 9b)][a].
- Personal relationships with USACE staff in Mississippi Valley Division Headquarters, Task Force Hope, New Orleans District (Protection Restoration Office), Hurricane Protection Office, or officials from the State of Louisiana and Local governing entities including Southeast Louisiana Flood Protection Authority.

- Participation in the Interagency Performance Evaluation Task (IPET) Force, American Society of Civil Engineers External Review of the Louisiana Coastal Protection and Restoration Study, and/or National Research Council Committee on New Orleans Regional Hurricane Protection Projects.
- Any other perceived COI not listed.

In selecting the final members of the Panel from the list of candidates, Battelle chose experts who best fit the expertise areas and had no COIs. The two final reviewers were both affiliated with consulting companies. 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. Although the Panel was disclosed to USACE, Battelle made the final decision on selecting the panel members. Section 4 of this report provides names and biographical information on the panel members.

Prior to beginning their review and within 16 days of their subcontracts being finalized, both 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, and other pertinent information for the Panel.

3.3 Preparation of the Charge and Conduct of the IEPR

Battelle drafted a preliminary charge document, including specific charge questions and discussion points. The charge was prepared by Battelle to assist USACE in developing the charge questions to guide the peer review, according to guidance provided in USACE (2010) and OMB (2004). The draft charge was submitted to USACE for evaluation as part of the draft Work Plan. USACE provided comments and revisions to the draft charge, which was used to produce the final charge. The final charge was submitted to USACE for approval. In addition to a list of 20 charge questions/discussion points, the final charge included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

The IEPR Panel received an electronic version of the DER Addendum including its appendices, and supporting documents, along with the final charge. A full list of the documents reviewed by the Panel is provided in Appendix B of this report. The Panel was instructed to address the charge questions/discussion points within a comment-response form provided by Battelle.

3.4 Review of Individual Comments

At the end of the review period, the Panel produced approximately 40 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. As a result of the review, Battelle was able to summarize the 40 comments into a preliminary list of 6 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

3.5 IEPR Panel Teleconference

Battelle facilitated a 45-minute teleconference with the Panel so that the panel experts 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 IEPR report and decide which panel member would 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 high-level importance to the findings, and merged any related individual comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

At the end of these discussions, the Panel identified five comments and discussion points that should be brought forward as Final Panel Comments.

3.6 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared a summary memorandum for the Panel documenting each Final Panel Comment. The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the DER Addendum:

- 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 the merged individual comments table, a summary 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 other IEPR panel members 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 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, low; see description below)
    4. Recommendation 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: Describes a fundamental problem with the guidelines that could affect the suggested methods used.
    2. Medium: Affects the completeness or understanding of the guidelines.
    3. Low: Affects the technical quality of the guidelines, but will not affect the recommendation of the methods used.

- Guidance for Developing the Recommendation: The recommendation was to include specific actions that the 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).

At the end of this process, five Final Panel Comments were prepared and assembled and one Final Panel Comment was merged with another comment. 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 USACE policy. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

4. PANEL DESCRIPTION

Candidates for the Panel were identified using criteria specified in the USACE SOW to (1) contact candidate panel members to evaluate technical skills, potential COIs, availability, and hourly rates, and (2) identify two experts from the pool of candidates on existing Task Force Hope task orders to serve on the IEPR Panel. Battelle chose two of the most qualified candidates and confirmed their interest and availability. Both candidates were proposed as primary reviewers for the final IEPR Panel. Battelle prepared a draft list of primary candidate panel members (who were screened for availability, technical background, and COIs), and provided it to USACE for feedback. Battelle made the final selection of panel members.

An overview of the credentials of the final two primary members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table 2. More detailed biographical information regarding each panel member and his area of technical expertise is presented in the text that follows the table.

Table 2. HSDRRS Design Elevation Report Addendum IEPR Panel: Technical Criteria and Areas of Expertise

	Dr. Bijay Panigrahi	Dr. Charles Vita
Hydraulic Engineering (one expert needed)	**X**	
Panel member on a previous Task Force Hope IEPR Task Order	**X**	
Extensive experience in design of coastal structures or levees in a coastal environment	**X**	
Extensive experience in hurricane surge and wave modeling	**X**	
Experience in design and construction of projects similar in scope to the HSDRRS	**X**	
Experience with the HSDRRS Design Guidelines	**X**	
Masters degree in engineering or hands on relevant engineering experience	**X**	

	Dr. Bijay Panigrahi	Dr. Charles Vita
Minimum 15 years experience and responsible charge of engineering work in hydraulic engineering	X	
Civil Engineering (one expert needed)		**X**
Panel member on a previous Task Force Hope IEPR Task Order		X
Extensive experience in design of levees		X
Experience in design and construction of projects similar in scope to the HSDRRS		X
Experience with the HSDRRS Design Guidelines		X
Masters degree in engineering or hands on relevant engineering experience		X
Minimum 15 years experience and responsible charge of engineering work in hydraulic engineering		X

Bijay Panigrahi

Role: This panel member was chosen primarily for his hydraulic engineering experience and expertise.
Affiliation: BPC Group Inc.

Dr. Bijay Panigrahi is a registered professional engineer and is a Principal Engineer and President of BPC Group, Inc., in Orlando, Florida. He has more than 30 years of experience in the specialty areas of environmental, geotechnical and water resources engineering, including ground water and surface water modeling. He has directed and managed a number of multidisciplinary projects involving hydraulics and hydrologic modeling, flood protection studies, feasibility studies, stormwater management system design, watershed and water quality assessment and modeling, stochastic modeling, geotechnical and environmental design and studies, seepage and slope stability analyses, foundation analyses, scour and erosion control, water resources facility design, and permitting. He has assessed and designed a number of canal conveyance systems and water resources control structures such as levees/dikes, culverts, reservoirs, and treatment systems. Dr. Panigrahi has completed a number Comprehensive Everglades Restoration Plan (CERP) and non-CERP projects in Florida involving modeling and design of hydraulic structures (reservoirs/impoundments, canals, and pump stations) and hydraulic measurements and rating analyses. He completed wave run analyses and scour evaluation for extreme hurricane conditions on Big Sand Lake to assist in the design of the Westgate Lakes resort in Orlando, Florida. He also conducted hydrologic and hydraulic modeling of the C-51 basin (including ACME Basin B) in support of Basin Rule modifications, using HEC-HMS/HEC-RAS models for calibration to Hurricane Irene and further basin analyses. On behalf of the Interagency Modeling Center/Water Management District, he has peer reviewed more than 30 hydraulic-hydrodynamic models, which included surface water, groundwater, integrated surface water-ground water, seepage, and numerous watershed water quality models. Some of these projects include Biscayne Bay Coastal Wetlands, Lower East Coast sub-Regional model, C-11 and C-9 Impoundments, C-44 Canal Design, and Stormwater

Treatment Area 5&6 Expansion. Additionally, Dr. Panigrahi is a member of several professional affiliations, including the American Society of Civil Engineers' Environmental and Water Resources Institute, and has authored more than 50 technical manuals, monographs, and peer-reviewed papers.

Chuck Vita

Role: This panel member was chosen primarily for his civil engineering experience and expertise.
Affiliation: Exponent[b]

Dr. Charles Vita is a registered civil and geotechnical engineer and is a Senior Managing Engineer for Exponent in Seattle, Washington. He has over 39 years of civil, geotechnical and geo-environmental experience on hundreds of infrastructure projects associated with site evaluation, development, redevelopment, and cleanup. His expertise includes engineering planning, siting, exploration, site and route characterization, analysis, design, construction, and monitoring; oversight and quality assurance; and forensic engineering and litigation support. Dr. Vita is specially skilled and a technical leader in the analysis of uncertainty, risk, and reliability, including probability-based site characterization and engineering performance analyses and reliability-based design; he has conducted hundreds of statistical data analyses and interpretations, including design and evaluation of exploration, testing, site characterization, and monitoring programs. Dr. Vita has authored more than 60 comprehensive reports, professional papers, and presentations on these subjects. Dr. Vita has broad experience with levee design including his support to the Federal Emergency Management Agency for levee breach repairs in Plaquemines Parish, his work with the New Orleans East Levee Improvement Program, his levee work for the National Oceanic and Atmospheric Administration, and with his work for the California Department of Water Resources Urban Levee Geotechnical Evaluation Program, as well as geotechnical stability issues associated with tailings dams and other kinds of earth embankments and structures. He is familiar with construction industry practices used in wetland restoration, flood control/coastal storm damage reduction in the Gulf of Mexico coast, including the New Orleans HSDRRS. He is familiar with the Levee System Design Guidelines and has served as an independent expert technical reviewer where major issues have included, geotechnical characterization for analysis and design, geotechnical structural and seepage stability, back-slope erosion, design surge and wave loading, and system performance, including resilience, robustness and redundancy.

5. SUMMARY OF FINAL PANEL COMMENTS

USACE (2010) guidance states that the final report will contain the Panel's "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used." However, for the DER Addendum IEPR, the Panel focused solely on the coastal and hydraulic engineering analysis of the project; no economic or environmental assessment was conducted. The Panel agreed on its assessment of the adequacy and acceptability of the engineering methods, models, and analyses used in the DER Addendum.

[b] During the actual review of the documents, Dr. Vita worked for URS; however, by the time the Final Panel Comments were addressed in DrChecks, Dr. Vita had changed jobs and worked for Exponent.

The assumptions that underlie the engineering analyses and planning methods appeared sound. The Panel was generally satisfied with the DER Addendum. The DER Addendum were technically defensible for their purpose to update the HSDRRS DER, which is now at Version 4.0a (dated 12 December 2011), and document the analyses performed to develop the resulting preliminary design elevations. Appropriate further analyses were identified that would remedy deficiencies noted in the current analysis (e.g., the overtopping exceedances at the Seabrook Closure Gate, SBRK-G). The DER Addendum Appendix A discussion and analysis of relative sea level rise (RSLR) in the context of the HSDRRS design elevations were appropriate. The Panel believes that the DER Addendum that update Version 4.0a of the HSDRRS DER represent a clear and significant improvement over the original HSDRRS DER of 2007 and 2010.

The Panel believes that the technical quality of the DER Addendum could be improved by providing a more explicit and unified discussion of the key issues of resilience, redundancy, robustness, and system performance. These aspects of the HSDRRS relate to its overall effectiveness to reduce real-world risk and uncertainty, and should be clearly explained in the Addendum.

Table 3 lists the five Final Panel Comment statements.

Table 3. Overview of Five Final Panel Comments Identified by the HSDRRS Design Elevation Report Addendum IEPR Panel

No.	Final Panel Comments
Significance – Low	
1	The computed wave overtopping rates for the Seabrook Sector Gate Complex presented in the DER Addendum exceed the design criteria.
2	The redundancy associated with the interfaces between structures, materials, members, and project phases is not discussed in the DER or the Addendum.
3	The DER and Addendum do not specifically address how the various HSDRRS components work as an effective system.
4	The model analysis for surge levels does not include an update on quantification of the differences with the Federal Emergency Management Agency (FEMA) flood insurance study for the 100-year return period.
5	The DER Addendum does not discuss HSDRRS resiliency and robustness to the extent warranted given their importance to system performance.

Battelle posted the Final Panel Comments into the Design Review and Checking System (DrChecks) on March 6, 2012. The USACE PDT evaluated and reviewed the IEPR panel comments and provided draft Evaluator Responses to Battelle (using a template provided by Battelle) on July 24, 2012. Battelle immediately provided the draft Evaluator Responses to the IEPR Panel and directed the panel members to develop draft BackCheck Responses. Given USACE's concurrence with the Final Panel Comments, and their Evaluator Responses, the Panel determined that there was no need for a teleconference to discuss the Evaluator Responses. Therefore, USACE uploaded the final Evaluator Responses into DrChecks on August 8, 2012.

Battelle downloaded these responses, provided them to the Panel, and directed the Panel to prepare final BackCheck Responses. The panel members considered the final Evaluator Responses and concurred with the USACE PDT on all five Final Panel Comments. The final BackCheck Responses were uploaded to DrChecks and the comments were closed on August 13, 2012.

6. 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 (2007). Peer Review Process. Department of the Army, US Army Corps of Engineers, Washington, D.C. CECW-CP Memorandum. March 30.

USACE (2010). Water Resources Policies and Authorities: Civil Works Review Policy. Department of the Army, US Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 1165-2-209. January 31.

APPENDIX A

Final Panel Comments

on the

HSDRRS Design Elevation Report Addendum

This page is intentionally left blank.

Final Panel Comment 1:

The computed wave overtopping rates for the Seabrook Sector Gate Complex presented in the Design Elevation Report (DER) Addendum exceed the design criteria.

Basis for Comment:

The 1% chance annual exceedance criteria for wave overtopping rate (q) established in the Design Elevation Report (DER, V4.0a) include 50% and 90% non-exceedance values (q_{50} and q_{90}) of less than 0.03 cubic feet second (cfs) per foot (ft) ($q_{50} < 0.03$ cfs/ft) for hard structures, less than 0.01 cfs/ft ($q_{50} < 0.01$ cfs/ft) for grass-covered levees, and less than 0.1 cfs/ft ($q_{90} < 0.01$ cfs/ft) with appropriate erosion protection on the protected side. As documented in Section 8 (pp. 303-304) of the DER V4.0a, the established criteria are based on the best available information to date.

The computed wave overtopping rates for the design sections presented in this DER Addendum are reasonable and appropriate and met the above established criteria for the hydraulic design except for the Seabrook Sector Gate (SBRK-G) Complex. As documented in Table 2-19 on p. 2-104 of this DER Addendum, the computed overtopping rates for this gate structure are $q_{50} = 0.078$ cfs/ft and $q_{90} = 0.181$ cfs/ft, which exceed the above established design criteria. The basis of this exceedance, given on p. 2-102 of the DER Addendum, is stated as follows:

a) the exact location of the Seabrook gate is unknown,
b) the STWAVE model has a relatively coarse resolution, and
c) the bed geometry is relatively complicated for this particular case.

The DER Addendum (p. 2-103) presented a resolution to the STWAVE computation: a more detailed and accurate wave analysis prior to finalizing the design of the structure. This proposed resolution is reasonable as long as the computed overtopping remains within the specified criteria.

Significance – Low:

The overtopping rate exceedance is isolated due to uncertainty of the hydraulic and geometric input parameters at the proposed gate with no exact location. The proposed resolution is anticipated to remedy the inaccurate computation.

Recommendation(s) for Resolution:

1. Re-run the STWAVE model with more accurate and exact hydraulic and geometric conditions and re-compute the overtopping rates at the gate structure that satisfy the established design criteria.

Final Panel Comment 2:

The redundancy associated with the interfaces between structures, materials, members, and project phases is not discussed in the DER or the Addendum.

Basis for Comment:

The DER Addendum does not directly address redundancy. However, system redundancy is addressed briefly in the Executive Summary of DER V4.0a (p. 5) as follows:

> "The existing levee/floodwall system in the Inner Harbor Navigation Canal/GIWW (IHNC/GIWW) and along the outfall canals will provide a useful measure of redundancy to the flood risk reduction system behind the primary line of protection such as the MRGO/GIWW gates, Seabrook gate, and the permanent outfall closures and pumps. Sector gage alternatives for the Harvey and Algiers Canal will also have some levee/floodwalls along the interior drainage outlets that can provide a measure of redundancy."

Although not specifically called out in the DER or the Addendum documents, the redundancy on the hydraulic design is adequately incorporated in the design process which includes still water level, surge and wave heights, and design elevation computations. For example, the friction effect is not considered in the STWAVE modeling for the 1% design elevations, which may or may not better represent the wave climate, but the absence of friction effect introduces a redundancy factor in the wave height calculation. An action plan is also being developed to determine ways to reduce uncertainty in wave characteristics and thus increase confidence in design parameters. Performance redundancy such as armoring to prevent scour and erosion from overtopping that leads to failure and breaching is recognized and acknowledged as a critical factor in the Hurricane and Storm Damage Risk Reduction System (HSDRRS). DER V4.0a states that implementation of the armoring process is currently under development and would be addressed separately from this hydraulic design. Structural superiority for difficult structures as described in the DER also contributes to redundancy, resilience, and robustness of designs.

These measures address the redundancy of the hydraulic design elevations for an individual structure or for a group of structures. However, neither the DER nor the Addendum documents specifically address the redundancy with an emphasis on the interfaces between structures, materials, members, and project phases.

Significance – Low:

The redundancy of the hydraulic design is well documented and adequate. However, the redundancy of interface between structures, materials, members, and project phases needs to be defined and described.

Recommendation(s) for Resolution:

1. Define and describe the terminology associated with the redundancy of interface between structures, materials, members, and project phases, and explain the relative procedure to address this issue.
2. A separate section in the DER or Addendum may be added to address this issue (redundancy with an emphasis on interfaces between structures, materials, members and project phases), including an explanation on how this is addressed.

Final Panel Comment 3:

The DER and Addendum do not specifically address how the various HSDRRS components work as an effective system.

Basis for Comment:

The DER Addendum discusses the various project features, elements, and components that are intended to work effectively as a system, which is a major design intent and expectation of the HSDRRS. The DER Addendum does not, however, discuss how these components work effectively as a system that is a critical subsystem of the HSDRRS. Such a discussion, at a conceptual level of detail, would improve the technical quality of the DER Addendum.

Furthermore, the DER Addendum also does not discuss the organizational and operational details associated with system performance (e.g., identifying administrative triggering action events or dates, chains and lines of intra- and extra-USACE communications and notifications, decision-making requirements and authority, oversight). Such details may be important enough to warrant discussion, perhaps as a separate appendix to the DER Addendum.

Significance – Low:

The technical quality of the DER Addendum would be increased by including a focused discussion of how the features, elements, and components presented in the DER Addendum work effectively as a subsystem of the HSDRRS.

Recommendation(s) for Resolution:

1. Include a section in the DER Addendum that explains how the features, elements and components discussed in the DER Addendum work effectively as a system, which is a subsystem of the HSDRRS.
2. Determine whether the organizational and operational details associated with system performance are important for inclusion and, if so, consider adding the discussion as a separate appendix to the DER Addendum.

Final Panel Comment 4:

The model analysis for surge levels does not include an update on quantification of the differences with the Federal Emergency Management Agency (FEMA) flood insurance study for the 100-year return period.

Basis for Comment:

The primary purpose of Appendix H "Investigation of ADCIRC Surge Results in St. Charles Parish; May 16, 2008" was to outline the evaluation process of the original ADCIRC model, implement the modified regional geometry and land cover characteristics into the hydraulic model, recompute the peak surge elevations after incorporating the modified regional characteristics into the ADCIRC model, and compare with the FEMA study results in the region of interest (St. Charles Parish).

Appendix H adequately describes the relative modifications of the model setup (Model Resolution - refined mesh) and some of the model input parameters (bathymetry and Manning's roughness coefficient to account for land cover). Physically pertinent alterations were made to the recent FEMA analysis production grid in St. Charles Parish. USACE selected 34 storms from the original 152 Southeastern Louisiana FEMA storm suite as reflective of the most significant storms affecting the St. Charles region for implementation of the updated model and to verify the surge levels reported in the region for the recent FEMA flood insurance study. In general, surge values were lowered between 0.25 and 1.50 feet throughout the region.

The comparison of surge results from the updated ADCIRC model in St. Charles Parish with the errors of the 2007 FEMA runs was adequate. However, analysis is required for St. Charles Parish to quantify differences in the 100-year return period from the values previously reported in the recent FEMA flood insurance study was not completed as part of this project. Instead, this analysis was deferred to the USACE New Orleans District Office to complete the study.

Significance – Low:

The modeling analysis process with the revised/updated geologic and hydraulic input parameters is adequate for the region of interest but is incomplete.

Recommendation(s) for Resolution:

1. Complete the model analysis in St. Charles Parish and compare the results with the recent FEMA flood insurance study for the 100-year return period.

Final Panel Comment 5:

The DER Addendum does not discuss HSDRRS resiliency and robustness to the extent warranted given their importance to system performance.

Basis for Comment:

HSDRRS resiliency is a critical project issue and major design objective. The DER Addendum addressed resiliency by computing 0.2% surge levels (50% confidence) for each hydraulic reach and showing that those surge levels were below the design elevations of the levees and other HSDRRS structures. On p. 2-2 of the DER Addendum, there is a brief introductory discussion of resiliency that specifies the minimum resiliency as being the requirement that levees and structures do not catastrophically breach when design criteria are exceeded—however, "design criteria" other than the 0.2% surge level being below design elevations are not identified. The DER Addendum references DER V4.0a (dated 12 December 2011) (Section 8) regarding the potential need for additional armoring to meet "the desired final level of resiliency" which is not defined. Resiliency is also discussed in the DER Addendum (Appendix F) where Engineering Alternative Measures (EAMs) were identified for the purpose of raising levee heights, which represents a critical aspect of resilient design. The DER Addendum appendices arguably address resiliency between project phases through the EARs (Appendix F) and Sea Level Changes (Appendix A). However, the DER Addendum (including appendices) does not:

- Define or elaborate on "the desired final level of resiliency," which remains vague in the DER Addendum.
- Define the relationship and interaction between design criteria and resiliency, which should be as clear and explicit as practicable.
- Discuss expected reach-specific levee or floodwall performance if the design criteria were exceeded.
- Address resiliency for interfaces between structure, materials, and members, which the Panel understands was intended to be emphasized in the DER Addendum.
- Discuss the vegetative reinforcement of levee backslopes or the provision of floodwall splash pads, both of which are used to provide erosion resistance (resiliency) against excessive wave overtopping or surge free flow.

HSDRRS robustness, which the Panel considered to be related to HSDRRS resiliency, was not defined or well discussed. Robustness was explicitly addressed only in Appendix F of the DER Addendum, which states (p. 10) that: "The purpose of EAMs is to provide an adequately robust risk reduction against a 1% hurricane event." The meaning of "robust risk reduction" is not clear, and there is no elaboration of robustness with an emphasis on interfaces between structures, materials, members, and project phases.

Significance – Low:

Because HSDRRS resiliency is a major performance issue and design objective, the technical quality of the DER Addendum would be increased with a clearer and more thorough discussion of HSDRRS resiliency and the related concept of robustness.

Recommendation(s) for Resolution:

1. Provide discussion in the DER Addendum that addresses the desired final level of resiliency for the HSDRRS, with more detail on interfaces between structures, materials,

members, and project phases.

2. Provide discussion in the DER Addendum that addresses HSDRRS robustness, with an emphasis on interfaces between structure, materials, members, and project phases.

3. Update the programs identified in DER V4.0a Section 8, with regard to Wave Overtopping Limits, Damage Thresholds programs, and Armoring and Resiliency programs.

APPENDIX B

Final Charge to the Independent External Peer Review Panel
as
Submitted to USACE on December 23, 2011

on the

HSDRRS Design Elevation Report Addendum

This page is intentionally left blank.

Charge Guidance and Questions to the Peer Reviewers
for the
Independent External Peer Review (IEPR) for the Document "Hurricane and Storm Damage Risk Reduction System – Design Elevation Report," Dated May 2010 and Addendum to this Report

BACKGROUND

The document "Hurricane and Storm Damage Risk Reduction System (HSDRRS) – Design Elevation Report" hereinafter referred to as the "Design Elevation Report," is a compendium of initial hydraulic design performed for the HSDRRS Lake Pontchartrain and Vicinity (LPV), West Bank and Vicinity (WBV), Mississippi River Co-Located and New Orleans to Venice projects. The first version of this report was titled "Elevations for Design of Hurricane Protection Levees and Structures – Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project and West Bank and Vicinity, Hurricane Protection Project" and was completed in October 2007. The report has recently been updated to include Mississippi River Levee co-located work and New Orleans to Venice project features. The Addendum to this report will include a compendium of additional hydraulic design that will be performed after the completion of the initial designs (i.e., Post-Design Addendum). It is estimated that up to three (3) Addendum will be provided for review.

The term "State" refers to both the State of Louisiana and Local governing entities, including the Southeast Louisiana Flood Protection Authorities and any levee district under their supervision.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Design Elevation Report (Review 1) and Addendum to this Report (Review 2) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released 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.

This purpose of the IEPR is "ensure the hydraulic design performed to develop initial and final HSDRRS design elevations and geometries meet current professional standards for similar studies" (per USACE Scope of Work). 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) with extensive engineering experience relevant to the project. They should also have experience applying their subject matter expertise to coastal storm damage reduction.

The panel members will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall report/Addendum. The panel members will identify, examine, and comment upon the assumptions underlying the analyses as well as evaluate the soundness of models and analytic methods. The panel members will evaluate whether the interpretations of analyses and conclusions are technically sound and reasonable, provide effective review in terms of both usefulness of results and of credibility, and have the flexibility to bring important issues to the attention of decision makers.

DOCUMENTS PROVIDED

The following is a list of documents and reference materials that will be provided for the review. **The documents and files presented in bold font are those which are to be reviewed**. All other documents are provided for reference.

USACE will provide the following documents for review:

- Review 1 (Tasks 4-6) **"HSDRRS - Design Elevation Report" - *includes LPV and WBV completed in October 2007 and NOV and MRL Co-located completed in May 2010***
- Review 2 (Tasks 7-9) **Post Design Addendum - "HSDRRS Design Elevation Report Addendum – Lake Pontchartrain & Vicinity and West Bank & Vicinity Draft Report 14 Nov 2011 and Appendices A through F and H** (Appendix G has already been reviewed and is only provided here for completeness.)

USACE provided the following supplemental information as part of the documentation for Review 1; it and the documents reviewed under Review 1 should be taken into account during Review 2. :

- *EPR files*
    - Att 101 oprt report 5-31-07
    - Att 301 Nearshore_Waves_June07
    - Att 401 JPM_FEMA_OFFSHORE_WAVES_REJ_2007_05-18
    - Att 501 DraftTR_May25 Erosion Test
    - Att 612 Overtopping Criteria Comparison
    - Att 711 2007-03-23-2007 HPS QMP
    - Att 712 02318
    - Att 713 02332-06-12Emb
    - Att 714 02922
    - Att 715 QMP Flowchart
    - Att 716 STB08_W912P8-06-R-0094[1]
    - Att 731 33cfr208.10
    - Att 732 Lake Borgne Levee District 2006 Compliance Inspection Report
    - Att 733 Levee Owner's Manual
    - Att 734 Encl 3- FCW Inspection Guide
    - Att 735 FEMA 44CFR65_10
    - Att 736 checklist_accred_criteria[1]
    - JSS Response to ASCE EPR 19June07

    - JSS Response to ASCE EPR No2 14Sept07
- *ITR files*
    - USACE FEMA JSS ITR Report Final Oct15 2007
- *Sela ids2 final pdf files*
    - App A erdc-tracks-001-162
    - App B PBL-A Storm Track File
    - App C PBL-B TROP File
    - App D PBL-C WIN_PRE File Format
    - Appendix A-D
    - Figure 1-27
    - Figure 28-130
    - Figure 131-154
    - Figure 155-175
    - Figure 176-185
    - Figure 186-199
    - Figure 200-221
    - Figure 222-246
    - Figure 247-266
    - Figure 267-278
    - Figure 279-314
    - Figure 315-340
    - Figure 341-369
    - Figure 370-373
    - Figure 374-476
    - Tables 1-40 - IDS2
    - Text SELA 2007 IDS 2 FINAL 072808
- *Other FEMA documents*
    - Att 101 oprt report 5-31-07
    - hull letter10-03-07
    - hull letter 7-30-07 v5 final
    - JSS Response to ASCE EPR 19June07
    - JSS Response to ASCE EPR No2 14Sept07
    - SELA_QAQC_App_Vol1of8_storms001to0018
    - SELA_QAQC_App_Vol2of8_storms019to037
    - SELA_QAQC_App_Vol3of8_storms038to056
    - SELA_QAQC_App_Vol4of8_storms057to080
    - SELA_QAQC_App_Vol5of8_storms081to105
    - SELA_QAQC_App_Vol6of8_storms106to131
    - SELA_QAQC_App_Vol7of8_storms132to153
    - SELA_QAQC_App_Vol8of8_storms154to162
    - USACE FEMA JSS ITR Report Final Oct15 2007
- *IPET review documents*
    - 11292006erpletter
    - Ch9_What Must We Do Next
    - erp_letter_4-15-08_FINAL
    - erp_progressreport

    - erpletterformat
    - ERPNRCBriefingv.6_5.15.06
    - ERPreport[1]
    - IPETASCEpanelmembers
    - New Orleans Hurricane Protection SystemIPETERPscope
    - NRCmeeting3-20
- *NRC documents*
    - Letter Report of the Committee on New Orleans Regional Hurricane Protection Projects
    - Second Report of the National Academy of Engineering/National Research Council Committee on New Orleans Regional Hurricane Protection Projects
    - Third Report of the National Academy of Engineering/National Research Council Committee on New Orleans Regional Hurricane Protection Project
    - Fourth Report of the National Academy of Engineering/National Research Council Committee on New Orleans Regional Hurricane Protection Projects: Review of the IPET Volume VIII
    - The New Orleans Hurricane Protection System: Assessing Pre-Katrina Vulnerability and Improving Mitigation and Preparedness
- USACE guidance *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010
- CECW-CP Memorandum dated March 31, 2007
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.
- ER 1110-1-12 Engineering and Design Quality Management (21 July 2006)

SCHEDULE

TASK	ACTION	REVIEW 2 ESTIMATED DUE DATES
Conduct Peer Review	Review documents sent to panel members	12/26/2011
	IEPR panel members complete their review	1/25/2012
Prepare Final Panel Comments	Battelle provides panel members merged individual comments and talking points for panel review teleconference	1/31/2012
	Convene panel review teleconference	2/1/2012
	Battelle provides Final Panel Comments directive to panel	2/2/2012
	Panel members provide draft Final Panel Comments to Battelle	2/9/2012
	Battelle provides feedback to panel members on draft Final Panel Comments; panel provides revised draft Final Panel Comments per Battelle feedback (iterative process)	2/9-21/2012
	Final Panel Comments finalized	2/21/2012
Comment/ Response Process	Battelle inputs Final Panel Comments to DrChecks; Battelle provides Final Panel Comment response template to USACE	2/23/2012
	USACE PDT provides draft responses and clarifying questions to Battelle (Highly recommended)	3/8/2012
	Battelle provides panel members the draft Evaluator responses and clarifying questions	3/12/2012
	Panel members provide Battelle with draft BackCheck responses	3/15/2012
	Teleconference with Battelle and panel members to discuss panel's draft BackCheck responses	3/12/2012
	FPC Teleconference between Battelle, IEPR team, and PDT to discuss Final Panel Comments, draft responses and clarifying questions	3/19/2012
	USACE inputs final Evaluator responses in DrChecks	4/2/2012
	Battelle provides Evaluator responses to panel members	4/5/2012
	Panel members provide Battelle with BackCheck responses	4/10/2012
	Battelle inputs BackCheck responses in DrChecks	4/16/2012
	*Battelle submits pdf printout of DrChecks to USACE	4/17/2012
Prepare Final IEPR Report	Battelle provides Final IEPR report to panel for review	4/19/2012
	Panel provides comments on Final IEPR report	4/21/2012
	*Battelle submit Final IEPR Report to USACE	4/25/2012

CHARGE FOR PEER REVIEW

Members of this peer review panel are asked to determine whether the technical approach and scientific rationale presented in the Design Elevation Report and Addendum (Review 1 and 2, respectively) are credible and whether the conclusions are valid. The reviewers are asked to determine whether the technical work is adequate and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the engineering. The reviewers are not being asked whether they would have conducted the work in a similar manner.

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

The following will be taken into consideration by the Panel:

- JPM-OS and the original surge and wave modeling that were used as input into the hydraulic design for the HSDRRS were initiated for the Louisiana Coastal Protection and Restoration study (LACPR) and incorporated into FEMA DFIRM mapping. A prior review was conducted on the FEMA products. IPET also utilized information developed from ADCIRC and STWAVE models and the JPM-OS process. Chapter 2 of the Design Elevation Report formed the basis for the hydraulic chapter in the Design Guidelines (i.e., Chapter 1 - HSDRRS Design Guidelines, June 2008). An IEPR was performed on the Design Guidelines, and comments and responses were documented in DrChecks. In 2007, a draft version of the Design Elevation Report was reviewed by an independent ASCE team. The draft report has been updated since this review to include the HSDRRS MRL Co-Located projects and NOV projects. As part of the IPET work, the National Research Council (NRC) and ASCE performed reviews of the IPET documents; NRC also reviewed the reviews/reports produced by ASCE for IPET.

- All supporting information, including the descriptions of the JPM-OS and modeling results, the IPET, ASCE, and Design Guidelines IEPR review documents and the NRC reports, are part of the supporting information provided for reference during the review.

- The IEPR Panel shall perform an independent review and make efforts to not replicate comments made in the FEMA review, the 2007 ASCE review, or the Design Guidelines review; the IEPR team should assess these review documents and report on the completeness of the reviews, in view of the use of the JPM-OS and model results used in the hydraulic design documented in the Design Elevation Report. The IEPR team should make comments on items that were not addressed and/or resolved in the original reviews.

- One specific topic that the IEPR Panel shall address pertains to the wave overtopping rates (i.e., Are these rates reasonable and appropriate for the hydraulic design?). Wave overtopping rates established for the New Orleans District hurricane protection system are as follows:

- For the 1% exceedence still water, wave height and wave period, the maximum allowable average wave overtopping of 0.1 cfs/ft at 90% level of assurance and 0.01 cfs/ft at 50% level of assurance for grass-covered levees;
- For the 1% exceedence still water, wave height and wave period, the maximum allowable average wave overtopping of 0.1 cfs/ft at 90% level of assurance and 0.03 cfs/ft at 50% level of assurance for floodwalls with appropriate protection on the back side.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the Design Elevation Report and Addendum. Please focus on your areas of expertise and technical knowledge. Some sections have no questions associated with them; however, 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 are asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to the adequacy of the report(s).

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. Identify, explain, and comment upon assumptions that underlie all the analyses, and evaluate the soundness of models, surveys, investigations, and methods.
3. Evaluate whether the interpretations of the analysis and the conclusions based on the analysis are reasonable.
4. 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 Independent Technical Review.
2. Please contact the Battelle project manager (Lynn McLeod, mcleod@battelle.org) or program manager (Karen Johnson-Young, johnson-youngk@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle project manager 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 January 19, 2012, 10 pm EST for Review 2.

Independent External Peer Review (IEPR) for the Document "Hurricane and Storm Damage Risk Reduction System – Design Elevation Report", Dated May 2010 and Addendum to this Report

Final Charge Questions for the Design Elevation Report Addendum

GENERAL QUESTIONS

1. Comment on whether the assumptions that underlie the engineering analyses are sound.
2. Comment on whether the engineering methods, models, and analyses used are adequate and acceptable.
3. Are the interpretations of analysis and conclusions based on the analysis reasonable? If not, please explain.

Developed from USACE SOW

4. Comment on whether the hydraulic design performed to develop initial and final HSDRRS design elevations and geometries meets current professional standards for similar studies.
5. Comment on items that were not addressed and/or resolved from your previous review.
6. Comment on whether the wave overtopping rates are reasonable and appropriate for the hydraulic design?

Developed from Appendix E of EC 1165-2-209

7. Comment on whether the Addendum to the Design Elevation Report adequately addresses redundancy[3] with an emphasis on interfaces between structures, materials, members, and project phases.
8. Comment on whether the Addendum to the Design Elevation Report adequately addresses resiliency with an emphasis on interfaces between structures, materials, members, and project phases.
9. Comment on whether the Addendum to the Design Elevation Report adequately addresses robustness with an emphasis on interfaces between structures, materials, members, and project phases.
10. Comment on whether the project features and/or components work effectively as a system.
11. Comment on whether the models used to assess hazards are appropriate.

Developed from Addendum (including its Appendices) to the Design Elevation Report

13. Comment on whether the Addendum and its Appendices, when taken into consideration with the HSDRRS Design Elevation Report, adequately addresses existing and future conditions.

[3] Redundancy - Redundancy is the duplication of critical components of a system with the intention of increasing reliability of the system, usually in the case of a backup or failsafe.

14. Comment on whether the Addendum and its Appendices, when taken into consideration with the HSDRRS Design Elevation Report, adequately addresses the design elevations and loads for levees, floodwalls, and other structures.
15. Comment on whether Addendum and its Appendices, when taken into consideration with the HSDRRS Design Elevation Report, adequately details the process to document changes in the design elevations.
16. Comment on whether the Addendum and its Appendices, when taken into consideration with the HSDRRS Design Elevation Report, adequately addresses areas identified for further investigation.
17. Comment on whether the Addendum and its Appendices, when taken into consideration with the HSDRRS Design Elevation Report, adequately addresses resiliency.
18. Comment on whether Appendix A - Sea Level Rise adequately describes the analysis of sea level change in regards to HSDRRS projects?
19. Comment on whether Appendix A – Sea Level Rise meets the requirements of EC 1165-2-211.
20. Comment on whether Appendix H adequately describes the investigation and results of the ADCIRC Surge Results in St. Charles Parish.

FINAL OVERVIEW QUESTION

21. What is the most important concern you have with the addendum or its appendices that was not covered in your answers to the questions above?