Independent External Peer Review of the Rahway River Basin, New Jersey Coastal Storm Risk Management Feasibility Report

Final Report
02 November 2017

Prepared by: Analysis Planning and Management Institute & Logistics Management Institute

Prepared for: Department of the Army
U.S. Army Corps of Engineers
Coastal Storm Risk Management Planning Center of Expertise
New York District

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The views, opinions, and/or findings contained in this report are those of the author and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.
Executive Summary

This report provides the results of an Independent External Peer Review (IEPR) that assessed the technical adequacy of the analyses and underlying methods and assumptions of the documents associated with the Rahway River Basin, New Jersey, Coastal Storm Risk Management Feasibility Report & Environmental Assessment (The Project). The New York District of the U.S. Army Corps of Engineers (USACE) prepared the Draft Integrated Feasibility Report & Environmental Assessment (DIFR/EA).

Project Background

The Rahway River System located in New Jersey, consists of Rahway River and four branches that flow into each other at various points. The West Branch flows south from Verona through South Mountain Reservation and downtown Millburn. The East Branch originates in West Orange and Montclair and travels through South Orange and Maplewood. These two branches converge near Route 78 in Springfield to form the main stem of the Rahway River, which then flows through the municipalities of Springfield, Union, Cranford, and Clark before traveling through Rahway, entering from Clark at Rahway River Park. At that point, the river receives the waters of two additional branches: the Robinsons Branch, which flows in at Elizabeth Avenue between West Grand Avenue and West Main Street, and the South Branch, which flows in at the intersection of East Hazelwood Avenue and Leesville Avenue. After the river leaves Rahway it passes through the city limits of Linden and Carteret before flowing into the Arthur Kill.

The primary problem encountered in the study area is flooding from elevated water levels associated with coastal storm surge on the Rahway River and tributaries. A number of storms, tropical storms, northeasters, and hurricanes have caused coastal storm surge inundation and damage in recent decades. The most significant storms to this study are Hurricane Sandy and Tropical Storm Irene. The objectives of this study and the resulting project (the Project) are to reduce the risk to human life and property damage posed by coastal storm surge flooding, and increase public awareness to the risk of flooding.

Independent External Peer Review

The LMI Team, consisting of Logistics Management Institute (LMI) and Analysis Planning and Management Institute (APMI), conducted an IEPR of the DIFR/EA. The IEPR Panel (the Panel), consisting of four Panel Members, was charged with providing a broad technical evaluation of the material contained in the Rahway River Basin review documents. The review was conducted to analyze the adequacy and acceptability of the methods, modeling, data, and analyses used. The review focused solely on a technical review and did not involve policy review. The IEPR was conducted in accordance with the procedures described in the Department of the Army, USACE Engineer Circular No. 1165-2-214, Civil Works Review, dated 15 December 2012, as amended in the Engineering and Construction Bulletin 2016-9, dated 4 March 2016.

Summary of the IEPR Results

The Panel Members reached consensus on their assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used in the reports. The following paragraphs include an overall assessment of the results of this IEPR, grouped by disciplines.
Biological Resources and Environmental Law Compliance Specialist

Overall, the DIFR/EA makes a reasonable effort to address the intent of the decision document and the purpose and need for the Project. However, there are specific areas of concern related to environmental and socioeconomic impacts that are not adequately discussed. Specifically, it is not clear from the documentation whether there might be disproportional impacts to Environmental Justice (EJ) populations and/or children as a result of the Project’s implementation. The DIFR/EA indicates that there are substantial numbers of EJ populations within areas that may be affected by the Tentatively Selected Plan (TSP), but concludes that there would not be disproportionate impacts to EJ populations; data to support this finding are sparse within the document. Additionally, it is not clear whether sources for sediment contamination and the management of any contaminated sediment in areas that would be disturbed by the Project have been adequately considered. Finally, it is not clear from the DIFR/EA whether the USACE has a sufficiently comprehensive plan for preventing the proliferation of invasive species as a result of Project activities. Other concerns include the discussion of effects to aquatic resources as a result of the levee construction and the alternative analysis pertaining to the drainage structure at Casey’s Creek. The document would benefit from a more substantive discussion and analysis in these subject areas moving forward.

Civil Works Planner/Economist

The documentation identifies and explains the assumptions, data, methods, and models that underlie the Project analyses. From a plan formulation and economic analyses perspective, the soundness of models, surveys, investigations, and methods are clearly explained. The planning analysis is sound, and the conclusions based on the planning analysis are appropriate and logically follow from the stated problems, opportunities, objectives, constraints, screening, and alternatives evaluation. However, there are a few areas where the data presented are inconsistent, resulting in uncertainty. No clear indication is provided as to whether the 175 structures were removed from the 2,502 structures identified in the 500-year floodplain for the “without project” damages and “with project” benefit calculations. Substantially different information on the percentage of the total number of structures and their value are also presented in the main body of the DIFR/EA and the supporting information in Appendix B, Economics. Other issues appear to be typos on the surface but should be closely reviewed by USACE to ensure accuracy (e.g., the Annual Exceedance Event should be the 500-year instead of the >100-year flood-event floodplain, citing correct guidance, and distinguishing between direct and indirect effects with respect to environmental consequences.)

Hydrology and Hydraulic Engineer

The USACE documentation was thorough and comprehensive for the hydrology and hydraulic analyses, but a few issues were not fully addressed or require clarification to ensure accuracy. The interior drainage (behind the new culvert and gate) on the levee at Casey’s Creek should be evaluated for depth of flooding and inundation to ensure compliance with Federal Emergency Management Agency (FEMA) regulations. The interior drainage area will accumulate stormwater runoff, resulting in flooding of the area behind the levee from the time the gate is closed until the gate is re-opened. Interior drainage impacts should be addressed in more detail in the documentation. FEMA requires communities address interior drainage as a part of their participation in the National Flood Insurance Program, under which levees are provided to reduce the risk of flooding, generally with the use of gate structures, and/or pumping stations with designated one percent ponding areas on the upstream side of the levee to restrict development
within the Special Flood Hazard Area. In addition, the Hydraulic Engineering Center’s River Analysis System (HEC-RAS) model should be evaluated to ensure consideration of expansion and contraction coefficient at bridges, which influences water surface elevations and inundation limits, and the model’s calibration in order to specifically address the anomaly at the St. Georges Avenue Bridge and to confirm FEMA modeling requirements of any other bridges or culverts in the model. Furthermore, the Panel notes the importance of timely processing of the FEMA Letter of Map Change, especially the Conditional Letter of Map Revision, which could affect the construction schedule. Finally, FEMA does not permit flood proofing of residential structures without special exceptions for basements. This issue should be corrected in the documentation under Alternatives 3a and 3b and in the TSP in Tables 26 and 31.

**Structural/Civil Engineer**

The DIFR/EA adequately documents the structural/civil engineering aspects of the development and evaluation of alternatives and selection of the TSP. There are specific areas, however, that could be expanded to provide a more complete and better understanding of the components and operation of the recommended TSP. Specifically, it would be helpful if the documentation further explained how the water that will accumulate behind the levee on Casey’s Creek for the TSP will be evacuated when the flap gate on the culvert through the levee is closed during a storm event.

**Summary of Panel Comments**

Presented below is a summary of the Panel’s comments in tabular format organized by the level of significance from High to Low. Section 4 of this document includes definitions of comment significance and the complete Final Panel Comments with explanations, rationale, and recommendations. In summary, this IEPR resulted in 0 High, 2 Medium High, 8 Medium, 4 Medium Low, and 2 Low comments.

<table>
<thead>
<tr>
<th>No.</th>
<th>Panel Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Significance: High</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Significance: Medium High</strong></td>
<td>1 In the Hydrology and Hydraulics (H&amp;H) modeling of bridges and culverts, it is important to use the expansion-contraction coefficients for two sections upstream and one section downstream of such bridges or culverts consistent with the requirements of FEMA regulations.</td>
</tr>
<tr>
<td></td>
<td>2 It is not clear from the documentation whether there might be disproportional impacts to EJ populations and/or children as a result of the implementation of the Project.</td>
</tr>
</tbody>
</table>
It is not clear from the documentation whether the plan for preventing the proliferation of invasive species is sufficient at this stage to accomplish USACE goals in this regard.

It is not clear from the documentation how the water behind the levee in Casey’s Creek (for the TSP) would be handled during a storm event when the flap gate on the culvert through the levee is closed.

The calibration of HEC RAS model showed significant accuracy between the model results and available data except for the cross section at River Station 33162.1, which has a 0.6+ foot difference between the model and the High Water Mark.

More specific information should be included in the documentation regarding sources of sediment contamination, any sediment analysis for contaminants in areas that would be disturbed by the Project, and management of contaminated sediments.

Flood proofing has been proposed as Alternatives 3a and 3b. However, the National Flood Insurance Program (NFIP) prohibits flood proofing of residential structures in riverine or coastal high hazard areas, similar to Rahway Coastal Project, unless an exception is granted by FEMA for basements.

The hydrology analysis focuses on the modeling of low-frequency, large storms in comparison with high-frequency, small storm events. For some projects, cumulative damages resulting from the latter events could exceed those from the former.

From the information presented in the main report it is not possible to determine whether the 175 structures were removed from the 2,502 structures identified in the 500-year floodplain for the “without Project” damage and “with Project” benefit calculations.

The DIFR/EA presents substantially different information on the percentage of the total number of structures and their value from what is presented in the Table 4 on page 9 of the Economics Appendix.

On any project that modifies the existing Special Flood Hazard Area, especially a Detailed Zone AE with Floodway Zone, one or more Letters of Map Change should be developed and filed with FEMA for approval.

Discussion of the effects of the TSP on aquatic resources and proposed mitigation in the construction zone of the proposed levee needs revision to improve clarity.

The documentation is lacking an explanation of the basis for why Alternative 4a (the TSP) is the only alternative that will be evaluated for various flood frequency heights.

It is not clear from the DIFR/EA whether other alternatives to the enclosed concrete pipe drainage structure at Casey’s Creek were considered during plan formulation or will be considered during or after optimization.

To ensure complete and consistent economic analysis and results, the documentation should include additional specific information, clarification, or correction.

Specific elements of the 404(b)(1) Evaluation are unclear as presented, including information on water condition impacts and secondary effects.
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1 Introduction

1.1 Overview

This Independent External Peer Review (IEPR) Final Report provides the results of an IEPR of the documents associated with the Rahway River Basin, New Jersey, Coastal Storm Risk Management Feasibility Study (the Project). The Project is being conducted by the New York District of the U.S. Army Corps of Engineers (USACE). The objective of this IEPR is to review the Project as documented in the Draft Integrated Feasibility Report and Environmental Assessment (DIFR/EA). The IEPR has been conducted in accordance with the procedures described in the Department of the Army, USACE Engineer Circular (EC) No. 1165-2-214, Civil Works Review, dated 15 December 2012 as amended in Engineering and Construction Bulletin 2016-9, dated 4 March 2016.¹

The USACE lifecycle review strategy for civil works projects provides a review of project documents from initial planning through the project phases of design and construction, as well as operation, maintenance, repair, replacement, and rehabilitation. The strategy provides procedures for ensuring the quality and credibility of USACE decision, implementation, and operations and maintenance documents in addition to work products. Peer reviews, such as this IEPR, are one of the important procedures used to ensure that the quality of USACE published information meets the standards of the scientific and technical community.

This IEPR has been conducted by a group of independent experts under the auspices of Analysis Planning and Management Institute (APMI) as a subcontractor to the Logistics Management Institute (LMI). Both organizations meet the requirements of USACE and the Water Resources Development Act of 2007 as amended in 2014, in addition to EC 1165-2-214, as an Outside Eligible Organization (OEO). Specifically, each of the two organizations has experience in establishing and administering peer review panels, is qualified as an Internal Revenue Code Section 501(C)(3), is an independent science and technology organization, is free from conflicts of interest (COI), and does not carry out or advocate for or against federal water resources projects. Both organizations and the Panel Members for this IEPR have not been involved in any capacity with the Project. Consistent with EC 1165-2-214, OEO is used in this report to represent the combined efforts of LMI and APMI.

1.2 Project Background

The Rahway River, located in New Jersey, consists of four branches that flow into each other at various points. The West Branch flows south from Verona through South Mountain Reservation and downtown Millburn. The East Branch originates in West Orange and Montclair and travels through South Orange and Maplewood. These two branches converge near Route 78 in Springfield to form the main stem of the Rahway River, which then flows through the municipalities of Springfield, Union, Cranford, and Clark before traveling through Rahway, entering from Clark at Rahway River Park. At that point, the river receives the waters of two additional branches: the Robinsons Branch flows in at Elizabeth Avenue between West Grand Avenue and West Main Street, and the South Branch flows in at the intersection of

¹ Engineering and Construction Bulletin No. 2016-9 provides interim civil works review policy for continued use of EC-1165-2-214, which expired in 2014, with the exception of few specific changes from the Water Resources Reform and Development Act of 2014. These changes do not affect the process for conducting Type I IEPRs.
East Hazelwood Avenue and Leesville Avenue. After the river leaves Rahway it passes through the city limits of Linden and Carteret before flowing into the Arthur Kill.

The lower Rahway River is tidal. The study area encompasses portions of the Cities of Linden and Rahway in Union County and Woodbridge Township and the Borough of Carteret in Middlesex County. The furthest significant tidal portion of the river extends up into the City of Rahway (only in the immediate vicinity of the river). A large portion of the study area lies within the City of Rahway.

The City of Rahway is located in southern Union County, New Jersey. According to the United States Census Bureau, Rahway had a total area of 4.028 square miles. Of this area, 3.897 square miles is land and 0.131 square miles (3.26 percent) is water. Rahway is bordered to the northwest by Clark, to the northeast by Linden, and to the south by Woodbridge Township in Middlesex County. Figure 1 is a map of the Project area showing the Federal Emergency Management Agency (FEMA) Tidal Map and Tidal Influences.

![Figure 1: Rahway River Basin Study Area](image_url)
The primary problem encountered in the study area is flooding from elevated water levels associated with coastal storm surge on the Rahway River and tributaries. A number of storms, tropical storms, northeasters and hurricanes have caused coastal storm surge inundation and damage in recent decades. The most significant storms to this study are Hurricane Sandy and Tropical Storm Irene. The objectives of this study and the resulting project are to reduce the risk to human life and property damage posed by coastal storm surge flooding and increase public awareness to the risk of flooding.
2 Independent External Peer Review Process

This section summarizes the process for conducting this IEPR. Details of the review were documented in various intermediate work products provided to USACE during the course of this effort.

2.1 Managing the Review

The OEO developed and executed a Work Plan to define and manage the process for conducting the IEPR. The Work Plan described the process for screening and selecting independent reviewers, communicating and meeting with the USACE Project Team, maintaining the Project schedule and quality control, compiling and disseminating the independent reviewers’ comments, and Project management and administration.

The OEO established an organizational structure for managing the IEPR to assure the independence of the review. This was accomplished by the OEO organizing and mediating all interactions between the Panel and USACE in accordance with the procedures described in EC 1165-2-214, as shown in Figure 2.

![Figure 2: Organization for Managing the IEPR](image)

2.2 Selecting the Panel

The OEO identified experts who met and exceeded the technical expertise required for this IEPR. We identified any potential COI issues that potential Panel Members could have with the Project, in accordance with the standards of the National Academy of Sciences and Office of Management and Budget M-05-03, Final Information Quality Bulletin for Peer Review. The following criteria were considered in the screening of the candidates:

- **Expertise**: Ensuring the selected reviewer has the knowledge, experience, and skills necessary to perform the review.
- **Independence**: Confirming the reviewer was not involved with projects for the Rahway River Basin or in producing the documents to be reviewed.
- **Conflict of Interest**: Identifying any financial or other interest that conflicts with the service of an individual on the Panel because it could impair the individual’s objectivity or could create an unfair competitive advantage for a person or organization.
- **Availability**: Assessing the candidates’ availability to meet the Project schedule.
With our selective candidate determination process, we were able to identify the most qualified candidates who were available to serve on the IEPR Panel while ensuring balanced representation of perspectives from academia, industry, and government. Additional details for each Panel Member may be found in section 3.1 and Appendix A.

2.3 Performing the Review

The USACE provided the OEO the documents to be reviewed by the IEPR Panel. Table 1 is the list of the documents reviewed in this IEPR. These documents were then distributed to the Panel along with the charge questions. These charge questions established the general boundaries for the IEPR. In addition, the Panel Members used the charge questions as guidance for identifying relevant information and developing their comments and recommendations. The full list of charge questions for this Project is located in Appendix B.

Table 1: IEPR Documentation

<table>
<thead>
<tr>
<th>Documents for Review</th>
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<tbody>
<tr>
<td>Draft Integrated Feasibility Report &amp; Environmental Assessment</td>
</tr>
<tr>
<td>Appendix A: Environmental Analysis</td>
</tr>
<tr>
<td>Appendix B: Economics</td>
</tr>
<tr>
<td>Appendix CI: Hydrology</td>
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<tr>
<td>Appendix CII: Hydraulics</td>
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<tr>
<td>Appendix D: Cost Engineering</td>
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<tr>
<td>Appendix E: Real Estate Plan</td>
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</tbody>
</table>

The OEO provided the Panel Members with templates and instructions for preparing their comments to ensure proper coverage of all important issues and consistency in preparing the IEPR comments. The Panel was also instructed that the OEO would be the conduit for information exchange between the Panel and USACE throughout the review in order to preserve the independence of the review.

This IEPR involved reviewing the Project documentation to analyze the adequacy and acceptability of engineering methods, models, data, and analyses. The review focused solely on conducting a technical review and did not involve policy issues.

2.4 Developing Comments

After completing the review, individual Panel Members submitted a draft of their comments to the OEO. We collated the Panel comments and confirmed they were complete and responsive to the charge. We identified overall themes that were presented by multiple peer reviewers or repeated by one reviewer, comments that indicated conflicting peer review opinions, and other noteworthy comments. The OEO ensured that the Panel comments focused on a technical review of the documents and did not comment on policy-related issues.

Subsequently, the OEO worked with the Panel to reach consensus on the comments, identify and consolidate any overlapping comments, resolve any contradictions, and finalize the significance rating of all comments. The Final Panel Comments were included in the final IEPR report presented here. Following
the guidelines of EC 1165-2-214, the OEO also entered the comments into the Design Review and Checking System (DrChecks)\(^2\) for USACE internal tracking of the Final Panel Comments and recommendations.

\(^2\) Hosted on the USACE’s PROject extraNET (ProjNet), a web service that allows secure exchange of information.
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3 Qualification and Experience

The OEO assembled a panel of experts that met the qualifications set forth by the USACE in the Performance Work Statement for the task. We supported and assisted the Panel in carrying out its review and served as the intermediary for communications and information exchange between the Panel and USACE during the IEPR process.

3.1 Panel

Listed below in Table 2 are the individual Panel Members who participated in this IEPR. Panel Members’ full qualifications and resumes are located in Appendix A.

Table 2: Summary of Panel Member Qualifications by Discipline for this IEPR

<table>
<thead>
<tr>
<th>Panel Qualifications</th>
<th>Prof. Don Ator</th>
<th>Prof. Jim Dobberstine</th>
<th>Mr. Chuck Hutton</th>
<th>Mr. Willard Smith</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest Degree</td>
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<td>MS</td>
<td>MS</td>
<td>MS</td>
</tr>
<tr>
<td>Years of Experience</td>
<td>35+</td>
<td>20+</td>
<td>45+</td>
<td>45+</td>
</tr>
<tr>
<td>Past Experience with USACE (Direct [D], Indirect [I], and none [N])</td>
<td>D</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Subject Matter Expertise</td>
<td>Biological Resources and Environmental Law Compliance Specialist</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Civil Works Planner/Economist</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Hydrology and Hydraulic Engineer</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td>Structural/Civil Engineer</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Safety Assurance Review (SAR)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Professor Don Ator
Civil Works Planner/Economist

Professor Ator was chosen for his civil works planning and economics experience and expertise. He earned a Master of Science (MS) in Economics and Agriculture Economics and a Master of Business Administration (MBA) with a Concentration in Finance and Accounting from Louisiana State University. He has 38 years of experience working for 28 USACE districts. During this time, he has worked as a full-time employee with the USACE Vicksburg District, and in the private sector with Gulf South Research Institute, and with three architect-engineer firms. He has conducted more than 500 civil works planning and economics studies of flood risk management projects with high public and interagency interest nationwide. He has worked extensively with USACE conducting civil works planning and economics studies in accordance with Engineering Regulation 1105-2-100 and other pertinent guidance, laws, and regulations applicable to the USACE Six-Step Planning Process and EC 1165-2-209 review requirements. Professor Ator is nationally recognized for his work with USACE in plan formulation and economic analysis of flood risk management projects and is actively involved in the American Society of Civil Engineers and the Society of American Military Engineers.
**Prof. Jim Dobberstine**  
**Biological Resources and Environmental Law Compliance Specialist**

Professor Dobberstine currently serves as chair of the Math, Engineering, and Sciences Division at Lee College. He is responsible for all operational aspects of the Mathematics, Engineering, and Science Division. He holds a Bachelor of Arts in Life Sciences from Concordia University, an MS in Environmental Management from the University of Houston-Clear Lake, and an MS in Environmental Science from the University of Houston, Clear Lake. Professor Dobberstine teaches Environmental Science and Biology at Lee College, and is engaged in ecosystem studies in the Galveston Bay, Texas, estuary with his students, the results of which have been featured through organizations, including Restore America’s Estuaries, among others.

Professor Dobberstine holds certificates in USACE wetland delineation (Texas A&M University) and water quality improvement using constructed wetlands (Clemson University). He is frequently called on to serve as an advisor on projects and panels. He currently serves on the Advisory Council to the Arthur Temple College of Forestry and Agriculture at Stephen F. Austin State University and formerly served as a curriculum review advisor to the Environmental Management Program at the University of Houston-Clear Lake. He serves on the Memorial Park Demonstration Project Vegetation Advisory Workgroup, a project led by the Harris County Flood Control District to stabilize the shoreline of Houston’s Buffalo Bayou while enhancing riparian habitat. He serves on the Monitoring and Research Subcommittee of the Galveston Bay Council (Galveston Bay Estuary Program), on the Board of Directors of the Texas Association of Environmental Professionals (President 2010–present) and the South Central Regional Chapter of Society for Environmental Toxicology and Chemistry (as President 2013–2015), and as a former Trustee and current Advisory Board Member of the Galveston Bay Foundation.

**Mr. Chuck Hutton**  
**Structural/Civil Engineer**

Mr. Hutton has an MS degree in Structural Engineering and professional engineering registration as a Civil Engineer. He has 48 years of experience in the design and management of water resource projects involving dams, hydraulic structures, hydropower, pumping plants, and water conveyance facilities in Asia, Africa, Latin America, the Middle East, and the United States. His expertise includes preparing feasibility studies, designs, drawings, and specifications for roller-compacted concrete, gravity and arch dams, hydropower plants, pumping plants, pipelines, canals, waterways, spillways and other hydraulic structures; performing dam safety inspections; conducting condition assessments of existing dams, hydropower facilities, and water conveyance systems; developing designs for rehabilitation; technical review; project management; and construction management. The first 15 years of his career were with the Bureau of Reclamation in Denver, Colorado, followed by 23 years with the international water resource firm AECOM, Inc. (formerly ECI Consultants).

Mr. Hutton completed training for the Sandia National Laboratories Risk Assessment Methodology for Dams (RAM-D) and performed vulnerability and risk assessments for concrete and earth dams and their appurtenant facilities. He has also completed training for the Federal Energy Regulatory Commission (FERC) Dam Safety Performance Monitoring Program and Potential Failure Mode Analysis methodology and has been involved in numerous projects that required application of this methodology. He also participated in Risk Analysis Training conducted by Professor David Bowles, Managing Principal at RAC Engineers and Economists LLC, for a USACE contract. He has served as a FERC qualified independent
consultant for the safety inspection of over 25 dam and hydroelectric projects. He was the IEPR Dam Safety Assurance expert.

Mr. Hutton served as a Program Structural Engineer panel member for four previous USACE projects, including: Bluestone Dam in West Virginia, Dover Dam in Ohio, Rough River Dam in Kentucky, and Addicks and Barker Dams in Texas. He is currently a Structural Engineer for the Morris Sheppard Dam Concrete Assessment and Service Life Extension project for the Brazos River Authority in Texas that will involve a comprehensive Probable Failure Mode Analysis and Risk Assessment.

Mr. Willard Smith
Hydrology and Hydraulic Engineer

Mr. Smith is president of Hydropower International Services Inter-National Consultancy, LLC, a private consulting firm. He has extensive expertise in providing engineering services for hydroelectric generating projects, and other hydrologic, hydraulic, and floodplain management projects. He is a graduate of the Missouri School of Mines with a Bachelor of Science (BS) in Civil Engineering specializing in hydrology and hydraulics.

Mr. Smith was president of the National Hydropower Association (NHA) from 1988–1989 and an active member of NHA’s Board of Directors for over 5 years (1984–1989). He also served as Vice President, Creator and Chairman of both the FERC Committee and the International Committee and represented NHA as a technical specialist on Trade Missions throughout the world from 1989 to 1994. He is the recipient of the NHA 2008 Dr. Kenneth Henwood Lifetime Achievement Award. In October 2009, along with Dr. Linda Church Ciocci, he was recognized by the International Water Power & Dam Construction magazine’s list as one of the 60 most influential people who have helped shape the course of the global hydropower and dam business over the past 60 years. Mr. Smith is also a Past Chair of the Oklahoma Floodplain Managers Association for 2007–2008 and remains active in the association coordinating a Disaster Response Team, Training Cadre, and is the current Vice Chair (2nd time).

Mr. Smith has conducted independent reviews of dams over the past 25 years as an FERC Independent Part 12D Inspection Consultant. He has experience with regularly using the USACE Hydraulic Engineering Center (HEC) Hydrologic Modeling System and River Analysis System computer programs in performing floodplain management and stormwater design projects. He has designed non-federal hydropower projects such as USACE navigation locks and dams and prepared designs in accordance with USACE design standards. Mr. Smith has been designated as the Chief Dam Safety Engineer for FERC Licensed Hydropower Projects by two of his clients in accordance with the requirements of dam safety for FERC projects.

3.2 OEO Key Personnel

The OEO consisted of the following members:

Doug Wheeler, PMP, CCP, RMP, Program Manager (LMI)

Mr. Wheeler is an industrial and mechanical engineer with more than 20 years of experience in strategic process engineering and financial analysis including work for USACE, Department of Energy (DOE), and the General Services Administration (GSA). For USACE, he led a consultant and client team in
Ahmad Faramarzi, PE, PMP, Project Manager (APMI)

Mr. Faramarzi supervised project personnel and communicated policies, procedures, and goals to the IEPR Team. In coordination with Mr. Wheeler, Mr. Faramarzi maintained regular contact with USACE and was responsible for the overall project plan, project performance, and client satisfaction on this as well as future tasks for USACE. He also had multiple technical and administrative staff as direct reports. Mr. Faramarzi is a registered Professional Engineer and a Certified Project Management Professional with 36 years of experience providing managerial and technical expertise to private sector and government clients, including the USACE, Office of the Secretary of Defense, the U.S. Army, the U.S. Air Force, and Defense Nuclear Facilities Safety Board. He has organized and managed several important and highly visible standing expert panels in response to recommendations by the National Academy of Sciences. Mr. Faramarzi has a Post-Masters applied scientist/engineer degree from the George Washington University in Aerospace and Mechanical Engineering (fluid mechanics), an MS in Thermofluid Engineering from Northeastern University, and a BS in Nuclear Engineering from Oklahoma University. He has extensive experience with nodal and multi-dimensional fluid flow models, and is on the Board of Directors of the Washington, DC, Section of the American Society of Mechanical Engineers and an active member of the Fluid Dynamics branch.

Barbara Batson, Task Leader (APMI)

Ms. Batson has over 20 years of experience with project management and facilitation with both government and corporate clients where she was responsible for ensuring that project quality was maintained and schedules were completed on time. She has worked on projects for the Department of Defense, Department of Education, U.S. Treasury, Social Security Administration, and Department of Energy. Her project responsibilities included managing global projects with aggressive schedules and facilitating team members on multiple continents. Her experience with project management will ensure the project stays on schedule and all milestones are met.
4 Panel Comments

The IEPR Panel completed a detailed independent technical review of the DIFR/EA prepared by the USACE New York District. The review included reviewing economic, engineering, and environmental issues, models, assumptions, and calculations.

4.1 Summary of Comments

Biological Resources and Environmental Law Compliance Specialist

Overall, the DIFR/EA makes a reasonable effort to address the intent of the decision document and the purpose and need for the Project. However, there are specific areas of concern related to environmental and socioeconomic impacts that are not adequately discussed. Specifically, it is not clear from the documentation whether there might be disproportional impacts to Environmental Justice (EJ) populations and/or children as a result of the Project’s implementation. The DIFR/EA indicates that there are substantial numbers of EJ populations within areas that may be affected by the Tentatively Selected Plan (TSP), but concludes that there would not be disproportionate impacts to EJ populations; data to support this finding are sparse within the document. Additionally, it is not clear whether sources for sediment contamination and the management of any contaminated sediment in areas that would be disturbed by the Project have been adequately considered. Finally, it is not clear from the DIFR/EA whether the USACE has a sufficiently comprehensive plan for preventing the proliferation of invasive species as a result of Project activities. Other concerns include the discussion of effects to aquatic resources as a result of the levee construction and the alternative analysis pertaining to the drainage structure at Casey’s Creek. The document would benefit from a more substantive discussion and analysis in these subject areas moving forward.

Civil Works Planner/Economist

The documentation identifies and explains the assumptions, data, methods, and models that underlie the Project analyses. From a plan formulation and economic analyses perspective, the soundness of models, surveys, investigations, and methods are clearly explained. The planning analysis is sound, and the conclusions based on the planning analysis are appropriate and logically follow from the stated problems, opportunities, objectives, constraints, screening, and alternatives evaluation. However, there are a few areas where the data presented are inconsistent, resulting in uncertainty. No clear indication is provided as to whether the 175 structures were removed from the 2,502 structures identified in the 500-year floodplain for the “without project” damages and “with project” benefit calculations. Substantially different information on the percentage of the total number of structures and their value are also presented in the main body of the DIFR/EA and the supporting information in Appendix B, Economics. Other issues appear to be typos on the surface but should be closely reviewed by USACE to ensure accuracy (e.g., the Annual Exceedance Event should be the 500-year instead of the >100-year flood-event floodplain, citing correct guidance, and distinguishing between direct and indirect effects with respect to environmental consequences.)
Hydrology and Hydraulic Engineer

The USACE documentation was thorough and comprehensive for the hydrology and hydraulic analyses, but a few issues were not fully addressed or require clarification to ensure accuracy. The interior drainage (behind the new culvert and gate) on the levee at Casey’s Creek should be evaluated for depth of flooding and inundation to ensure compliance with FEMA regulations. The interior drainage area will accumulate stormwater runoff, resulting in flooding of the area behind the levee from the time the gate is closed until the gate is re-opened. Interior drainage impacts should be addressed in more detail in the documentation. FEMA requires communities address interior drainage as a part of their participation in the National Flood Insurance Program, under which levees are provided to reduce the risk of flooding, generally with the use of gate structures, and/or pumping stations with designated one percent ponding areas on the upstream side of the levee to restrict development within the Special Flood Hazard Area. In addition, the Hydraulic Engineering Center’s River Analysis System (HEC-RAS) model should be evaluated to ensure consideration of expansion and contraction coefficient at bridges, which influences water surface elevations and inundation limits, and the model’s calibration in order to specifically address the anomaly at the St. Georges Avenue Bridge and to confirm FEMA modeling requirements of any other bridges or culverts in the model. Furthermore, the Panel notes the importance of timely processing of the FEMA Letter of Map Change (LOMC), especially the Conditional Letter of Map Revision, which could affect the construction schedule. Finally, FEMA does not permit flood proofing of residential structures without special exceptions for basements. This issue should be corrected in the documentation under Alternatives 3a and 3b and in the TSP in Tables 26 and 31.

Structural/Civil Engineer

The DIFR/EA adequately documents the structural/civil engineering aspects of the development and evaluation of alternatives and selection of the TSP. There are specific areas, however, that could be expanded to provide a more complete and better understanding of the components and operation of the recommended TSP. Specifically, it would be helpful if the documentation further explained how the water that will accumulate behind the levee on Casey’s Creek for the TSP will be evacuated when the flap gate on the culvert through the levee is closed during a storm event.

4.2 Full Panel Comments

This section contains the complete set of comments of the IEPR Panel. Each comment consists of four parts:

- **Comment**: A clear statement of the concern.
- **Basis for Comment**: A narrative describing the cause for the concern.
- **Significance**: A significance rating of the concern, as well as a statement supporting this significance rating.
- **Recommendation[s] for Resolution**: Recommended actions necessary to resolve the concern, including a description of any additional research that would appreciably influence the conclusions.
Comments were rated to indicate the general significance related to the Project impact using the following definitions:

- **High**: There is a fundamental issue within study documents or data that will influence the technical or scientific basis for the selection of, justification of, or ability to implement the recommended plan.

- **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 the selection of, justification of, or ability to implement the recommended plan.

- **Medium**: There is a fundamental issue within study documents or data that has the low probability of influencing the technical or scientific basis for the selection of, justification of, or ability to implement the recommended plan.

- **Medium/Low**: There is missing, incomplete or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.

- **Low**: There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.

In the sections below is a detailed list of the Panel comments grouped by their significance as determined during the IEPR.

### 4.2.1 Significance: High

None

### 4.2.2 Significance: Medium High

**Comment 1**

In the Hydrology and Hydraulics (H&H) modeling of bridges and culverts, it is important to use the expansion-contraction coefficients for two sections upstream and one section downstream of such bridges or culverts consistent with the requirements of FEMA regulations.

**Basis for Comment**

FEMA is now checking closely the expansion and contraction coefficients on bridge or culvert modeling to ensure proper consideration of expansion-contraction for the appropriate number of sections upstream and downstream of bridges and culverts. This FEMA requirement is included in the HEC RAS Reference Manual. The modelling needs to be compliant with FEMA guidelines as the updated modeling will eventually be reviewed by FEMA for updating its Flood Insurance Rate Map panels.

**Significance: Medium High**

This aspect of H&H modeling is critical to delineating the impact areas and could reduce the size of flood areas. As such, it has a high probability of impacting the analysis of alternatives and the selection of the Tentatively Selected Plan (TSP), depending on the results of the final modeling.
**Recommendation for Resolution**

**Recommendation 1:** Review the H&H modeling to confirm that the expansion/contraction coefficients are applied in accordance with applicable FEMA guidelines.

**Comment 2**

It is not clear from the documentation whether there might be disproportional impacts to EJ populations and/or children as a result of the implementation of the Project.

**Basis for Comment**

Section 3.7.2 states, “According to EO 12898, minority populations exist where the percentage of minorities exceeds 50% or where the minority population percentage in the affected area is meaningfully greater than in the general population. EO 12898 does not provide criteria to determine if an affected area consists of a low-income population.” Further, Section 3.7.2 also notes that, “Those municipalities where the combined minority populations and/or the low income populations are higher than the County are subject to Environmental Justice considerations.” The DFIR/EA indicates that there are substantial numbers of minority and low-income populations within areas that may be affected by the TSP. These include Union and Middlesex Counties, and the cities of Linden and Rahway, among others noted. However, Section 6.8 concluded that “…no adverse impacts to environmental justice considerations is [sic] expected”; data to support this finding appear sparse within the document. Further, Section 7.6 concludes that the “...TSP will have no adverse cumulative impacts on the existing demographics, economy, housing and Environmental Justice communities…”, and that “…the actions considered could produce positive cumulative socioeconomic impacts within the watershed by reducing flooding, which is disruptive to socioeconomic conditions.” While the Panel agrees that the reduction of flood risk could provide positive impacts, it is not clear from the provided information whether this would be a net gain over potential adverse impacts that do not appear to have been fully considered within the documentation.

Significant impacts that persist or repeat can result in permanent and cumulative effects to EJ communities. EJ populations often have a higher baseline exposure to risk associated with environmental stressors than non-EJ populations. Further, these populations can be disproportionately impacted as a result of not having the resources to compensate for the impacts incurred as a result of environmental stressors while they are occurring, or recover after they have ceased, in comparison with non-EJ populations exposed to the same impact. These issues can include lack of health care to respond to air quality and other environmental impacts, lack of transportation options to compensate for traffic disruptions, and lack of means to accommodate cost increases to avoid heavily trafficked/closed roadways, etc. Further, the DFIR/EA does not appear to indicate the level of unemployment or underemployment in the areas/tracts identified as low-income or minority; this status could exacerbate vulnerability to any adverse impacts associated with the Project. It is not clear from the DFIR/EA where these communities are located relative to the Project site.

The U.S. Environmental Protection Agency (USEPA) suggests in its guidance (1998) that consideration of affected communities should be made carefully, stating, “The sensitivity to environmental justice concerns should sharpen the focus of the analysis. While the analytical tools to be used are similar, the analysis should focus both on the overall affected area and population and on smaller areas and/or communities within the affected area” and, “Identifying the ‘affected community’ is particularly important...” Further, the guidance suggests, “...exhausting all applicable analyses will provide the greatest likelihood of accurately depicting the possibility of disproportionately high and adverse effects on
Analysts should be as resourceful as possible in addition to seeking information from traditional sources.” The guidance goes on to give examples of cumulative impacts with EJ implications that should be considered. Additional USEPA guidance (May 2015) notes there are a number of factors that contribute to potential EJ concerns, including proximity and exposure to emission sources, unique exposure pathways, physical infrastructure, multiple stressors and cumulative impacts, and capacity to participate in decision making.

It is not clear from the DIFR/EA whether EJ populations have had an opportunity to meaningfully participate in the development and review of the Project alternatives, nor whether there has in fact been meaningful participation by these groups. As noted in USEPA guidance (2015), the capacity of EJ populations to meaningfully participate in decision making of this type is often restricted based on a number of extrinsic and intrinsic factors. Further, Esnard, et al., (2001) note the benefits of working at the microscale when addressing EJ concerns, specifically citing the value of working with local community groups that often have distinct data sets, local knowledge, and an understanding of the local issues of concerns (e.g., local polluters absent from the Toxic Releases Inventory, bus depots and/or congested traffic areas with idling vehicles close to residential areas, etc.). It is also not clear from the DIFR/EA whether impacts to children have been adequately considered. Presumably, the identified EJ communities would include children subject to the same impacts and vulnerabilities as the rest of these populations.

Failure to fully consider and address EJ concerns can result in avoidable impacts to sensitive populations, and potentially result in both litigation and costly impacts to the Project schedule. In the counties exceeding the stated thresholds, it seems advisable to take additional steps to avoid those impacts or provide mitigation. Further, the Panel is concerned that the census-level screen may be too coarse for this Project, and additional efforts at a finer resolution may yield more informative data on this subject. It would be advisable and responsible to look at the distribution of EJ populations within the tracts wherever possible to identify whether Project activities might disproportionately impact specific populations within those tracts. Data to this extent may be available through local colleges and universities, city planning or development boards, or, in some cases, available via online resources and/or searchable databases such as www.City-Data.com.

With regard to EJ concerns, the DIFR/EA states that, “no adverse impacts to environmental justice considerations is [sic] expected.” The DIFR/EA does not sufficiently support these findings within the appropriate sections of the document. The DIFR/EA would benefit from a more robust discussion to clarify why these populations would not be disproportionally adversely affected by the Project, to demonstrate that they have had the opportunity to meaningfully participate in the decision-making process, and to better discuss and clearly support the findings with regard to potential direct, indirect, and cumulative impacts to these populations.

**Literature Cited:**


**Significance: Medium High**

There is a fundamental issue within study documents or data related to EJ that has a strong probability of influencing the technical or scientific basis for the selection of, justification of, or ability to implement the TSP.

**Recommendation for Resolution**

**Recommendation 1:** Provide a more robust discussion within the DIFR/EA pertaining to potential effects on EJ populations and justify findings that there will not be disproportionate net unavoidable adverse impacts to these populations.

**4.2.3 Significance: Medium**

**Comment 3**

It is not clear from the documentation whether the plan for preventing the proliferation of invasive species is sufficient at this stage to accomplish USACE goals in this regard.

**Basis for Comment**

Section 6.4.3 of the DIFR/EA addresses invasive plant species management, and presents a brief overview of the invasive plant species management goals related to the levee component of the Project, but ultimately notes that the comprehensive plan would be developed at a later date. The documentation does not appear to identify invasive animal (aquatic or terrestrial) species. Further, it is not clear whether there are any considerations given to invasive species proliferation in the non-structural measures.

The literature indicates that invasive species (including *Phragmites australis*) remain a serious ecologic threat, causing severe economic and ecologic damage. Areas disturbed by construction related activities can provide prime opportunities for invasive species to establish and proliferate. Studies have determined numerous mechanisms for invasion stemming from anthropogenic alteration to the ecosystem and subsequent alteration by the species themselves once established that promote the continuing competitive advantage of these species. The DIFR/EA does not prominently address invasive species proliferation issues that might arise as a direct result of disturbance associated with the Project, nor does it prominently specify controls on proliferation during construction or post-construction monitoring plans beyond that specifically for *Phragmites*. These might range from direct disturbance by construction-related activities to additional stress related to changes in hydrology as a result of construction. Further, impacts to and/or displacement of native species can alter ecologic niche fulfillment...
within biologic communities, opening new pathways for the introduction and proliferation of invasive species.

The DIFR/EA would benefit from a more thorough discussion of invasive species proliferation pathways and concerns as they relate to potential consequences of the preferred alternative. The document would also benefit from some notation that the monitoring and management plan would specify appropriate, biologically relevant monitoring periods and intervals for the noted species, target coverage/abundance for invasive species sufficient to prevent substantive alteration of the biologic community, and protocols for maintenance to prevent post-construction proliferation (again, over a biologically relevant time frame). Further, contractor education efforts should include information to note that in addition to equipment, materials brought in from offsite (e.g., mulch and other natural top covers, erosion control materials, etc.) can be potential sources of invasive species (e.g., seed sources, etc.) that should be monitored to prevent incursion of invasive species. Finally, the Panel is concerned that the proposed 10 percent aerial coverage of invasive species in the success criteria for mitigation and monitoring in Appendix A.9 is too high to be a manageable value over time, and may undermine the long-term viability of the site.

EO 13112 and subsequent USACE Invasive Species Policy set comprehensive goals for invasive species management, but those do not appear to be fully reflected by the information provided in the DIFR/EA. It would be advisable to more clearly address this issue prior to construction, rather than potentially introduce the need for more cost-intensive, difficult-to-implement controls after the fact.

**Literature Cited:**


**Significance: Medium**

There is a fundamental issue within the study documents pertaining to invasive species management sediment contamination that has low probability of influencing the technical or scientific basis for the selection of, justification of, or ability to implement the TSP but requires more robust discussion within the documents to fully evaluate and communicate risks associated with the plan.
## Recommendations for Resolution

**Recommendation 1:** Revise the documentation to clearly include additional information on invasive species management, monitoring, and control as noted above.

**Recommendation 2:** Update the invasive species management plans for the Project to clearly include criteria and education for contractors working on the Project to avoid and control proliferation of invasive species, or introduction of such species from off-site.

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## Comment 4

It is not clear from the documentation how the water behind the levee in Casey’s Creek (for the TSP) would be handled during a storm event when the flap gate on the culvert through the levee is closed.

### Basis for Comment

According to Section 6.3.1 of the DIFR/EA, approximately 200 linear feet of Casey’s Creek will be modified through the installation of the levee and associated drainage structure. The report indicates the drainage structure will consist of a concrete culvert containing a flap gate. The flap gate will remain open during normal flows and will only be closed prior to storm events. The report does not indicate how the water from Casey’s Creek that will accumulate in the area behind the levee during the storm event will be managed to prevent flooding of property and structures. It is also unclear why the flap gate would be physically closed during a storm event since the gate will close automatically when the water level in the river rises above the water level on the backside of the gate.

### Significance: Medium

There is a fundamental issue within study documents pertaining to stream flow, sheet flow, and inundation behind the levee that has the low probability of influencing the technical or scientific basis for the selection of, justification of, or ability to implement the TSP but needs more robust discussion within the documents to fully evaluate and communicate risks associated with the plan.

### Recommendations for Resolution

**Recommendation 1:** Include a discussion in the documentation regarding how the accumulation of water behind the levee will be handled during a storm event. Include appropriate details in the Feasibility Report.

**Recommendation 2:** Include in the documentation a defined area of inundation once the gate is closed to determine the depth and area of inundation during a 1 percent storm and at 0.2 percent storm event until the gate is able to be reopened to determine the impact of interior drainage effects.
**Comment 5**

The calibration of HEC RAS model showed significant accuracy between the model results and available data except for the cross section at River Station 33162.1, which has a 0.6+ foot difference between the model and the High Water Mark.

**Basis for Comment**

The H&H model calibration is an important part of both conceptual and final design phases since it establishes the basis of design and determines the extent of damages. As discussed verbally with USACE during the Mid-point meeting, this is an area where the model should be reviewed in detail and improved, if possible. The specific cross section with the above discrepancy appears to be just upstream of the St. Georges Avenue bridge at the Rahway U.S. Geological Survey Gage.

**Significance: Medium**

H&H modeling establishes the basis of design. Changes in the modeling results have a low probability of influencing the technical or scientific basis for the selection of, justification of, or ability to implement the recommended plan, if the modeling is properly completed (raising or lowering) the flood water surface and inundation area.

**Recommendation for Resolution**

Recommendation 1: Update the documentation to address the HEC RAS calibration anomaly and revise the analysis, as appropriate, for the final design.

**Comment 6**

More specific information should be included in the documentation regarding sources of sediment contamination, any sediment analysis for contaminants in areas that would be disturbed by the Project, and management of contaminated sediments.

**Basis for Comment**

Adjacent urban land use is well documented within the literature as negatively influencing conditions in adjacent streams and other water bodies for water and sediment parameters, such as bacteria, organic and inorganic contaminants, and altered biologic conditions in both tidal and non-tidal streams, including many in New Jersey. Contaminant transport from within the watershed can occur through a number of processes, including overland flow, groundwater migration, etc. Historically, the Rahway River has been studied and found to have elevated levels of a variety of contaminants in the sediments, including organics (e.g., chlordane, dieldrin, PCBs, DDT, DDE, DDD), and heavy metals (e.g., copper, chromium, lead, zinc). Not surprisingly, many of these have also been detected in water samples, along with other contaminants, including atrazine, metachlor, carbaryl, arsenic, mercury, etc.

Section 6.9 of the DIFR/EA notes, “Geotechnical investigations and soil testing will be conducted prior to any construction activities associated with Levee Segment D or the non-structural elements, as necessary”, but it is not clear to what extent that would address Hazardous, Toxic, and Radioactive Waste and related concerns as noted above. Unfortunately, sediments can be both a sink and a source for contaminants within an aquatic system. Additionally, contaminants do not necessarily accumulate uniformly across the sediment surface, but rather will sequester to sediments where the physical and chemical characteristics are most favorable, often forming hotspots that can vary in depth. Section 3 of the DIFR/EA and the 404(b)(1) Evaluation in Appendix A.2 note that the sediment profiles include clays and silts, suggesting that pockets of contaminant accumulation over prior decades could be possible.
This understanding suggests substantive, comprehensive precautions, identification, and management of contaminated sediments to minimize disturbance and subsequent exposure risk are warranted, and that maintenance of a riparian buffer zone is important to minimize in-stream contaminant loading. Additional discussion in the documents to better clarify sediment contaminant analysis and management would aid understanding of the risks as they pertain to the TSP.

**Literature Cited:**


**Significance: Medium**

There is a fundamental issue within the study documents pertaining to sediment contamination that has the low probability of influencing the technical or scientific basis for the selection of, justification of, or ability to implement the recommended plan but needs more robust discussion within the documents to fully evaluate and communicate risks associated with the plan.

**Recommendation for Resolution**

**Recommendation 1:** Include additional discussion within the document regarding sediment contaminants and provisions for comprehensive precautions and management to minimize disturbance and in-stream contaminant loading.
Comment 7

Flood proofing has been proposed as Alternatives 3a and 3b. However, the National Flood Insurance Program (NFIP) prohibits flood proofing of residential structures in riverine or coastal high hazard areas, similar to Rahway Coastal Project, unless an exception is granted by FEMA for basements.

Basis for Comment

Table 8, Non-Structural Treatments, where the above statement is made, is a misrepresentation of a potential resolution.

FEMA requirements state that “Flood proofing of areas below the Base Flood Elevation [BFE] in residential buildings is not permitted under the NFIP except in communities that have been granted an exception to permit flood proofed basements. Flood proofing is not permitted in Coastal High Hazard Areas (Zone V, VE, or V1-30). It is recommended that flood proofing be implemented up to one foot above BFE for a factor of safety and to receive full credit for flood insurance rating.” [Reference: FEMA Website—Flood proofing Definition/Description - Paragraph 3]. This issue needs to be resolved in the report and Alternatives 3a and 3b corrected. Also in the TSP—which is defined as Segment D of the Alternative for the Levee Design combined with non-structural treatment alternatives under Alternative 4a—flood proofing of one residential structure is identified, which is not acceptable unless the variance is granted by FEMA for basements.

Significance: Medium

This issue is expected to have a low probability of impacting the analysis of alternatives and the choice of selected plan, since flood proofing is only currently included in the TSP for one residential structure. Non-residential structures are permitted to be flood proofed.

Recommendation for Resolution

Recommendation 1: Update the documentation to make appropriate changes, including excluding flood proofing of the one residential structure in the TSP, unless special FEMA authorization has been granted for a basement, if applicable to this residential structure.

Comment 8

The hydrology analysis focuses on the modeling of low-frequency, large storms in comparison with high-frequency, small storm events. For some projects, cumulative damages resulting from the latter events could exceed those from the former.

Basis for Comment

Historically, there have been instances where more frequent, lower-consequence storm events have caused more damage over a period of time in comparison with a single major storm. In addition, more frequent events could change the antecedent conditions, resulting in more stormwater runoff and consequently a larger flooding event.

Significance: Medium

This issue has the potential for impacting the implementation of the TSP. A Project-specific evaluation will determine the impact of such considerations for this Project and the extent of impact on the analysis and documentation. The more frequent but smaller storm events could affect the EJ populations. For example, frequent street flooding could prevent access to work or other activities impacting the economics of the populations through reduced income or loss of jobs.
Recommendation for Resolution

**Recommendation 1:** Conduct an evaluation of this issue to determine if further analysis and modeling are required for the implementation TSP.

Comment 9

From the information presented in the main report it is not possible to determine whether the 175 structures were removed from the 2,502 structures identified in the 500-year floodplain for the “without Project” damage and “with Project” benefit calculations.

Basis for Comment

In the main body of the DIFR/EA, on page 48, it is stated that 175 structures in Woodbridge Township are in the process of being bought out by the New Jersey Department of Environmental Protection. The “without Project” damages and “with Project” benefits would be slightly overstated if the structures and structure values were included in the analysis.

Significance: Medium

The 175 structures in question represent only 7 percent of the 2,502 structures in the 500-year floodplain. This has a low probability of affecting the technical quality basis of the Project based on the presentation of information related to the TSP or justification of the Project. However, the Panel does not have sufficient information to determine the impact on the feasibility of the Project.

Recommendation for Resolution

**Recommendation 1:** Include a statement in Section 4.2.1, Summary of Structure Types and Values, on page 6 of the Economics Appendix that the 175 structures in Woodbridge Township are being bought out by the New Jersey Department of Environmental Protection and were excluded from the benefit pool.

Comment 10

The DIFR/EA presents substantially different information on the percentage of the total number of structures and their value from what is presented in the Table 4 on page 9 of the Economics Appendix.

Basis for Comment

Table 18, *Proportions of Structures by Damage Category*, on page 55 of the Feasibility Report is reproduced below. The report does not provide any narrative description of the information presented in this table to allow the reviewer to determine the impacts on the analysis of alternatives. In addition, there is no explanation of the reasons for the differences between this table and the information presented in Table 4 of the Economics Appendix.

<table>
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</table>

**Significance: Medium**

As currently written, the inconsistencies between the main body of DIFR/EA and the *Economics Appendix* affect the technical quality and understanding of the Project based on the presentation of information related to the recommendation or justification of the Project. During the Mid-point meeting, USACE indicated that the numbers in Table 18 presented in the body of DIFR should have been the numbers presented in Table 4 in the *Economics Appendix*. However, the Panel does not have sufficient information to determine the impact, if any, on Project feasibility and assumes there is low probability of influencing the technical or scientific basis for selection and justification of the recommended plan.

**Recommendation for Resolution**

**Recommendation 1:** Correct Table 18 in the DIFR to be consistent with information presented in Table 4 in the *Economics Appendix*.

### 4.2.4 Significance: Medium Low

**Comment 11**

On any project that modifies the existing Special Flood Hazard Area, especially a Detailed Zone AE with Floodway Zone, one or more Letters of Map Change should be developed and filed with FEMA for approval.

**Basis for Comment**

Under the NFIP, any change to a Special Flood Hazard Area (Zone A, Zone AE, Zone AE with Floodway) requires the LOMC process. While this Project is in an early stage of the design process, this comment is a reminder that this process is required for any changes to the floodway, BFE, or floodplain limits. This may be performed either by the USACE or by the local community. There are many cases throughout the United States where this process has been ignored, resulting in unwanted and unknown flood risk impact on the community.

**Significance: Medium Low**

It is prudent to initiate this process early on to minimize any impact on the start of construction considering that the Conditional Letter of Map Revision (CLOMR) process would have to be initiated or completed prior to start of construction, depending on the ordinance and local community requirements. The CLOMR process following completion of construction would be less critical as the changes to the floodplain limits have no timing associated with them to be filed with FEMA, although it could affect the implementation of other future projects in the areas.
Recommendation for Resolution

**Recommendation 1:** Determine the local ordinance and requirements and take appropriate actions to ensure timely completion of the application and approval of CLOMR during the design phase, as appropriate.

**Comment 12**

Discussion of the effects of the TSP on aquatic resources and proposed mitigation in the construction zone of the proposed levee needs revision to improve clarity.

**Basis for Comment**

Section 6.3.3 of the DIFR/EA notes, "The area on the landside of the levee has been extensively modified to create recreational infrastructure (asphalt walking trail, athletic fields) within the Joseph Medwick Memorial Park. Therefore, the area on the landside of the levee identified as managed wetlands is presumed have experienced such extensive modifications that it no longer functions as wetland and that the levee will not cause any indirect impacts to these wetlands that require compensatory mitigation."

Section 6.4.2 further notes, "The construction of the levee and the 15 ft vegetation free zone will convert the vegetation within the phragmites dominated marsh, the low marsh and the scrub shrub wetland to maintained lawn and embankment fill. The 0.40 acres of managed wetland is already comprised of a combination of maintained lawn and asphalt. Therefore, there is no impact. The District is proposing on-site mitigation that will replace the vegetation lost with native marsh and scrub shrub wetland species."

Further, Section 6.3.4 notes, "The alteration of on-site tidal influences is necessary to manage coastal storm risk as well as improve the hydrology for salt marsh habitat restoration. Significant adverse on-site and off-site impacts are not expected."

In regard to section 6.3.3, it is not clear from the information contained in the DIFR/EA or Appendix A why the area on the landside of the levee identified as “managed wetlands” is no longer functioning as a wetland. Further, information presented in the text seems to contradict that finding. Information shared by the USACE during the Mid-point Meeting on September 26, 2017, indicated that the USACE has completed onsite visits to visually confirm that there are no longer wetland obligate species in that section of the marsh, and that the hydrology has been so altered by modification to support park activities that it would no longer support wetland functions. Further, the USACE indicated that the imagery employed in Figure 4 of Appendix A is no longer current, thus misrepresenting current conditions and misidentifying this area as a wetland.

The DIFR/EA would benefit from revisions to improve consistency and make the discussion current/accurate as it pertains to these features in order to better communicate impacts and risks associated with implementation of the Project. Revisions may include additional explanation within the text of sections 3 and 6 of the DIFR/EA (perhaps including a short list of species found at that impacted location currently to demonstrate these are not wetland species). It is recommended that at such point that wetlands within the Project area are delineated, these former wetlands should be evaluated to verify that they are not still performing wetland functions in some capacity. Additionally, it is not clear whether the previous alterations to these former wetlands were authorized impacts to jurisdictional waters and if there might be compensatory mitigation wetlands in the Project area that should also be identified in the document, particularly if these might be impacted by the proposed levee or associated activities.
In regard to Section 6.3.4, it is not clear whether the USACE has developed modeling to verify the hydrologic requirements of the site related to salt marsh habitat restoration, and/or whether there are reference restoration sites that would prove informative. Information shared by the USACE during the Mid-point Meeting on September 26, 2017, USACE made reference to the 14 acre tidal marsh restoration site in Joseph Medwick Memorial Park identified in Section 3.3.3 of the DIFR/EA as a potential reference site for the proposed mitigation. However, this is not well specified within the document at this stage. For clarity, the DIFR/EA would benefit from additional text in Section 6.3.3 and/or 6.3.4 mirroring the statement in reference to Appendix A.9, “The District completed a 14 acre tidal marsh wetland mitigation within the Joseph Medwick Memorial Park in 2007... This area will be used as a reference site during optimization of the TSP to further develop conceptual mitigation plans.” Further, if additional hydrologic modeling is anticipated as it relates specifically to the mitigation/restoration effort, it would be helpful to specify that more clearly in these sections of the document. Finally, it is recommended that functional targets for the mitigation site be clearly identified as the mitigation planning takes shape. Some studies (e.g., C. Violin, et.al.) have determined that failure to consider the design characteristics of riparian restoration projects can lead to failure of the restored habitat to achieve better habitat characteristics than the impaired or degraded habitat that it is designed to replace, suggesting careful consideration of biologic targets and the habitat characteristics required to achieve those targets.

**Literature Cited:**


**Significance:** Medium Low

There is missing, incomplete, or inconsistent technical or scientific information pertaining to aquatic resource impacts and mitigation that affects the clarity, understanding, or completeness of the study documents. It remains uncertain whether, but doubtful that, the missing information will affect the selection, justification, or ability to implement the recommended plan.

**Recommendations for Resolution**

**Recommendation 1:** Revise the DIFR/EA to provide additional information regarding the status of the managed wetlands noted above for accuracy and clarity.

**Recommendation 2:** Add text to the DIFR/EA in Section 6.3.3 and/or 6.3.4 mirroring the statement in reference to Appendix A.9 as noted in the comment above. Further, if additional hydrologic modeling is anticipated as it relates specifically to the mitigation/restoration effort, it would be helpful to specify that more clearly in these sections of the document.

**Comment 13**

The documentation is lacking an explanation of the basis for why Alternative 4a (the TSP) is the only alternative that will be evaluated for various flood frequency heights.

**Basis for Comment**

The report indicates that optimization of Alternative 4a is the next step of the hydraulic analysis, during which nonstructural treatments and the levee segment will be revisited for analysis at various flood frequency design events. This statement assumes that none of the other alternatives will be evaluated for additional flood frequencies. This approach assumes that Alternative 4a will have the highest net
benefits for all flood frequencies. This may not be a valid assumption. The report does not indicate the basis for only evaluating Alternative 4a for additional flood frequencies.

**Significance: Medium Low**

There is a fundamental issue within the study documents pertaining to an alternative analysis that affects the clarity and understanding of the technical or scientific basis for the selection of, justification of, or ability to implement the TSP but needs more robust discussion within the documents to fully evaluate and communicate risks associated with the plan.

**Recommendation for Resolution**

**Recommendation 1:** Include a narrative of why only Alternative 4a will be evaluated for additional flood frequencies.

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**Comment 14**

It is not clear from the DIFR/EA whether other alternatives to the enclosed concrete pipe drainage structure at Casey’s Creek were considered during plan formulation or will be considered during or after optimization.

**Basis for Comment**

It is not clear from the documentation whether any alternatives other than the enclosed concrete pipe and flap gate for the levee drainage structure at Casey’s Creek were considered during plan formulation, nor whether there are other alternatives that may provide storm surge protection and improve conveyance, water quality, and/or habitat values, further reducing risk and/or environmental impacts (see Section 6.3.2, *Water Quality and Aquatic Habitat*). This discussion would benefit from more information in the text regarding the reasons behind the option chosen, given that the potential isolation of fish from upstream resources and possible restoration opportunities and resultant water and habitat quality benefits in the upstream portions of the creek that could be precluded by the selection of this drainage option.

Information shared by USACE during the Mid-point Meeting on September 26, 2017, indicated that USACE did not consider other options at this stage and that other options would not be considered as part of optimization. But, it was suggested that other options could be considered at later stages of the Project. There is no prominent information within the Environmental Assessment as to why this is the case. The document would benefit from either additional text in this section or reference to another section in the documentation to better explain this choice and the subsequent process.

**Significance: Medium Low**

There is missing, incomplete or inconsistent technical or scientific information pertaining to the selection and analysis of the enclosed concrete pipe and flap gate for the levee drainage structure at Casey’s Creek that affects the clarity, understanding, or completeness of study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.

**Recommendation for Resolution**

**Recommendation 1:** Provide additional discussion and references in the appropriate sections of the DIFR/EA.
4.2.5 Significance: Low

Comment 15
To ensure complete and consistent economic analysis and results, the documentation should include additional specific information, clarification, or correction.

Basis for Comment
There are three specific issues noted here in regard to the information provided.

1. It is not clear if Damaged Structures identified in the DIFR/EA are within the 500-year flood-event floodplain or all structures in the study area. The Annual Exceedance Event should be the 500-year instead of the >100-year flood-event floodplain noted in the tables. In Table 17, Summary of Damaged Structures by Flood Event of the Feasibility Report, page 54, the right hand column is titled “<1% (>100-yr)”.

2. The value of contents for each structure was effectively assumed to be equal to 100 percent of the structure value, in accordance with the appropriate guidance (Reference: Section 4.2.3 of the Economics Appendix). A citation for the appropriate guidance should be provided in the report.

3. In Chapter 4, Affected Environment and Environmental Consequences, no distinction is made as to whether the expected environmental effects of alternatives are direct or indirect effects. Council for Environmental Quality regulations state that direct effects “are caused by the action and occur at the same time and place” (40 CFR 1508.8) while indirect effects “…are caused by the action and are later in time and farther removed in distance, but still reasonably foreseeable”.

Significance: Low
The significance of this comment is low considering the verbal clarification provided by USACE during the Mid-point Meeting. This comment has no impact on Project feasibility.

Recommendation for Resolution
Recommendation 1: Revise the column heading in Table 17 of the Feasibility Report to indicate if the information in the column is the number of Damaged Structures in the 500-year flood plain or all structures in the study area. Also, include correct citation to the appropriate guidance. Finally, revised the documentation to make a clear distinction between direct and indirect environmental impacts.

Comment 16
Specific elements of the 404(b)(1) Evaluation are unclear as presented, including information on water condition impacts and secondary effects.

Basis for Comment
Appendix A.2: 404(b)(1) Evaluation report:

Section IIb1c- Clarity: If there are impacts to Casey’s Creek, it is not clear why there would not also be impacts to the Rahway River since Casey’s Creek flows into the Rahway River. This would also seem to conflict with information presented in Section IIb1h- Nutrients, and Section IIc1- Suspended Particulates, Section IIc2- Turbidity, and others, which state that nutrients, turbidity, light, dissolved oxygen, organics, etc., likely would be increased in the Rahway River.
Section II3h, Determination of Secondary Effects on the Aquatic Ecosystem, states, “No secondary effects on the aquatic ecosystem are expected from this project.” It seems possible there could be some secondary effects, including from the restriction caused by the flap gate and culvert that was identified in the DIFR/EA. Also, secondary and cumulative impacts are typically interrelated, suggesting that the language applied to one may apply to the other.

**Significance: Low**

There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of study documents within the 404(b)(1) Evaluation, but does not influence the selection of, justification of, or ability to implement the recommended plan.

**Recommendation for Resolution**

**Recommendation 1:** Consider revisions to the 404(b)(1) Evaluation to improve consistency and accuracy.
Appendix A  Qualifications of the Review Panel Members

The detailed qualifications and experience of each IEPR Panel Member (in alphabetical order) is provided below.

A.1  Professor Don Ator

Role: Civil Works Planner/Economist

Professor Ator is a Research Associate, Professor, and Undergraduate Advisor in the Department of Agriculture Economics and Agribusiness at Louisiana State University. Professor Ator’s responsibilities include research, grant writing and proposal development, extension and outreach, undergraduate advising and teaching Agricultural Commodity Marketing and Risk Management. His current research is in financial resiliency planning for local governments in Louisiana, Texas, Alabama, Mississippi, Florida, Georgia, Kentucky, and Nebraska.

Professor Ator has over 35 years of demonstrated experience in public works planning, working with project teams to identify and evaluate measures and alternatives using appropriate planning methodologies to reduce life safety risk. He earned his MS in economics and agricultural economics and has an MBA in finance and accounting from Louisiana State University. He has worked with 22 different USACE districts nationwide, as well as with the Bureau of Land Management, Bureau of Reclamation, and the Department of Commerce. He was the associate director and senior economist for the Gulf South Research Institute and project/program manager and senior economist at three private engineering firms. He has conducted more than 500 civil works projects nationwide that required the development of relevant and credible socioeconomic information and analysis, and performed the quality assurance review for all economic aspects of these projects. He is experienced in determining the scope and appropriate methodologies for impact assessment and analyses for a variety of projects and programs with high public and interagency interests. His scope includes: Economic Evaluation of Benefits from Beneficial Use Disposal Alternatives of Dredged Material for Consistency with State of Texas Coastal Management Plan, Texas (USACE, Galveston District); Missouri River Authorized Purposes Study Project Management Plan (USACE, Omaha and Kansas City Districts); and the Municipal and Industrial Water Use Forecast, Southwest Florida Feasibility Study, Florida (USACE, Jacksonville District).

Professor Ator’s experience has made him intimately familiar with the USACE plan formulation process, procedures, and standards as they relate to flood risk management. He has demonstrated proficiency in the USACE six-step planning process as evidenced by development of a template for preparing Project Management Plans for feasibility studies for USACE Regional Planning and Environment Division South, Mississippi Valley Division in 2011 and field testing the template in 2012. Most recently, he worked with the USACE New Orleans District Project Delivery Team to develop the Project Management Plan for the West Shore Lake Pontchartrain Flood and Storm Damage Risk Reduction Project. In 2010, Professor Ator served as a team leader while embedded in the Plan Formulation Branch USACE New Orleans District directing plan formulation activities of three plan formulators and providing project oversight and review to ensure compliance with USACE guidelines.
Professor Ator is familiar with the USACE structural flood-risk management analysis and economic benefit calculations and standard USACE computer programs, including Hydraulic Engineering Center’s Flood Damage Reduction Analysis (HEC-FDA). He has conducted structure inventory surveys for flood damage reduction studies, developed content-to-structure value relationships for urban flood control economic analyses, and has prepared Section 905(b) flood damage reduction and ecosystem restoration reconnaissance reports. A majority of the projects he has conducted have required use of the HEC-FDA computer program. He attended a USACE-sponsored workshop on the model certified version of HEC-FDA in March of 2010 hosted by the Mississippi Valley Division. His related project experience includes the Structure and Content Depth Damage Relationship Surveys, Ouachita Parish, Louisiana (USACE, Vicksburg District); the Development of Content to Structure Value Relationships for Urban Flood Control Economic Analysis, Cypress Creek, Texas (USACE, Galveston District); and the Orleans Parish, Louisiana, Urban Flood Control Feasibility Study, Structure Inventory (USACE, New Orleans District).

Professor Ator’s experience with National Economic Development analysis procedures, particularly as they relate to flood risk management, includes serving as a team leader in 2010 while embedded in the Plan Formulation Branch (USACE, New Orleans District). His responsibilities included directing plan formulation activities, and providing project oversight and review to ensure compliance with USACE guidelines. In this capacity, he worked closely with Project Delivery Teams to identify and evaluate measures and alternatives using appropriate planning methodologies on 13 projects to reduce life safety risk, all of which included a combination of flood risk management, life-loss probability analysis, population at risk, residual risk, and vulnerability analysis. For example, Professor Ator’s work on the Greens Bayou Residual Flood Plain Properties Buyout Analysis, Texas (USACE, Galveston District) included flood risk management, population at risk, residual risk, and vulnerability analysis. In addition, the Donaldsonville to the Gulf–Flood Damage Risk Reduction Feasibility Study, Louisiana (USACE, New Orleans District) included flood risk management, life loss probability analysis, population at risk, residual risk, and vulnerability analysis.

In Professor Ator’s 35+ years of experience, he has worked on social effects evaluation of large civil works projects for hundreds of National Environmental Policy Act (NEPA) compliance documents, including experience with community cohesion/identity, cultural and historical value, low-income population, economic vitality of the community, and vulnerability of the population. For example, he contributed to a social impact assessment for the Little Colorado River in Holbrook, Arizona (USACE, Los Angeles District) and an environmental impact statement for U.S. Navy Home Porting Projects (USACE, Galveston District), both of which dealt with community cohesion and identity. His work on the Historic American Building Survey Documentation for the Perry Creek Flood Control Project in Sioux City, Iowa (USACE, Omaha District) and on screening the cultural and historic features at the Di-Lane Plantation, Georgia (USACE, Savannah District) illustrates his experience with evaluating cultural and historical value. He gained experience working with low-income populations through assessing the socioeconomic impacts from flooding and flood control measures in the Yazoo Delta, Mississippi (USACE, Vicksburg District) and through the development of an initial job training program for the Community Impact Mitigation Plan for the Inner Harbor Navigation Canal Lock in New Orleans, Louisiana (USACE, New Orleans District). Prof. Ator has experience with the economic vitality of the community through working on the Memphis Riverfront Development Project (USACE, Memphis District) and on an analysis of economic development benefits from the construction of a floodwall and levee system along the Greenbrier River and Knapp Creek in Marlinton, West Virginia (USACE, Huntington District). Finally, he is familiar with the vulnerability of the population through his work on a social impact assessment for the Kissimmee River Upper Basin Restoration Project (USACE, Jacksonville District) and from the Environmental Impact Statement for the proposed widening of the Pascagoula Lower Sound/Bayou Casotte Channel (USACE, Mobile District).
A.2  Professor Jim Dobberstine

Role: Biological Resources and Environmental Law Compliance Specialist

Professor Dobberstine currently serves as chair of the Math, Engineering, and Sciences Division at Lee College, in Baytown, Texas, where he is responsible for all operational aspects of the division, including oversight of three departments (Mathematics, Biological Sciences, and Physical Sciences) and associated laboratories, approximately 30 faculty and staff, and departmental budgets. He teaches Environmental Science and Biology and is engaged in ecosystem studies in the Galveston Bay estuary with his students, the results of which have been featured through organizations including Restore America’s Estuaries, among others. Professor Dobberstine holds a Bachelor of Arts in Life Sciences (Biology/Chemistry; Concordia University), an MS in Environmental Management (Environmental Policy and Law, including NEPA, Clean Water Act, Endangered Species Act, and other regulatory programs; University of Houston-Clear Lake), and an MS in Environmental Science (Biology and Environmental Toxicology; University of Houston-Clear Lake). He also holds certificates in USACE wetland delineation (Texas A&M University) and water quality improvement using constructed wetlands (Clemson University) and has completed numerous professional development courses, including Geographic Information System Techniques in Environmental Assessment (University of North Texas), Probabilistic Ecological Risk Assessment (Texas Tech University), Application of Adaptive Management to Address Climate Change-Related Challenges National Oceanic and Atmospheric Administration Coastal Service Center and the PBS&J Ecosystem Restoration Division, Benthic Mapping Techniques, U.S. Department of Agriculture-Natural Resources Conservation Service, and the University of Rhode Island), Sampling Benthic Sediments: Methods, Analyses, and Judgments (University of North Texas Institute of Applied Sciences), and Conserving Land with Conservation Easements (National Land Trust Alliance Land Conservation Leadership Program).

As an Environmental Scientist focusing on wetlands and other aquatic habitats, Professor Dobberstine is experienced with the complex regulatory framework affecting projects that potentially impact coastal habitat. He has evaluation experience with NEPA impact and cumulative effects analyses on projects with high public and interagency interest within sensitive aquatic habitats, including wetlands. Professor Dobberstine has extensive research experience with many aspects of aquatic and riparian habitats, including aquatic habitat characterization, the effect of adjacent land use on in-stream water and sediments, and ecosystem function. This includes experience assessing aquatic habitats using the Sediment Triad method (toxicology, chemistry, and biologic community). Data collected as part of a 2004–2007 study is part of the baseline aquatic habitat data being applied to an USEPA superfund project on the Houston Ship Channel (HSC-Patrick Bayou). He also has ongoing grant-funded (Texas Coastal Management Program/National Oceanic and Atmospheric Administration and the Galveston Bay Estuary Program/U.S. Environmental Protection Agency) research gathering data to be used for adaptive management of ecosystem restoration in aquatic habitats in lower Galveston Bay, comparing the functional aspects of the biologic communities across different habitat restoration designs. The data are being gathered and managed under criteria developed for the USEPA and the Texas Commission of Environmental Quality required Quality Assurance Program Plan. Professor Dobberstine is also studying the biologic community characteristics associated with small-scale shoreline restoration (Living Shorelines) in comparison to natural reference marshes and traditionally armored (bulkhead) shorelines in estuarine and freshwater ecosystems. He has experience associated with adaptive management strategy development with the Galveston Bay Estuary Program Freshwater Inflows Group and the Harris County Flood Control District Memorial Park Demonstration Project/Buffalo Bayou shoreline stabilization/habitat restoration project. Professor Dobberstine is also experienced with risk as-
essment for restoration projects in mixed urban/industrial environments where potential toxicant/exposure concerns contrast with significant cultural and environmental benefits, including community education and recreation opportunities and ecosystem enhancement. He is familiar with habitat and life-cycle requirements for many species of fish and wildlife endemic to rivers and watersheds in many areas of the United States, including threatened and endangered species.

Professor Dobberstine has worked in the area of habitat conservation with the Galveston Bay Foundation, where he led several programs including the Living Shorelines, Land Conservation, and Permit Review Programs. He has extensive experience with conservation easements including the development of habitat assessments, project cost models, and contract development. He was responsible for overseeing more than 2,500 acres of protected coastal habitat. He has extensive experience with aquatic habitat restoration projects including project development, planning, permitting, risk assessment and ecotoxicology, fundraising and grant development, project implementation, management, and monitoring. He has a working knowledge of coastal, riparian, and floodplain ecology, and methodologies for evaluation, including research, work on design and grant development for restoration projects (including beneficial uses of dredge material), and permit development and evaluation. He has successfully raised grant funds for projects from partners including the U.S. Fish and Wildlife Service Coastal Program, the Texas Coastal Management Program, the Texas Coastal Assistance Program, the Galveston Bay Estuary Program, and others.

Professor Dobberstine is frequently called on to serve as an advisor on projects and panels, currently serving on the Advisory Council to the Arthur Temple College of Forestry and Agriculture at Stephen F. Austin State University, and formerly as a curriculum review advisor to the Environmental Management Program at the University of Houston-Clear Lake. He also serves as a member of the Memorial Park Demonstration Project Vegetation Advisory Workgroup, the Moody Gardens Animal Care and Use Committee, and on the Monitoring and Research Subcommittee of the Galveston Bay Council. Professor Dobberstine is a member of the National Association of Environmental Professionals. He also currently serves on the Boards of Directors of the Texas Association of Environmental Professionals (President 2010–present) and the South Central Regional Chapter of Society for Environmental Toxicology and Chemistry (as President 2013–2015), and as a former Trustee and current Advisory Board Member of the Galveston Bay Foundation. Professor Dobberstine has served on several IEPRs for USACE projects in the areas of biologic resources and environmental law compliance. IEPR experience includes infrastructure projects (dam safety and flood risk reduction), ecologic modeling, and water management.

A.3 Mr. Chuck Hutton

Role: Structural/Civil Engineer

Mr. Hutton is a civil/structural engineer with 48 years of experience in the design and management of water resource projects involving dams, hydraulic structures, hydropower, pumping plants, and water conveyance facilities in Asia, Africa, Latin America, Middle East and the United States. He achieved his Professional Engineer registration in 1981 in Colorado. Mr. Hutton’s expertise includes preparing feasibility studies, designs, drawings, and specifications for roller-compacted concrete, gravity and arch dams, hydropower plants, pumping plants, pipelines, canals and hydraulic structures; performing dam safety inspections; conducting condition assessments of existing dams, hydropower facilities and water conveyance systems; developing designs for rehabilitation; technical review; failure mode analysis and risk assessment of large complex systems; project management and construction management.
He received his MS in Civil and Environmental Engineering and BS in Civil Engineering in Structural Engineering from Purdue University, completed graduate studies in Water Resource Engineering at the University of Colorado, RAM-D through USACE, and Potential Failure Mode Analysis through FERC.

Mr. Hutton has completed training for the Sandia National Laboratories RAM-D and performed vulnerability and risk assessments for several concrete and earth dams and their appurtenant facilities. He also has completed training for the FERC Dam Safety Performance Monitoring Program and Potential Failure Mode Analysis methodology and has been involved in many projects that required application of this methodology. He has served as a FERC qualified independent consultant for the safety inspection of numerous licensed dam and hydroelectric projects.

His long-term overseas assignments include Vietnam, Philippines, Malaysia and Peru, with short-term assignments in Cambodia, Zambia, Iceland, Jordan, Indonesia, and Ecuador. In addition, he has worked on projects in the Dominican Republic, Turkey, Nicaragua, Guyana, Lebanon and Puerto Rico.

Mr. Hutton has served on multiple Independent External Peer Review panels. Some examples are:

- Addicks and Barker Dam Safety Assurance Program IEPR, Texas.
- Isabella Dam Seismic Evaluation, California Bluestone Dam Safety Assurance Program IEPR, West Virginia Dover Dam Safety Assurance Program IEPR, Ohio San Gabriel Dam and Hydroelectric Project Potential Failure Mode Analysis, California.
- Barker Dam and Hydroelectric Project Potential Failure Mode Analysis, Colorado.

He is the author or co-author of 13 technical papers presented at national conferences, seminars, and workshops and published in national engineering publications. In addition to his strong technical background in water resource engineering, he has been a successful project team leader and technical designer and/or reviewer on domestic and international water resource projects. He also has conducted seminars on dam design, dam safety engineering and construction inspection. Mr. Hutton is a member of the American Society of Civil Engineers, United States Society of Dams, and the Association of State Dam Safety.

A.4 Mr. Willard Smith

Role: Hydrology and Hydraulic Engineer

Mr. Smith has over 41 years of experience as a hydrologist. He has used this expertise on many hydroelectric, water resource development, and stormwater/floodplain projects. Mr. Smith received his BS in Civil Engineering from the University of Missouri in 1974, his Associate of Applied Science in Mechanical Technology from State University of New York at Morrisville in 1968, and became a Certified Floodplain Manager in 2004. He is a registered Civil Engineer in Oklahoma, Arkansas, Kansas, Missouri, Colorado, and Wyoming.

Mr. Smith was President of the NHA from 1988–1989 and was an active member of NHA’s Board of Directors for over 5 years (1984—989). He served as Vice President, Creator, and Chairman of both the
FERC Committee and the International Committee. Mr. Smith was chosen to represent the NHA as a technical specialist on the Committee on Renewable Energy Commerce and Trade Missions to the Caribbean Basin (1987), to the Pacific Rim (1990, 1991, and 1993) and to Panama (1994).

Mr. Smith has been involved in many hydropower projects both domestic and international, including: Arkansas River Lock and Dam Nos. 2–6, 9, and 13; Mississippi River Locks and Dams; Red River Lock and Dam Nos. 1 and 2; Lake Eucha Dam; W. D. Mayo Lock and Dam, Jigüey-Aguacate dam complex, Dominican Republic, Hidro Jones Dam, Guatemala. He has also worked on dam design projects, including Phillips Refinery Stormwater Project; River Parks Low Water Dam, Caney River Water Supply Intake Dam, and the Arkansas River Corridor Study. Dam safety projects include Chimney Rock Dam, Robert S. Kerr Dam, Pensacola Dam, Warrenton Dam, Lee Creek Dam (Ft Smith), New Dam/Lake Project in Okmulgee County, Oklahoma, and Mosul Dam–Iraq. Mr. Smith is an FERC Part 12D Independent Consultant and an FERC Trained Potential Failure Model Analysis Facilitator.

Mr. Smith was presented the 1996 Newsmaker Award from Engineering News Record and was listed in International Who's Who of Professionals in 1995. Mr. Smith was awarded the Dr. Kenneth Henwood Lifetime Achievement Award from the NHA in April 2008. In September 2009, he was awarded the Charles Don Ellison Memorial Award from the Oklahoma Floodplain Managers Association in recognition of long-term contributions of leadership and support to the advancement of floodplain management in Oklahoma. In November 2009, Mr. Smith was recognized by the International Water Power & Dam Construction magazine’s list as one of the 60 most influential people who have helped shape the course of the global hydropower and dam business in the world over the past 60 years.

He is the current Past Chair of the Oklahoma Floodplain Managers Association (2008–2009), and was previously Chair (2007–2008), Vice Chair (2006–2007) and Mitigation Committee Chair (2004–006). Mr. Smith is also currently the coordinator of the Oklahoma Floodplain Managers Association (OFMA) Disaster Response Team (DRT) which provides support to communities, counties, and Indian Tribes in Oklahoma during disasters affecting the Special Flood Hazard Area.


He has also participated in the following workshop presentations:

- Facilitator—“Managing the NFIP in Oklahoma”—August 27–September 1, 2006, on behalf of Oklahoma Water Resources Board and OFMA.
- “Hydraulics 101”, OFMA, Training Session, 202 Workshops–periodic throughout each year.
- “Hydrology and Hydraulics 202”, OFMA, Training Session, 202 Workshops–periodic throughout each year.
Appendix B  Charge Questions

At the beginning of the review process, the OEO provided the charge questions to the Panel. The Panel members used these charge questions to guide their review. Working with the Panel, the OEO ensured that all charge questions were appropriately addressed. Below is the list of charge questions that were used for this IEPR that were provided to the Panel.

RAHWAY RIVER BASIN, NEW JERSEY
COASTAL STORM RISK MANAGEMENT FEASIBILITY REPORT
NEW YORK DISTRICT
INDEPENDENT EXTERNAL PEER REVIEW
CHARGE TO REVIEWERS

The following Charge to Reviewers outlines the objective of the Independent External Peer Review (IEPR) for the subject study and the specific advice sought from the IEPR 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 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 charge. The 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 charge.

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 panel may 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 IEPR Performance Work Statement provides additional details on how comments should be structured.

Broad Evaluation Charge Questions
1. Is the need for and intent of the decision document clearly stated?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical information?

Given the need for and intent of the decision document, assess the adequacy and acceptability of the following:
3. Project evaluation data used in the study analyses,
4. Economic, environmental, and engineering assumptions that underlie the study analyses,
5. Economic, environmental, and engineering methodologies, analyses, and projections,
6. Models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives,
7. Methods for integrating risk and uncertainty,
8. Formulation of alternative plans and the range of alternative plans considered,
9. Quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans, and
10. Overall assessment of significant environmental impacts and any biological analyses.

Further,
11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable, and
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.

For the tentatively selected plan, assess whether:
13. The models used to assess life safety hazards are appropriate,
14. The assumptions made for the life safety hazards are appropriate,
15. The quality and quantity of the surveys, investigations, and engineering are sufficient for a conceptual design considering the life safety hazards and to support the models and assumptions made for determining the hazards, and
16. The analysis adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project.
## Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>APMI</td>
<td>Analysis Planning and Management Institute</td>
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<tr>
<td>BFE</td>
<td>Base Flood Elevation</td>
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<tr>
<td>BS</td>
<td>Bachelor of Science</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>CLOMR</td>
<td>Conditional Letter of Map Revision</td>
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<tr>
<td>COI</td>
<td>Conflict of Interest</td>
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<tr>
<td>DIFR/EA</td>
<td>Draft Integrated Feasibility Report/Environmental Assessment</td>
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<tr>
<td>DOE</td>
<td>Department of Energy</td>
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<td>DrChecks</td>
<td>Design Review and Checking System</td>
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<td>DRT</td>
<td>Disaster Response Team</td>
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