December 12, 2013

Final Independent External Peer Review Report Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico



Prepared by
Battelle Memorial Institute

Prepared for
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San Juan, PR 00940

ENLACE Professional Services Contract No. 2014-000015

Final Independent External Peer Review Report of the

Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico

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EXECUTIVE SUMMARY

Project Background and Purpose

The Caño Martín Peña (CMP) is a tidal channel 3.75 miles long in metropolitan San Juan, Puerto Rico. It is part of the San Juan Bay Estuary (SJBE), the only tropical estuary included in the U.S. Environmental Protection Agency (USEPA) National Estuary Program (NEP). The SJBE's watershed is heavily urbanized and covers 97 square miles. Due to years of encroachment and fill of the mangrove swamps along the CMP, it no longer serves as a functional connection between San Juan Bay and San José Lagoon. Sedimentation rates within the CMP are nearly two orders of magnitude higher than in other parts of the SJBE. Open waters in areas closer to the San José Lagoon have been lost, as the area has started transitioning into a wetland.

Significant areas of these communities lack sewer systems. Raw sewage discharges from eight communities north and south of the eastern CMP areas as well as from combined sewer overflows have led to fecal coliform concentrations of 2,000,000 colonies per 100 mL, when the regulatory standard is of 200 colonies per 100 mL. Water residence time in the San José and Los Corozos lagoons is on the order of 17 days, causing strong salinity stratification that has led to low oxygen or no oxygen levels in the 702 acres of lagoons with depth below 4 to 6 feet, severely affecting benthic habitats. Water quality and essential fish habitat have also been affected. The CMP Ecosystem Restoration Project (ERP) will restore tidal connectivity between the San José Lagoon and the San Juan Bay by removing over 800,000 cubic yards of sediments, debris, and trash; reducing water residence time; improving water quality; improving essential fish habitat conditions, and mobility of fish throughout the SJBE; and boosting biodiversity.

Restoring exchange between the different areas of San Juan Bay is expected to help restore habitat quality. The CH3D-WES hydrodynamic model was used to compute the improvement (decrease) in residence time within San José Lagoon as a result of increasing the cross sectional area of the CMP within the planned project area. The output on residence time is combined with data from a recently developed Benthic Index for San Juan Bay Estuary to develop a statistically significant relationship between residence time and benthic community health within San José Lagoon. Ten project alternatives were evaluated for predicted environmental benefits including an existing condition, modeled as a 33 foot wide by 3 foot deep channel, and channel widths of 75, 100, 125, 150, 175, and 200, dredged to depths of 10 and 15 feet, to remove the existing garbage and restore previous channel depths.

Independent External Peer Review Process

The Corporación del Proyecto ENLACE del Caño Martín Peña (hereinafter: ENLACE) is conducting an Independent External Peer Review (IEPR) of the Draft Feasibility Report and Environmental Impact Statement (DFR-EIS) for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico (hereinafter: CMP-IEPR). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses. Battelle has experience in establishing and administering peer review panels for the USACE Army Corps of Engineers (USACE) and was engaged to coordinate the IEPR of the CMP-ERP. As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described by the USACE (2012). The IEPR was conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report describes the IEPR process, describes the panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel (the Panel).

Based on the technical content of the CMP-ERP review documents and the overall scope of the project, Battelle identified candidates for the Panel in the following key technical areas: economics, wetland and National Environmental Policy Act (NEPA) impact assessment, civil engineering, and hydraulic engineering. Four panel members were selected for the IEPR: one economist, two experts providing wetland and NEPA impact assessment expertise, and one in a combined role in the disciplines of civil and hydraulic engineering. ENLACE was given the list of candidate panel members, but Battelle made the final selection of the Panel.

The Panel received an electronic version of the CMP-ERP documents, totaling 1,336 pages, along with a charge that solicited comments on specific sections of the documents to be reviewed. ENLACE prepared the charge questions following guidance provided in USACE (2012) and OMB (2004). Battelle reviewed the charge questions, provided suggested revisions as necessary, and included two additional charge questions requesting summary information from the IEPR Panel. The charge questions were included in the draft and final Work Plans.

The ENLACE Project Delivery Team briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review to provide the Panel an opportunity to ask questions of ENLACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct communication between the Panel and ENLACE during the peer review process. The Panel produced individual comments in response to the charge questions.

IEPR panel members reviewed the CMP-ERP documents individually. The panel members then met via teleconference with Battelle to review key technical comments, discuss charge questions for which there were conflicting responses, and reach agreement on the Final Panel Comments to be provided to ENLACE. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium, or low); and (4) recommendations on how to resolve the comment. Overall, five Final Panel Comments were identified and documented. Of these, two were identified as having high significance, and three had medium significance.

Results of the Independent External Peer Review

The panel members agreed among one another on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the CMP-ERP review documents. Table ES-1 lists the Final Panel Comments statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summarizes the Panel's findings.

The CMP IEPR and Model Quality Assurance Review were conducted concurrently and by separate review panels. The IEPR Panel reviewed the CMP DFR-EIS under the assumption that all models employed in the study met the required technical quality and usability standards set by USACE. If the results of the Model Quality Assurance Review indicate that this assumption is incorrect, then the IEPR Panel's assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, data, and analyses performed for the CMP-ERP, as described here, would be compromised. Any significant issues identified by the Model Quality Assurance Review would need to be resolved to ensure that the accuracy and reliability of the plan formulation process, cost estimate, and stated benefits of the CMP-ERP are realized.

The Panel agreed that the CMP-ERP review documents and appendices are well-written and provide a comprehensive description of the ecosystem restoration project. Conclusions are supported with logical and easy-to-follow supporting information. While the Panel deemed the report generally had robust documentation, it identified areas where additional documentation and clarification are warranted.

Wetland and NEPA Impact Assessment –The Panel found the assumptions made for the environmental analysis and assessment of wetland impacts and benefits are sound. However, the assumption that water quality improvements resulting from the restoration of tidal connectivity in the study area may not be accurate since the combined sewer overflows and direct dumping of raw sewage have the potential to affect recovery of the ecosystem in some locations within the study area. The importance of project measures, particularly to eliminate raw sewage and provide storm water treatment, to the study area, as outlined in the adaptive management plan, cannot be understated. Three of the five primary uncertainties listed in the adaptive management plan are attributed to the discharge of untreated waste or combined storm water and waste into the study area. The adaptive management plan rates these three uncertainties as "high" risks and states that they relate to the main objective of the project. The Panel is concerned that wastewater loads from combined sewer overflows and direct dumping of raw sewage in the study area has the potential of inhibiting the recovery of benthic and mangrove habitat, resulting in the projected restoration outputs not being fully achieved. The Panel believes these issues can be addressed by documenting the details of known existing programs or projects intended to eliminate or sufficiently reduce the dumping of raw sewage or combined storm water and sewage overflow into the CMP, conducting the studies or modeling necessary to better determine the potential impacts of the discharge of sewage and polluted storm water into the study area, and coordinating with the appropriate agencies to facilitate the removal, reduction, or remediation of sewage into the study area.

The Panel found the monitoring and adaptive management plans to be largely conceptual and do not provide specific methodologies to determine the capabilities, limitations, and costs of the plans. The monitoring information is very general and the methods used to sample these parameters are not supported by references to the professional literature. The adaptive management plan lacks supporting documentation for these trigger levels, the performance standards, and the expected success of proposed management actions. Additionally, no cost estimates or funding sources are given for the proposed management actions. The Panel believes this issue can be addressed by providing a more through description and documentation of (1) the baseline data and the proposed monitoring methods and procedures and the associated costs, including appropriate citations from professional literature supporting the specific methods selected for each monitoring element; and (2) proposed adaptive management performance standards, the related management actions, and cost estimates and funding sources to identify viable options.

Engineering – The Panel found the preliminary engineering analysis to be comprehensive and the assumptions made for the engineering analysis to be sound and reasonable. The engineering analysis uses accepted USACE hydrologic and hydraulic models. The CHED-WES hydrodynamic model is used to assess flow velocities and water quality (as residence time), and its model capabilities and limitations are clearly defined. However, the Panel is concerned that geotechnical engineering data are limited for this stage of the project.

The impacts of channel velocities on scour rates could not be determined due to the limited geotechnical data and soil analyses, which could affect the estimated construction costs and selected channel configuration. Uncertainties in the soil analyses and shear stress calculations could impact the required scour protection, channel configuration, and cost estimate. The Panel believes this concern can be addressed by performing additional geotechnical analysis to obtain a higher level of confidence in the scour analysis, revising scour protection requirements for alternatives based on the results of geotechnical analysis and in consideration of detailed modeling output, and revising cost estimates for the project alternatives accordingly.

The Panel also found that the decision for eliminating a trapezoidal section early in the screening process is not supported by data or analyses. A more thorough analysis of the geotechnical conditions and more detailed cost analysis may identify lower cost channel configuration alternatives. This issue could be addressed by determining additional costs associated with the excavation, transport, and disposition of additional sediments associated with a trapezoidal channel, performing addition geotechnical analysis to determine suitable slopes for a trapezoidal channel, and analyzing additional costs associated with slope stabilization materials for the trapezoidal channel, if applicable.

The Panel also noted that an alternative disposal site is not identified in the event that the contamination of the dredged material is determined to be unacceptable for ocean disposal. It is not clear whether dredged material can be properly disposed at the selected disposal site, which risks project delays and potentially additional costs. The Panel believes this can be confirmed by conducting the sediment fate modeling and bioassays referenced to verify that the dredged materials from the CMP are suitable for ocean disposal at the Ocean Dredged Material Disposal Site (ODMDS) site, and considering alternative dredged material disposal sites solutions,

including cost implications, if the sediment fate modeling and bioassays cannot confirm the suitability of ocean disposal.

Economics – The economic analysis is thorough and provides sufficient justification for the Tentatively Selected Plan (TSP). The methods, models, and analysis used in the Cost Effectiveness and Incremental Cost Analyses (CE/ICA) process are adequate and acceptable. Existing socioeconomic resources are adequately described and provide support for the without project conditions. Socioeconomic impacts of the project are discussed and sufficient plans to address these impacts are provided. Potential socioeconomic impacts of the project will also need to be monitored and addressed in the future, as discussed in the CMP-ERP review documents.

Table ES-1. Overview of Five Final Panel Comments Identified by the CMP IEPR Panel

No.	Final Panel Comment
Significance – High	
1	The assumption that the water quality improvements resulting from the restoration of tidal connectivity in the study area will substantially increase biodiversity and improve the functional value of mangrove habitat throughout the SJBE may not be accurate since the combined sewer overflows and direct dumping of raw sewage have the potential to affect recovery of the ecosystem in some locations within the study area.
2	The impacts of channel velocities on scour rates cannot be determined due to the limited geotechnical data and soil analyses, which could affect the estimated construction costs and selected channel configuration.
Significance – Medium	
3	The monitoring and adaptive management plans are largely conceptual and do not provide specific methodologies to determine the capabilities, limitations, and costs of the plans.
4	The decision to eliminate a trapezoidal section early in the screening process is not supported by data or analyses.
5	An alternative disposal site has not been identified in the event that the contamination of the dredged material is determined to be unacceptable for ocean disposal.

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LIST OF ACRONYMS

AMP	Adaptive Management Plan
ATR	Agency Technical Review
AWT	Advanced Wastewater Treatment
CAD	Contained Aquatic Disposal
CE/ICA	Cost Effectiveness and Incremental Cost Analysis
CMP	Caño Martín Peña
CSO	Combined Sewer Overflows
COI	Conflict of Interest
DFR-EIS	Draft Feasibility Report and Environmental Impact Statement
DrChecks	Design Review and Checking System
DFR	Draft Feasibility Report
EC	Engineering Circular
ERDC	Engineer Research and Development Center
ERP	Ecosystem Restoration Project
EIS	Environmental Impact Statement
HGM	Hydrogeomorphic Model
IBI	Indices of Biotic Integrity
IEPR	Independent External Peer Review
MP	Monitoring Plan
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NTP	Notice to Proceed
ODMDS	Ocean Dredge Material Disposal Site
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
P&G	Principles and Guidelines
PI	Plasticity Index
SJBE	San Juan Bay Estuary
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

1. INTRODUCTION

The Caño Martín Peña (CMP) is a tidal channel 3.75 miles long in metropolitan San Juan, Puerto Rico. It is part of the San Juan Bay Estuary (SJBE), the only tropical estuary included in the U.S. Environmental Protection Agency (USEPA) National Estuary Program (NEP). The SJBE's watershed is heavily urbanized and covers 97 square miles. Due to years of encroachment and fill of the mangrove swamps along the CMP, it no longer serves as a functional connection between San Juan Bay and San José Lagoon. Sedimentation rates within the CMP are nearly two orders of magnitude higher than in other parts of the SJBE. Open waters in areas closer to the San José Lagoon have been lost, as the area has started transitioning into a wetland.

Significant areas of these communities lack sewer systems. Raw sewage discharges from eight communities north and south of the eastern CMP areas as well as from combined sewer overflows have led to fecal coliform concentrations of 2,000,000 colonies per 100 mL, when the regulatory standard is of 200 colonies per 100 mL. Water residence time in the San José and Los Corozos lagoons is on the order of 17 days, causing strong salinity stratification that has led to low oxygen or no oxygen levels in the 702 acres of lagoons with depth below 4 to 6 feet, severely affecting benthic habitats. Water quality and essential fish habitat have also been affected. The CMP Ecosystem Restoration Project (ERP) will restore tidal connectivity between the San José Lagoon and the San Juan Bay by removing over 800,000 cubic yards of sediments, debris, and trash; reducing water residence time; improving water quality; improving essential fish habitat conditions, and mobility of fish throughout the SJBE; and boosting biodiversity.

Restoring exchange between the different areas of San Juan Bay is expected to help restore habitat quality. The CH3D-WES hydrodynamic model was used to compute the improvement (decrease) in residence time within San José Lagoon as a result of increasing the cross sectional area of the CMP within the planned project area. The output on residence time is combined with data from a recently developed Benthic Index for San Juan Bay Estuary to develop a statistically significant relationship between residence time and benthic community health within San José Lagoon. Ten project alternatives were evaluated for predicted environmental benefits including an existing condition, modeled as a 33 foot wide by 3 foot deep channel, and channel widths of 75, 100, 125, 150, 175, and 200, dredged to depths of 10 and 15 feet, to remove the existing garbage and restore previous channel depths.

The Corporación del Proyecto ENLACE del Caño Martín Peña (hereinafter: ENLACE) is conducting an Independent External Peer Review (IEPR) of the Draft Feasibility Report and Environmental Impact Statement (DFR-EIS) for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico (hereinafter: CMP-IEPR). The work described here documents the activities of Battelle, which was engaged to coordinate the IEPR of the CMP-ERP. Battelle followed procedures dexcribed in the Department of the Army, U.S. Army Corps of Engineers (USACE) Engineer Circular (EC) *Civil Works Review* (EC 1165-2-214) (USACE, 2012) and Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

This final report details the IEPR process, describes the IEPR panel members and their selection, and summarizes the Final Panel Comments of the IEPR Panel on the existing environmental, economic, and engineering analyses contained in the CMP. The full text of the Final Panel Comments is presented in Appendix A.

2. PURPOSE OF THE IEPR

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

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

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

3. METHODS

This section describes the method followed in selecting the members for the IEPR Panel (the Panel) and in planning and conducting the IEPR. The IEPR was conducted following procedures described by USACE (2012) and in accordance with OMB (2004) guidance. Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

3.1 Planning and Schedule

After receiving the Notice to Proceed (NTP), Battelle held a kick-off meeting with ENLACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. In addition, 36 charge questions were provided by ENLACE; Battelle reviewed the charge questions, provided suggested revisions as necessary, and included two additional charge questions requesting summary information from the IEPR Panel. The charge, included in the draft and final Work Plans, also included general guidance for the Panel on the conduct of the peer review (provided in Appendix B of this final report).

Table 1 presents the schedule followed in executing the IEPR. Due dates for milestones and deliverables are based on the award/effective date of October 8, 2013. The review documents

were provided by ENLACE on October 10, 2013. Note that the work items listed in Task 9 occur after the submission of this report. Battelle will enter the five Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that ENLACE can review and respond to them. ENLACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All ENLACE and Panel responses will be documented by Battelle. Battelle will provide ENLACE and the Panel a pdf printout of all DrChecks entries, through comment closure, as a final deliverable and record of the IEPR results.

Table 1. CMP IEPR Schedule

Task	Action	Due Date
1	Notice to Proceed (NTP)	10/8/2013
	Review documents available	10/10/2013
	Battelle submits draft Work Plan [a]	**10/17/2013**
	ENLACE provides comments on draft Work Plan	10/30/2013
	*Battelle submits final Work Plan [a]	**11/1/2013**
2	Battelle requests input from ENLACE on the conflict of interest (COI) questionnaire	10/9/2013
	ENLACE provides comments on COI questionnaire	10/11/2013
	Battelle submits list of selected panel members [a]	**10/17/2013**
	ENLACE confirms the panel members have no COI	10/18/2013
	Battelle completes subcontracts for panel members	10/24/2013
3	Battelle convenes kick-off meeting with ENLACE	10/10/2013
	Battelle sends review documents to panel members	10/28/2013
	Battelle convenes kick-off meeting with panel members	10/28/2013
	Battelle convenes kick-off meeting with ENLACE and IEPR panel members	10/31/2013
7 (IEPR)	Battelle provides ENLACE with IEPR Panel Mid-Review clarifying questions	11/6/2013
	Battelle convenes mid-review teleconference for the IEPR Panel to ask clarifying questions of ENLACE	11/8/2013
	IEPR panel members complete their individual reviews	11/14/2013
	Battelle provides panel members with merged individual comments talking points for Panel Review Teleconference	11/18/2013
	Battelle convenes Panel Review Teleconference	11/19/2013
	Battelle provides Final Panel Comment templates and instructions to panel members	11/20/2013
	Panel members provide draft Final Panel Comments to Battelle	11/26/2013

Table 1. CMP IEPR Schedule (continued)

Task	Action	Due Date
7 (IEPR)	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	11/27-12/5/2013
	Battelle finalizes Final Panel Comments	12/6/2013
8 (IEPR)	Battelle provides Final IEPR Report to panel members for review	12/9/2013
	Panel members provide comments on Final IEPR Report	12/10/2013
	Battelle submits Final IEPR Report to ENLACE [a]	**12/12/2013**
9[b] (IEPR)	Battelle convenes teleconference with ENLACE to review the Post-Final Panel Comment Response Process	12/13/2013
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	12/16/2013
	Battelle inputs Final Panel Comments into DrChecks; Battelle provides the panel members the draft Evaluator Responses	12/16/2013
	ENLACE provides draft Evaluator Responses to Battelle	12/23/2013
	Battelle provides the panel members the draft Evaluator Responses and clarifying questions	1/3/2014
	Panel members provide Battelle with draft BackCheck Responses	1/9/2014
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	1/10/2014
	Battelle convenes Comment-Response Teleconference with panel members and ENLACE	1/13/2014
	ENLACE inputs final Evaluator Responses into DrChecks	1/17/2014
	Battelle provides final Evaluator Responses to panel members	1/23/2014
	Panel members provide Battelle with final BackCheck Responses	1/28/2014
	Battelle inputs final BackCheck Responses into DrChecks	1/30/2014
	Battelle submits pdf printout of DrChecks project file to ENLACE [a]	**1/31/2014**

a Deliverable.

b Task 9 occurs after the submission of this report.

Note: Tasks 4 through 6 are part of the concurrent Model Quality Assurance Review and are not included in this table.

3.2 Identification and Selection of IEPR Panel Members

The candidates for the Panel were evaluated based on their technical expertise in the following key areas: economics, wetland and National Environmental Policy Act (NEPA) impact assessment, civil engineering, and hydraulic engineering. These areas correspond to the technical content of the CMP-ERP and overall scope of the CMP IEPR.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former

panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential COIs. Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected four experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

The candidates were screened for the following potential exclusion criteria or COIs.[1] These COI questions were intended to serve as a means of disclosure and to better characterize a candidate's employment history and background. Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

- Previous and/or current involvement by you or your firm[2] in the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project and San Juan Bay Estuary.
- Previous and/or current involvement by you or your firm[2] in flood control, ecosystem restoration, or model quality assurance review within the area of San Juan Bay Estuary, Puerto Rico.
- Previous and/or current involvement by you or your firm[2] in the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project.
- Previous and/or current involvement by you or your firm[2] in the conceptual or actual design, construction, or operations and maintenance of any projects in the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project.
- Current employment by the U.S. Army Corps of Engineers (USACE).

[1] Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "….when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

[2] Includes any joint ventures in which a panel member's firm is involved and if the firm serves as a prime or as a subcontractor to a prime.

- Previous and/or current involvement with paid or unpaid expert testimony related to Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project.
- Previous and/or current employment or affiliation with members of the cooperating agencies or local sponsors: Corporación del Proyecto ENLACE del Caño Martín Peña; USACE (for pay or pro bono).
- Past, current or future interests or involvements (financial or otherwise) by you, your spouse or children related to the San Juan Bay Estuary, Puerto Rico.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Jacksonville District.
- Previous or current involvement with the development or testing of models that will be used for or in support of the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project.
- Current firm[2] involvement with other USACE projects, specifically those projects/contracts that are with the Jacksonville District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Jacksonville District. Please explain.
- Any previous employment by the USACE as a direct employee, notably if employment was with the Jacksonville District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by the USACE as a contractor (either as an individual or through your firm[2]) within the last 10 years, notably if those projects/contracts are with the Jacksonville District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning ecosystem review or flood management, and include the client/agency and duration of review (approximate dates).
- Pending, current or future financial interests in the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project or related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years came from USACE contracts.

- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from contracts with the non-federal sponsor (Proyecto ENLACE Del Caño Martín Peña).
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project.
- Participation in relevant prior and/or current Federal studies relevant to this project and/or the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project.
- Previous and/or current participation in prior non-Federal studies relevant to this project and/or the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, or the Performance Measures Benthic Index, Mangrove Root Community and Fisheries Habitat Models for the Caño Martín Peña Ecosystem Restoration Project.
- Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe:

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. The four final reviewers are affiliated with consulting companies or are independent consultants. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. ENLACE was given the list of candidate panel members, but Battelle made the final selection of the Panel. Section 4 of this report provides names and biographical information on the panel members.

3.3 Conduct of the IEPR

Prior to beginning their review and within two days of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which ENLACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge as well as the CMP-ERP review documents and reference materials listed below. The documents and files in bold font were provided for review; the other documents were provided for reference or supplemental information only.

- **CMP-ERP Draft Feasibility Report (204 pages)**
- **Appendix A: National Ecosystem Benefits Evaluation (32 pages)**
- **Appendix B: Real Estate Plan (18 pages)**

- **Appendix C: Recreation Resources Assessment and Recreation Plan (29 pages)**
- **Appendix D: Cost Engineering (166 pages)**
- **Appendix E: Adaptive Management Plan (39 pages)**
- **Appendix F: Monitoring Plan (18 pages)**
- **Appendix G: Engineering (293 pages)**
- **Appendix H: CMP ERP Environmental Impact Statement (208 pages)**
- **Essential Fish Habitat (57 pages)**
- **Biological Assessment (42 pages)**
- **404(b) (1) Evaluation (161 pages)**
- **CZMC (22 pages)**
- **Relevant Correspondence (47 pages)**
- USACE guidance Civil Works Review, (EC 1165-2-214) dated 15 December 2012
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

About half way through the review of the CMP-ERP review documents, a teleconference was held with ENLACE, the Panel, and Battelle so that ENLACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted three panel member questions to ENLACE. ENLACE was able to provide responses to all three questions during the teleconference.

3.4 Review of Individual Comments

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

3.5 IEPR Panel Teleconference

Battelle facilitated a 4-hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of high-level importance to the findings, and merged any related individual

comments. In addition, Battelle confirmed each Final Panel Comment's level of significance to the Panel.

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

3.6 Preparation of Final Panel Comments

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

- Lead Responsibility: For each Final Panel Comment, one Panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel member as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
    1. Comment Statement (succinct summary statement of concern)
    2. Basis for Comment (details regarding the concern)
    3. Significance (high, medium, low; see description below)
    4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
    1. High: Describes a fundamental problem with the project that could affect the recommendation, success, or justification of the project. Comments rated as high indicate that the Panel analyzed or assessed the methods, models, and/or analyses and determined that there is a "showstopper" issue.
    2. Medium: Affects the completeness of the report in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium indicate that the Panel does not have sufficient information to analyze or assess the methods, models, or analyses.

3. Low: Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project. Comments rated as low indicate that the Panel identified information (tables, figures, equations, discussions) that was mislabeled or incorrect or data or report sections that were not clearly described or presented.

- Guidance for Developing Recommendations: The recommendation section was to include specific actions that ENLACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, five Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and ENLACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in Appendix A of this report.

4. PANEL DESCRIPTION

Candidates for the Panel were identified using Battelle's Peer Reviewer Database, targeted Internet searches using key words (e.g., technical area, geographic region), searches of websites of universities or other compiled expert sites, and referrals. Battelle prepared a draft list of primary and backup candidate panel members (who were screened for availability, technical background, and COIs), and provided it to ENLACE for feedback. Battelle made the final selection of panel members.

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

Table 2. CMP IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Milon	Pugh	Churchill	Giovannozzi
Economist				
Minimum 10 years of experience in evaluating and comparing alternative plans and evaluating and conducting National Ecosystem Restoration (NER) analyses of ecosystem restoration-related projects	X			
Familiarity with large, complex Civil Works projects with high public and interagency interests	X			
Experience working directly for or with USACE in applying Principles and Guidelines (P&G) to Civil Works project evaluations	X			
Active participation in related professional societies	X			
Master's degree or higher in a related field	X			
Wetland/NEPA Scientist (2 panel members)				
Minimum 10 years of experience directly related to environmental evaluation or review, including NEPA assessments		X	X	
Familiarity with large, complex Civil Works projects with high public and interagency interests		X	X	
Understanding of environmental impacts associated with dredging and placement of contaminated debris and sediment		X	X	
Experience working with wetlands and estuarine ecosystems		X	X	
Understanding of embayment and riparian wetland ecological responses to navigation channel and overbank improvements		X	X	
Ability to evaluate the application of a benthic index and wetland functional assessment employed to predict ecosystem restoration		X	X	
Experience in the Puerto Rico region *(preferred but not required)*		–	X	
Master's degree or higher in a related field		Waiver [a]	X	

Table 2. CMP IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Milon	Pugh	Churchill	Giovannozzi (Dual Role)
Civil Engineer				
Minimum 10 years of experience in engineering				X
Registered Professional Engineer				X
Familiarity with large, complex Civil Works projects with high public and interagency interests				X
Demonstrated experience in:				X
restoration projects				X
dredged material disposal				X
erosion				X
coastal currents				X
channel modifications				X
Active participation in related professional societies				X
Master's degree or higher in civil, hydraulic or related engineering field				X
Hydraulic Engineer				
Minimum 10 years of experience in engineering				X
Registered Professional Engineer				X
Familiarity with large, complex Civil Works projects with high public and interagency interests				X
Demonstrated experience in:				X
channel design				X
channel modifications				X
dredging				X
coastal currents				X
Active participation in related professional societies				X
Master's degree or higher in civil, hydraulic or related engineering field				X

[a] *Waiver statement presented as part of Task 2 deliverable and approved by ENLACE*

Walter Milon, Ph.D.

Role: Economist
Affiliation: Independent Consultant

Dr. Milon is the Provost's Distinguished Research Professor in the Department of Economics at the University of Central Florida's College of Business Administration, and has over 35 years of experience in research, teaching, and publishing related to water resource economics and ecosystem restoration. He earned a Ph.D. in economics from Florida State University in 1978. He teaches graduate-level courses on benefit cost and social impact analyses, economic theory, and natural resource and environmental economics.

Dr. Milon is familiar with large, complex Civil Works projects with high public and interagency interests. He has participated in the planning and technical advisory for the USACE Florida Everglades Restudy (1995-1999), and was lead economist on recent USACE IEPRs including the C-111 Spreader Canal Project Implementation Report and the Louisiana Coastal Area Restoration Project (2009-2011). He was also the principal investigator for the research project, Socioeconomic Evaluation of Hurricane Evacuation Response for the Florida Hurricane Research alliance, and co-principal investigator of Florida's Coastal Environmental Resources: Economic Valuation and Analysis. Dr. Milon has experience in evaluating and comparing alternative plans and evaluating and conducting National Ecosystem Restoration (NER) analyses of ecosystem restoration-related projects. He has participated in several projects that have a coastal ecosystem/restoration focus, including the Indian River Lagoon National Estuary Program, the Florida Keys National Marine Sanctuary, and projects in the U.S. Virgin Islands and the Hawaiian Islands National Marine Sanctuary. He also has several publications resulting from these projects.

Dr. Milon has experience directly working for or with USACE in applying Principles and Guidelines (P&G) to Civil Works projects. Dr. Milon has 25 years graduate teaching and research experience in benefit-cost and Cost Effectiveness and Incremental Cost Analyses (CE/ICA) methods, and is a member of the National Research Council Committee on USACE Water Resources Science, Engineering, and Planning.

Steven Pugh

Role: Wetland/NEPA Scientist
Affiliation: Independent Consultant

Mr. Pugh is an independent consultant with 21 years of direct ecology experience, including seven years with the USACE Baltimore District Planning Division (1999 – 2007). He earned his B.S. in natural resources management from the University of Maryland in 1997. He is an expert in the field of ecosystem restoration, the evaluation of ecosystem restoration projects and watershed studies, and plan formulation. Mr. Pugh has 14 years of experience directly related to environmental evaluation and review, which includes seven years as a planner and ecologist for USACE and seven years as an independent consultant. This has included producing NEPA documents, conducting fieldwork, and providing technical reviews. He has 21 years of experience working with wetlands and wetland restoration in every phase – from planning through implementation to monitoring and adaptive management. Much of this experience has

been within the Chesapeake Bay watershed and has included both freshwater and estuarine wetlands of many classes.

He has worked with USACE on many large, complex Civil Works projects with high public and interagency interests, including the Comprehensive Everglades Restoration Program, the Louisiana Coastal Area, the Chesapeake Marshlands Restoration Program, the Anacostia River Watershed Comprehensive Plan – Washington D.C., and the Kissimmee River Restoration project. During his time at USACE, he was a PROSPECT instructor for the course "Planning for Ecosystem Restoration" and is familiar with the application of USACE P&G to Civil Works projects.

Mr. Pugh has an understanding of environmental impacts associated with dredging and placement of contaminated debris and sediment. While working as a planner and ecologist with the USACE Baltimore District, he worked on the analysis of environmental impacts from dredging and placement of contaminated dredged material in urban rivers within the Chesapeake Bay watershed. These projects were designed to develop tidal emergent wetlands at the placement sites and to improve hydrologic exchange in back water channels. These projects resulted in the development of river fringe wetlands, backwater emergent wetlands, and tidal gut habitat, as well as placing dredged material from Federal maintained navigation channels. Mr. Pugh represented USACE as the liaison to the interagency committee for the Urban Rivers Restoration Initiative and on the Anacostia River Watershed Restoration Committee. He also has an understanding of embayment and riparian wetland ecological responses to navigation channel and overbank improvements. While at USACE, he worked on projects that included hydrologic improvements to ecosystems via the dredging of channels and tidal guts and the development of wetland habitat at placement sites in six areas on the Anacostia River. His work covered all aspects of planning, from reconnaissance to monitoring and adaptive management, and included annual workshops to develop lessons learned from the scientific community. In addition, he participated in the development of the Chesapeake Marshlands Tidal Wetlands Restoration Demonstration Project, which included studies related to tidal exchange and the placement of dredged material to restore large-scale marsh habitat in an estuarine environment.

He is able to evaluate the application of a benthic index and wetland functional assessment employed to predict ecosystem restoration. He has extensive experience with Wetlands Functional Assessments, including the development of functional assessments, the use of functional assessments in planning ecosystem restoration, and the evaluation of the use of functional assessments for ecosystem restoration studies/projects. From 1996 to 1999, Mr. Pugh worked for the Natural Resources Conservation Service Wetland Science Institute, where he served as team leader on studies related to the development of ecological performance measures for aquatic ecosystem restoration projects. He conducted studies to develop wetland assessment tools such as the Hydrogeomorphic Method (HGM) and Indices of Biotic Integrity (IBI) for isolated wetlands of the mid-Atlantic region. He participated in the National Biologic Assessment of Wetlands Workgroup. He conducted fish, reptile, amphibian, vegetation, aquatic invertebrate, soils, and hydrology studies related to the attributes of successful wetland restoration projects. Mr. Pugh has been a panel member on several IEPR teams reviewing large-scale ecosystem restoration studies and is an active member of the Society for Ecological Restoration.

Jeffrey Churchill

Role: Wetland/NEPA Scientist
Affiliation: Environmental Analysis and Permitting, Inc.

Mr. Churchill is an ecological consultant for Environmental Analysis and Permitting, Inc. in St. Petersburg, Florida. He has more than 33 years of ecological consulting experience in both government and private sectors with a focus on wetlands and wildlife issues, wetland mitigation, environmental permitting, and water use permitting assistance. He earned his M.S. in zoology from the University of South Florida in 1983. His experience includes preliminary ecological surveying, environmental permitting, NEPA assessments, mitigation design, Development of Regional Impact (DRI) preparation, habitat restoration, avian ecology, vegetation surveys, wildlife surveys, protected species permitting, and expert witness.

Mr. Churchill is familiar with large, complex Civil Works projects with high public and interagency interests. He provided his expertise for mitigation and restoration studies for state, local, Federal, and private entities on such studies as the SWIM Habitat Restoration in Tampa Bay and the Florida Department of Environmental Protection Rainbow Springs State Park Wetlands in Marion County, Florida. He was lead ecologist on the Northwest Hillsborough County Expressway project through the DEIS/EIS process and was involved in public meetings, wetland mitigation, design, and implementation. The project involved coordination with all Federal, state, and local environmental agency staff (including but not limited to National Marine Fisheries Service, U.S. Fish and Wildlife Service, USACE, U.S. Environmental Protection Agency, Florida Department of Environmental Protection, Florida Fish and Wildlife Conservation Commission, and Department of State).

Mr. Churchill has a strong understanding of environmental impacts associated with dredging and placement of contaminated debris and sediment. He has worked on a number of dredging projects where the disposal of the dredge material was assessed to ensure it was completed in an ecologically sound fashion avoiding unintended impacts to natural systems in the vicinity of the project area. Example studies include Port Redwing, Florida, Coastal Energy Impact Program and City of St. Petersburg Arterial Channel Dredging, St. Petersburg, Florida. He has experience working with wetlands and estuarine ecosystems; the majority of his projects in the last 30 years involve wetlands impacts/avoidance of impacts and mitigation/restoration. Approximately one third of these projects have involved estuarine wetlands including mangrove forests, salt marsh, and salt flats communities. Relevant studies include assessments of Rocky Point and Bayport/Westshore Hyatt, both in Tampa, Florida. Additionally, he was involved in a Navy project assessing the impacts on mangrove forests and developing a management plan on the Island of Vieques. Through the work in Vieques as well as many other restoration projects, Mr. Churchill has developed an understanding of how structural improvements such as channels dredging and overbank improvements affect the ecology/ hydrology and embayment and riparian wetlands.

Mr. Churchill is able to evaluate the application of benthic index and wetland functional assessments along with other tools used to predict ecosystem restoration. He is knowledgeable in the standard methods used for evaluating ecological benefits in tropical coastal and estuarine

ecosystems, such as functional analysis (Uniform Mitigation Assessment Method and Wetland Rapid Assessment Protocol). He is also able to evaluate ecological benefits by assessing community components such as productivity, diversity, and resources. He has knowledge of benthic invertebrate communities and mangrove root communities. He has been involved in numerous studies of benthic invertebrate communities in Tampa Bay and South Florida and from his master's research on the effect of infaunal populations on larval colonization in soft bottom benthic communities. He previously worked for Mangrove Systems, which specialized in restoration and impact assessment of mangrove forest areas. Most studies often included a faunal component assessing both epifauna and infauna associated with mangrove forests. He is familiar with the development of ecological models, evaluation of assumptions, and verification of models. He has worked with a variety of hydrologic models that intend to mimic naturally occurring events to predict ecological outcome.

Michael Giovannozzi, P.E.

Role: Civil and hydraulic engineering (dual role)
Affiliation: AquaTerra Consulting International

Mr. Giovannozzi is a coastal and hydraulic engineer for AquaTerra Consulting International in West Palm Beach, Florida. He has more than 13 years of engineering experience in both government and private sectors in the fields of coastal and hydraulic engineering throughout the United States. He earned his B.S. in civil engineering from the University of Delaware in 1999 and his M.S. in civil engineering from the University of Delaware in 2001. He is a registered professional engineer (P.E.) in Florida, Alabama, Texas, Georgia, South Carolina and Maryland. Mr. Giovannozzi's work history includes two years with the USACE Philadelphia District, three years with the USACE Seattle District, and eight years in private consulting. His experience includes hydraulic and hydrologic studies, sediment transport modeling, numerical modeling of water level and flow speed, probabilities of overtopping of protective structures, design of bank stabilization, wetland and ecosystem restoration, flood mapping, and flood damage reduction studies.

While with the USACE Seattle District, Mr. Giovannozzi was routinely involved in large, complex Civil Works projects. For example, he provided conceptual design reviews for the Puget Sound Nearshore Restoration Program, which included ecosystem restorations of over 40 sites throughout Puget Sound and had Federal, state, local, and tribal stakeholders. In addition to his work in Puget Sound, Mr. Giovanozzi has been involved in several restoration projects, most recently as the lead coastal engineer for a series of mangrove restoration projects in Guyana, South America. One of these projects included extensive channel modifications to restore hydraulic conductivity to a landlocked mangrove strand. Another restoration project that had high public and interagency interest was the Biscayne Bay Coastal Wetlands pilot project for the Everglades Restoration Program. Mr. Giovannozzi performed hydraulic modeling, seepage analysis, wave run-up and overtopping assessment, and water level and flow speed determination for the embankment design for water storage treatment areas.

Mr. Giovannozzi has participated in dredging projects from both a hydraulic and civil engineering standpoint. He is familiar with both mechanical and hydraulic dredging technologies and recently completed the USACE Dredging Fundamentals Course.

While at the USACE Seattle District, he was the project manager for the outer reach of the Grays Harbor Navigation Channel Maintenance Dredging project. Another example of his experience with dredged material is a project in Guyana that involved using dredged material to fill a series of geotextile tubes serving as breakwaters. Mr. Giovannozzi also has experience planning and designing stream bank stabilization and shore protection structures to minimize erosion due to wave and current action. Most recently, he was involved in the design of a 1,000 meter-long rip rap revetment on Leguan Island located near the mouth of the Essequibo River in Guyana, South America. Because of its close proximity to the Atlantic Ocean, the site had experienced significant erosion from locally generated wind waves, tidal currents, river currents, and vessel wake.

Mr. Giovannozzi has extensive experience in coastal current studies. He has performed hydrodynamic and sediment transport modeling, morphologic analysis, and engineering assessments for multiple projects to determine expected water levels, tidal exchange, wave conditions, and circulation patterns. Mr. Giovannozzi was also the coastal engineer for a dredging/environmental restoration project for an island community located on the Intracoastal Waterway in Palm Beach County, Florida. The work included tidal hydraulic modeling, channel optimization, and dredging cost estimates for hydraulic and mechanic dredging to restore tidal connectivity. While at the USACE Philadelphia District, he was the hydraulic engineer for a coastal inlet hydrodynamics study. The study involved numerical modeling to predict sediment transport potential for several alternative sand borrow-area strategies for a Federal beach fill project in Ocean City, New Jersey.

Mr. Giovannozzi also has demonstrated experience in channel design and in the modification of existing channels. He was involved in the hydrodynamic modeling of canals for the World Islands Mega Project in Dubai, United Arab Emirate. The project required a balanced design that allowed for safe navigation of pleasure craft, provided sufficient flow to minimize siltation and improve tidal flow, while also minimizing shoreline erosion. The study included hydrodynamic and sediment transport modeling. He was the lead project engineer on the Quillayute Navigation Channel Improvement Study in Washington State. This study used numerical wave and current models to optimize the channel modification scheme to improve hydraulic efficiency with an aim to reduce future maintenance dredging activities. Recommendations were provided to alter the channel cross section and to rehabilitate a nearby sea dike to optimize the channel flow.

Mr. Giovannozzi is an active member of several professional societies: the American Society of Civil Engineers; Coasts, Oceans, Ports, Rivers Institute; and the Association of Coastal Engineers. He regularly attends and presents at national and international conferences on flood damage reduction and shoreline protection. In addition, he is the Secretary for the World Association for Waterbourne Transport Infrastructure (PIANC) Work Group committee.

5. SUMMARY OF FINAL PANEL COMMENTS

The panel members agreed among one other on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the CMP document. Table 3 lists the Final Panel Comments statements by level of significance. The full text of the Final Panel Comments is presented in Appendix A of this report. The following summarizes the Panel's findings.

The CMP IEPR and Model Quality Assurance Review were conducted concurrently and by separate review panels. The IEPR Panel reviewed the CMP DFR-EIS under the assumption that all models employed in the study met the required technical quality and usability standards set by USACE. If the results of the Model Quality Assurance Review indicate that this assumption is incorrect, then the IEPR Panel's assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, data, and analyses performed for the CMP-ERP, as described here, would be compromised. Any significant issues identified by the Model Quality Assurance Review would need to be resolved to ensure that the accuracy and reliability of the plan formulation process, cost estimate, and stated benefits of the CMP-ERP are realized.

The Panel agreed that the CMP-ERP review documents and appendices are well-written and provide a comprehensive description of the ecosystem restoration project. Conclusions are supported with logical and easy-to-follow supporting information. While the Panel deemed the report generally had robust documentation, it identified areas where additional documentation and clarification are warranted.

Wetland and NEPA Impact Assessment –The Panel found the assumptions made for the environmental analysis and assessment of wetland impacts and benefits are sound. However, the assumption that water quality improvements resulting from the restoration of tidal connectivity in the study area may not be accurate since the combined sewer overflows and direct dumping of raw sewage have the potential to affect recovery of the ecosystem in some locations within the study area. The importance of project measures, particularly to eliminate raw sewage and provide storm water treatment, to the study area, as outlined in the adaptive management plan, cannot be understated. Three of the five primary uncertainties listed in the adaptive management plan are attributed to the discharge of untreated waste or combined storm water and waste into the study area. The adaptive management plan rates these three uncertainties as "high" risks and states that they relate to the main objective of the project. The Panel is concerned that wastewater loads from combined sewer overflows and direct dumping of raw sewage in the study area has the potential of inhibiting the recovery of benthic and mangrove habitat, resulting in the projected restoration outputs not being fully achieved. The Panel believes these issues can be addressed by documenting the details of known existing programs or projects intended to eliminate or sufficiently reduce the dumping of raw sewage or combined storm water and sewage overflow into the CMP, conducting the studies or modeling necessary to better determine the potential impacts of the discharge of sewage and polluted storm water into the study area, and coordinating with the appropriate agencies to facilitate the removal, reduction, or remediation of sewage into the study area.

The Panel found the monitoring and adaptive management plans to be largely conceptual and do not provide specific methodologies to determine the capabilities, limitations, and costs of the plans. The monitoring information is very general and the methods used to sample these parameters are not supported by references to the professional literature. The adaptive management plan lacks supporting documentation for these trigger levels, the performance standards, and the expected success of proposed management actions. Additionally, no cost estimates or funding sources are given for the proposed management actions. The Panel believes this issue can be addressed by providing a more through description and documentation of (1) the baseline data and the proposed monitoring methods and procedures and the associated costs, including appropriate citations from professional literature supporting the specific methods selected for each monitoring element; and (2) proposed adaptive management performance standards, the related management actions, and cost estimates and funding sources to identify viable options.

Engineering – The Panel found the preliminary engineering analysis to be comprehensive and the assumptions made for the engineering analysis to be sound and reasonable. The engineering analysis uses accepted USACE hydrologic and hydraulic models. The CHED-WES hydrodynamic model is used to assess flow velocities and water quality (as residence time), and its model capabilities and limitations are clearly defined. However, the Panel is concerned that geotechnical engineering data are limited for this stage of the project.

The impacts of channel velocities on scour rates could not be determined due to the limited geotechnical data and soil analyses, which could affect the estimated construction costs and selected channel configuration. Uncertainties in the soil analyses and shear stress calculations could impact the required scour protection, channel configuration, and cost estimate. The Panel believes this concern can be addressed by performing additional geotechnical analysis to obtain a higher level of confidence in the scour analysis, revising scour protection requirements for alternatives based on the results of geotechnical analysis and in consideration of detailed modeling output, and revising cost estimates for the project alternatives accordingly.

The Panel also found that the decision for eliminating a trapezoidal section early in the screening process is not supported by data or analyses. A more thorough analysis of the geotechnical conditions and more detailed cost analysis may identify lower cost channel configuration alternatives. This issue could be addressed by determining additional costs associated with the excavation, transport, and disposition of additional sediments associated with a trapezoidal channel, performing addition geotechnical analysis to determine suitable slopes for a trapezoidal channel, and analyzing additional costs associated with slope stabilization materials for the trapezoidal channel, if applicable.

The Panel also noted that an alternative disposal site is not identified in the event that the contamination of the dredged material is determined to be unacceptable for ocean disposal. It is not clear whether dredged material can be properly disposed at the selected disposal site, which risks project delays and potentially additional costs. The Panel believes this can be confirmed by conducting the sediment fate modeling and bioassays referenced to verify that the dredged materials from the CMP are suitable for ocean disposal at the Ocean Dredged Material Disposal Site (ODMDS) site, and considering alternative dredged material disposal sites solutions,

including cost implications, if the sediment fate modeling and bioassays cannot confirm the suitability of ocean disposal.

Economics – The economic analysis is thorough and provides sufficient justification for the Tentatively Selected Plan (TSP). The methods, models, and analysis used in the Cost Effectiveness and Incremental Cost Analyses (CE/ICA) process are adequate and acceptable. Existing socioeconomic resources are adequately described and provide support for the without project conditions. Socioeconomic impacts of the project are discussed and sufficient plans to address these impacts are provided. Potential socioeconomic impacts of the project will also need to be monitored and addressed in the future, as discussed in the CMP-ERP review documents.

Table 3. Overview of Five Final Panel Comments Identified by the CMP IEPR Panel

No.	Final Panel Comment
	Significance – High
1	The assumption that the water quality improvements resulting from the restoration of tidal connectivity in the study area will substantially increase biodiversity and improve the functional value of mangrove habitat throughout the SJBE may not be accurate since the combined sewer overflows and direct dumping of raw sewage have the potential to affect recovery of the ecosystem in some locations within the study area.
2	The impacts of channel velocities on scour rates cannot be determined due to the limited geotechnical data and soil analyses, which could affect the estimated construction costs and selected channel configuration.
	Significance – Medium
3	The monitoring and adaptive management plans are largely conceptual and do not provide specific methodologies to determine the capabilities, limitations, and costs of the plans.
4	The decision to eliminate a trapezoidal section early in the screening process is not supported by data or analyses.
5	An alternative disposal site has not been identified in the event that the contamination of the dredged material is determined to be unacceptable for ocean disposal.

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Webb, R.M.T., and F. Gómez-Gómez (1998). Synoptic Survey of Water Quality and Bottom Sediments, San Juan Bay Estuary System, Puerto Rico, December 1994-July 1995. U.S. Geological Survey Water Resources Investigations Report 97-4144. 69 pp. http://onlinepubs.er.usgs.gov/djvu/WRI/wrir_97_4144.djvu

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APPENDIX A

Final Panel Comments

for the

CMP IEPR

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Final Panel Comment 1

The assumption that the water quality improvements resulting from the restoration of tidal connectivity in the study area will substantially increase biodiversity and improve the functional value of mangrove habitat throughout the SJBE may not be accurate since the combined sewer overflows and direct dumping of raw sewage have the potential to affect recovery of the ecosystem in some locations within the study area.

Basis for Comment

The Environmental Impact Statement (EIS) states, "Restoration of the CMP will re-establish the tidal connection between the San Juan Lagoon and the San Juan Bay, which will improve dissolved oxygen levels and salinity stratification, increase biodiversity by restoring fish habitat and benthic conditions and improve the functional value of mangrove habitat within the estuary" (Appendix H, p. v).

The restoration of the Caño Martín Peña (CMP) certainly addresses one of the major sources of stress on the ecosystem by improving tidal flushing and reducing the residence time, therefore restoring a more natural tidal regime. Improving tidal flushing is expected to have a substantial positive impact on the water quality in the study area. However, the proposed restoration plan does not directly address the source of a second major stress on the ecosystem, namely the dumping of raw sewage into the water.

The EIS states, "In some places, the San Juan Bay Estuary (SJBE) is hypereutrophic or overwhelmed with nutrients, has anoxic or oxygen lacking bottom waters, its sediments contain heavy metals, trace elements, and organic compounds; and receives raw sewage from combined sewer overflows (CSO) and direct discharges from housing along parts of its perimeter" (Appendix H, p.3-7).

Based in part on studies conducted by Webb and Gomez (1998), the EIS attributes habitat and ecosystem degradation to multiple factors including wastewater loads. For instance the EIS states, "Violations to water quality standards have resulted in repeated high levels of fecal coliform and organic pollutants, and low levels of dissolved oxygen, all of which can directly affect public health as well as fish and wildlife resources in the CMP and the San José Lagoon, and indirectly, in most of the SJBE…The source of these impairments can be related to reduced flushing, wastewater loads from direct and indirect untreated sewage discharges, urban storm water runoff, subsurface seepage in areas littered with household waste, and direct household waste dumping." (Appendix H p. 3-7).

Additionally, three of the five primary uncertainties listed in the adaptive management plan (Appendix E, pp.16-17) are attributed to the discharge of untreated waste or CSO and waste into the study area. The adaptive management plan rates these three uncertainties as "high" risks and states that they relate to the main objective of the project.

The SJBE Ecological Model (Appendix A-1) also correlates discharges of sewage into the estuary with the degradation of coral reef, mangrove wetlands, estuarine fish communities, and the benthic community.

The deleterious impacts from wastewater loads on ecosystem health are well-documented in ecological literature even in areas where reduced tidal flushing is not an issue. For example, Johansson (1991) describes the history of water quality in Hillsborough Bay, Florida, a tidally connected portion of the Tampa Bay system. Although other sources contributed to water quality problems, early studies identified the City of Tampa Wastewater Treatment Plant as a primary source of nitrogen and carbonaceous material that contributed to the water quality problems of this system. This plant had been operating and discharging large nutrient loads for more than 40 years, and recommendations for improvements to the plant were identified as critical components of many of the ecological studies.

In 1979 the City of Tampa Waste Water Treatment Plant was upgraded to advanced wastewater treatment (AWT) standards, and nitrogen removal has been maintained at AWT standards since that time. Johansson (1991) has documented improvements in water quality and ecologic indicators that have occurred since upgrading to AWT standards including reduction in phytoplankton biomass, decreases in chlorophyll, and an increase in dissolved oxygen in bottom waters (particularly in summer). Although reductions in other nitrogen sources have been documented and contributed to water quality improvement, the removal of 60 million gallons per day of primary effluent is widely believed to have been a significant component of the improvement in water quality and ecosystem health in Hillsborough Bay.

It is the view of the Panel that removal, reduction, or remediation of the combined sewer overflows and raw sewage discharges into the CMP is an important step for improving water quality to the extent that the projected restoration benefits can be fully realized.

Significance – High

The wastewater loads from combined sewage overflow and direct dumping of raw sewage in the study area could potentially inhibit the recovery of benthic and mangrove habitat, so that projected restoration outputs might not be fully achieved.

Recommendations for Resolution

1. Document the details of known existing programs or projects intended to eliminate or sufficiently reduce the dumping of raw sewage or CSO into the CMP.
2. Conduct the studies or modeling necessary to better determine the potential impacts sewage discharge and polluted storm water into the study area.
3. Coordinate with the appropriate agencies to facilitate the removal, reduction, or re-mediation of sewage discharges into the study area.

Literature Cited:

Johansson, J.O.R. (1991). Long Term Trends of Nitrogen Loading, Water Quality and Biological Indicators in Hillsborough Bay, Florida. In: Treat, S. F., and Clark, P.A., eds. Proceedings, Tampa Bay Area Scientific Information Symposium (BASIS) 2, 1991, February 27- March 1. Tampa, FL, 528 pp.
http://tbeptech.org/BASIS/BASIS2/BASIS2.pdf#page=166

Webb, R.M.T., and F. Gómez-Gómez (1998). Synoptic Survey of Water Quality and Bottom Sediments, San Juan Bay Estuary System, Puerto Rico, December 1994-July 1995. U.S. Geological Survey Water Resources Investigations Report 97-4144. 69 pp. http://onlinepubs.er.usgs.gov/djvu/WRI/wrir_97_4144.djvu

Final Panel Comment 2

The impacts of channel velocities on scour rates cannot be determined due to the limited geotechnical data and soil analyses, which could affect the estimated construction costs and selected channel configuration.

Basis for Comment

The Engineering Appendix (Appendix D) states that bottom sediments consist of "predominately hard silts and clays at a depth of 10 to 15 feet below the existing bottom" (Section 5.2.2). For this type of soil the permissible shear strength depends on cohesive strength and soil density.

Hydraulic Engineering Circular 15 (FHWA 2005) is used to calculate permissible shear stress based on plasticity index (PI) and void ratio. However, the void ratio was not known for the limited soil samples that were analyzed and the PI varied greatly (from 14 to 24). In addition, the shear stress calculation assumes a PI > 20; however, out of the 34 core samples taken, only two samples had a PI greater than 20. Based on these assumptions, the scour potential analysis assumes that velocities of 3.5 to 4 fps would exceed critical sheer stresses, causing bed scour.

Given the uncertainty involved in the selection of the void ratio and PI, the error associated with the calculation of permissible shear stress and associated bottom velocities may be high. It therefore appears to be unreasonable to assume scour protection is required for the 75 ft wide x 10 ft deep channel alternative when the calculated peak channel velocities are only 5.5% greater than the high end of the selected threshold of 3.5 to 4 fps. Omitting scour protection would reduce costs by $10 million, making the 75 ft wide x 10 ft deep channel alternative more favorable.

Moreover, the analysis examines only the peak velocity of the entire spatial and temporal domain of the hydrodynamic model. The analysis does not consider areas of increased or reduced flow that may change scour protection requirements. Nor does it consider time dependency of the scour; since the peak tide velocities are expected to only occur for several hours per day, scouring events will be episodic and of limited duration. Therefore the scour protection requirements for the proposed alternatives do not appear to have been optimized through consideration of the spatial and temporal variation of channel velocities.

Significance – High

Uncertainties in the soil analyses and shear stress calculations could affect the required scour protection, channel configuration, and cost estimate.

Recommendations for Resolution

1. Perform additional geotechnical analysis to obtain a higher level of confidence in the scour analysis.
2. Revise scour protection requirements for alternatives based on the results of geotechnical analysis and in consideration of detailed modeling output.

3. Revise cost estimates for the project alternatives accordingly.

Literature Cited:

FHWA (2005). Design of Roadside Channels with Flexible Linings. Hydraulic Engineering Circular (HEC) 15, Third Edition. Publication No. FHWA-NHI-05-114. U.S. Department of Transportation, Federal Highway Administration, National Highway Institute. September.
http://www.fhwa.dot.gov/engineering/hydraulics/pubs/05114/05114.pdf

Final Panel Comment 3

The monitoring and adaptive management plans are largely conceptual and do not provide specific methodologies to determine the capabilities, limitations, and costs of the plans.

Basis for Comment

The monitoring plan (MP) (Appendix F) provides information about initial plans to determine baseline conditions for specific ecosystem parameters. The monitoring information is very general and the methods used to sample these parameters are not supported by references to the professional literature. Preconstruction monitoring appears to be a single event or based on existing data, and there is no discussion whether proposed monitoring station locations or methodologies are suitable for comparison with existing pre-project data. Bathymetric surveys to determine post-construction sedimentation rates and maintenance dredging requirements within the Caño Martín Peña (CMP) are not included in the MP. There is also no measure of the benefit to fisheries outside the mangrove prop root community of the CMP or other areas of the San Juan Bay Estuary (SJBE) predicted to benefit from the project. Costs for MP elements are provided in Appendix F, Table 3, but there is no supporting documentation to determine how these cost estimates were derived.

The adaptive management plan (AMP) (Appendix E) provides details on ecosystem targets and triggers for specific management actions. The AMP, however, lacks supporting documentation for these trigger levels, the performance standards, and the expected success of proposed management actions. Additionally, no cost estimates or funding sources are provided for the proposed management actions.

Both the MP and the AMP state that detailed performance standards and management actions would be developed in the Pre-Construction, Engineering and Design phase. However, the IEPR Panel could not determine the adequacy and acceptability of the proposed actions to achieve the restoration objectives since the current MP and AMP do not provide complete descriptions of future actions and the necessary details, including costs.

Significance – Medium

Sufficient documentation was not provided to assess the adequacy of the MP and AMP or whether the costs are reasonable.

Recommendations for Resolution

1. Provide a more through description and documentation of the baseline data and the proposed monitoring methods and procedures and the associated costs. Include appropriate citations from professional literature (e.g., standard methods, journal articles) supporting the specific methods selected for each monitoring element.
2. Provide a more thorough description and documentation for proposed adaptive management performance standards, the related management actions, and cost estimates and funding sources to identify viable options.

Final Panel Comment 4

The decision to eliminate a trapezoidal section early in the screening process is not supported by data or analyses.

Basis for Comment

Section 5.1, Plan Formulation Overview, explains that several alternative plans, such as a fully trapezoidal channel and a large diameter pipeline, were analyzed in previous reports, but were eliminated from further analysis due to various technical reasons. The Engineering Appendix (Appendix D) provides a comparative summary of the "slope versus bulkhead" channel configurations, with the primary considerations being dredging volumes, project costs, geotechnical, mangrove restoration, and recreation. Of these, the volume of dredge material is perhaps the biggest factor as it drives construction costs associated with excavation, transportation of sediments, and disposition of the sediments. However, a cost estimate has not been performed to compare the increased costs associated with the additional dredging/excavation requirements for the sloped structure (trapezoidal section) versus the sheet pile wall that is included in the seven alternatives that were evaluated in the planning process.

The geotechnical discussion in Section 5.17 (Appendix D) explains that, in addition to the increased excavation necessary to achieve the channel template, the trapezoidal channel would require "additional excavation of the sediments in the side slopes to a depth of 4 to 6 feet below the finished grade, filtering out the debris and placement and stabilization of the filtered sediments." However, since no cost information associated with these activities has been provided, the Panel could not compare the costs of a trapezoidal channel with sheet pile alternatives.

A similar slope stabilization technique would be necessary for the sheet pile wall alternative. Section 3.3.6.1, Channel Stability (Appendix D) mentions that during dredging operations "temporary slope angles will be maintained until the installation of the sheet pile," at a slope of 1V:3H down to -5 ft and 1V:5H from -5 to -10 ft. Figure 5.4-2 supports this statement as it shows over-excavation and backfilling as part of the sheet pile installation. Therefore the increased cost associated with slope stabilization is likely similar in order of magnitude for both the sloped and sheet pile alternatives.

The rough order of magnitude cost estimate provided in Appendix D indicates that the sheet pile wall will cost more than $53 million for Alternatives 1 and 2, whereas the cost associated with dredging (earthwork and dredge material disposal) only amounts to about $14.9 million and $16.7 million, respectively, for Alternatives 1 and 2. Given the relatively high cost of the sheet pile wall compared to the cost of dredging, completing additional geotechnical analysis to determine suitable dredge slopes and associated costs for a trapezoidal channel appears to be warranted.

Significance – Medium

A more thorough analysis of the geotechnical conditions and more detailed cost analysis may identify lower cost channel configuration alternatives.

Recommendations for Resolution

1. Determine the costs of excavation, transport, and disposition of additional sediments associated with a trapezoidal channel.
2. Perform additional geotechnical analysis to determine suitable slopes for a trapezoidal channel.
3. Analyze additional costs associated with slope stabilization materials for the trapezoidal channel, if applicable.

Final Panel Comment 5

An alternative disposal site has not been identified in the event that the contamination of the dredged material is determined to be unacceptable for ocean disposal.

Basis for Comment

Sediment sampling conducted as part of the Draft Feasibility Report-Environmental Impact Statement (DFR-EIS) indicates that the dredged material will include a mixture of materials: sediments containing an elevated level of contaminants, cleaner sediments, trash, and debris. The trash and debris, the product of past land development activities, is estimated to make up approximately 10% of the dredged material volume. The DFR-EIS calls for separation of the trash and debris from the dredged material and disposal of this material at an upland landfill. The methodology for handling the trash and debris is well-defined in the DFR-EIS, with a staging and dredged material handling site identified and analyzed for suitability. The remaining 90% of the dredged material, an estimated 657,000 cubic yards in situ, consists of sediments of various qualities.

The DFR-EIS considers a number of disposal methods for the sediment portion of the dredged material from the Caño Martín Peña (CMP). They include offshore ocean disposal at the San Juan Ocean Dredge Material Disposal Site (ODMDS), contained aquatic disposal (CAD) considering a number of sites in the San Juan Bay Estuary (SJBE), landfill disposal, permanent upland disposal, and beneficial use of dredged sediments. All of the potential sites/methods, with the exception of ocean disposal, were eliminated from consideration due to costs, constructability, vulnerability to resuspension of contaminated sediments, or public concern.

Sediment quality in the SJBE sampled over the years is characterized as severely degraded (Section 3.4.3, Appendix H). The DFR-EIS refers to the sediments to be dredged from the CMP as potentially contaminated and makes reference to bioassay and sediment testing that would be necessary to verify the suitability of the sediments for ocean disposal at the ODMDS.

Section 404(b)(1) Part 2, Section 2.2.7 (Appendix H) further discusses the potential for contaminated sediments and the suitability of ocean disposal. As described in this section, the Final Technical Memorandum (Task 2.6) and the Technical Memorandum (Task 2.05), developed by Atkins in 2010 and 2011 respectively, summarize the available information on the material proposed to be dredged from the CMP. These documents note that (1) the sediments exceed relevant guidance criteria for contamination; (2) the extreme depths of the ODMDS would likely result in dispersion of the sediments so that once they reached the sea floor they would not cause adverse environmental impacts; and (3) the metals concentrations of the contaminated sediments would not be expected to exceed the existing water quality criteria outside a 1000 foot mixing zone from the disposal area, based on earlier work by Bailey et al. (2004) with selenium. However, this section also states that a combination of sediment fate modeling and bioassays would be required to verify these assumptions and outcomes. Therefore the potential exists that the contaminated sediments may not be

suitable for disposal at the sole remaining disposal site.

Significance – Medium

The lack of confirmation that the dredged material can be properly disposed at the selected disposal site risks project delays and potentially additional costs.

Recommendations for Resolution

1. Conduct the sediment fate modeling and bioassays referenced to verify that the dredged materials from the CMP are suitable for ocean disposal at the ODMDS site.
2. Consider alternative dredged material disposal sites solutions, including cost implications, if the sediment fate modeling and bioassays cannot confirm the suitability of ocean disposal.

Literature Cited:

Bailey, S. E., P.R. Schroeder, C.E. Ruiz, M.R. Palermo, and B.W. Bunch (2002). Design of Contained Aquatic Disposal (CAD) Pits for CMP San Juan, Puerto Rico. U.S. Army Corps of Engineers Research and Development Center, Vicksburg, MS, December.
http://www.dragadomartinpena.org/docs/CAD_Pits_Rpt.pdf

APPENDIX B

Final Charge to the Independent External Peer Review Panel as Submitted to ENLACE on November 1, 2013

on the

CMP-ERP

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**Charge Questions and Guidance to the Panel Members
for the Independent External Peer Review
of the
Draft Feasibility Report and Environmental Impact Statement
for the Caño Martín Peña Ecosystem Restoration Project,
San Juan, Puerto Rico**

BACKGROUND

The Caño Martín Peña (CMP) is a tidal channel 3.75 miles long in metropolitan San Juan, Puerto Rico. It is part of the San Juan Bay Estuary (SJBE), the only tropical estuary included in the U.S. Environmental Protection Agency (USEPA) National Estuary Program (NEP). The SJBE's watershed is heavily urbanized and covers 97 square miles. The western half of the CMP was dredged during the 1980s as part of a waterway transportation project. The eastern half of the CMP, historically between 200 and 400 feet wide and navigable, has a current depth of between 3.94 feet to 0 feet towards San José Lagoon. Due to years of encroachment and fill of the mangrove swamps along the CMP, it no longer serves as a functional connection between San Juan Bay and San José Lagoon. Sedimentation rates within the CMP are nearly two orders of magnitude higher than in other parts of the SJBE. Open waters in areas closer to the San José Lagoon have been lost, as the area has started transitioning into a wetland. Sediments include a combination of debris, vegetation, and other waste accounting for 10% of its composition.

Approximately 26,000 US citizens and immigrants, many of whom have low to very low incomes, live in eight communities north and south of the eastern CMP, located next to the Hato Rey Financial District. Significant areas of these communities lack sewer systems. Raw sewage discharges from these areas as well as from combined sewer overflows have led to fecal coliform concentrations of 2,000,000 colonies per 100 mL, when the regulatory standard is of 200 colonies per 100 mL. Water residence time in the San José and Los Corozos lagoons is on the order of 17 days, causing strong salinity stratification that has led to low oxygen or no oxygen levels in the 702 acres of lagoons with depth below 4 to 6 ft, severely affecting benthic habitats. Water quality and essential fish habitat have also been affected. The CMP Ecosystem Restoration Project (ERP) will restore tidal connectivity between the San José Lagoon and the San Juan Bay by removing over 800,000 cubic yards of sediments, debris, and trash; reducing water residence time; improving water quality; improving essential fish habitat conditions, and mobility of fish throughout the SJBE; and boosting biodiversity.

San Juan Bay Estuary is one of the estuarine systems included in the U.S. Environmental Protection Agency's National Bay and Estuary Program (NEP). The NEP was started in 1987 as part of the Clean Water Act to protect and restore estuaries while supporting economic and recreational activities. One of the goals of the San Juan Bay Estuary Program (SJBEP) and the Environmental Quality Board of Puerto Rico included the development of a hydrodynamic and a water quality model of the SJBE system for use in determining effective alternatives for water quality improvement and predicting the impacts of future development. A study was conducted to satisfy this goal, and a model was developed to evaluate the effectiveness of management alternatives on water quality improvement. The model is used for evaluating the effects of changes in system hydrology, structural features, and/or pollutant loadings on circulation and

water quality. Management alternatives considered included methods to increase system flushing and reduce pollutant loadings.

Restoring exchange between the different areas of San Juan Bay is expected to help restore habitat quality. The CH3D-WES hydrodynamic model was used to compute the improvement (decrease) in residence time within San José Lagoon as a result of increasing the cross sectional area of the CMP within the planned project area. The output on residence time is combined with data from a recently developed Benthic Index for San Juan Bay Estuary to develop a statistically significant relationship between residence time and benthic community health within San José Lagoon. Ten project alternatives were evaluated for predicted environmental benefits including an existing condition, modeled as a 33 foot wide by 3 foot deep channel, and channel widths of 75, 100, 125, 150, 175, and 200, dredged to depths of 10 and 15 feet, to remove the existing garbage and restore previous channel depths.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico and Model Quality Assurance Review of the Performance Measures for Caño Martín Peña Ecosystem Restoration (hereinafter: CMP IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review* (EC 1165-2-214, dated December 15, 2012), and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the CMP-ERP documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in economics, environmental (wetlands and NEPA), and engineering (civil and hydraulic) issues relevant to the project. They will also have experience applying their subject matter expertise to ecosystem restoration.

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

panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

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

Documents for Review
The following documents are to be reviewed by designated discipline:

Title	Approx. No. of Pages	Required Disciplines
CMP ERP Draft Feasibility report	204	All Disciplines
Appendix A: National Ecosystem Benefits Evaluation	32	Wetland/NEPA Impact Assessment
Appendix B: Real Estate Plan	18	Economics
Appendix C: Recreation Resources Assessment and Recreation Plan	29	All Disciplines
Appendix D: Cost Engineering	166	Economics
Appendix E: Adaptive Management Plan	39	Wetland/NEPA Impact Assessment
Appendix F: Monitoring Plan	18	Wetland/NEPA Impact Assessment
Appendix G: Engineering	293	Civil Engineer & Hydraulic Engineer
Appendix H: CMP ERP Environmental Impact Statement	208	All Disciplines
Essential Fish Habitat	57	Wetland/NEPA Impact Assessment
Biological Assessment	42	Wetland/NEPA Impact Assessment
404(b) (1) Evaluation	161	Wetland/NEPA Impact Assessment & Hydraulic Engineer
CZMC	22	All Disciplines
Relevant Correspondence	47	All Disciplines
Total Page Count	**1336**	

Documents for Reference

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

SCHEDULE

This final schedule is based on the October 10, 2013 receipt of the final review documents. The schedule will be revised upon receipt of final review documents.

Task	Action	Due Date
Conduct Peer Review	Battelle sends review documents to panel members	10/28/2013
	Battelle convenes kick-off meeting with panel members	10/28/2013
	Battelle provides ENLACE with IEPR Panel Mid-Review clarifying questions	11/6/2013
	Battelle convenes mid-review teleconference for the IEPR Panel to ask clarifying questions of ENLACE	11/8/2013
IEPR: Prepare Final Panel Comments and Model Review Report	IEPR panel members complete their individual reviews	11/14/2013
	Battelle provides panel members with merged individual comments talking points for Panel Review Teleconference	11/18/2013
	Battelle convenes Panel Review Teleconference	11/19/2013
	Battelle provides Final Panel Comment templates and instructions to panel members	11/20/2013
	Panel members provide draft Final Panel Comments to Battelle	11/26/2013
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	11/27-12/5/2013
	Battelle finalizes Final Panel Comments	12/6/2013
	Battelle provides Final IEPR Report to panel members for review	12/9/2013
	Panel members provide comments on Final IEPR Report	12/10/2013
	*Battelle submits Final IEPR Report to ENLACE	12/12/2013
	Battelle convenes teleconference with ENLACE to review the Post-Final Panel Comment Response Process	12/13/2013
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process	12/16/2013
IEPR: Comment/ Response Process	Battelle inputs Final Panel Comments into DrChecks; Battelle provides the panel members the draft Evaluator Responses	12/16/2013
	ENLACE provides draft Evaluator Responses to Battelle	12/23/2013
	Battelle provides the panel members the draft Evaluator Responses and clarifying questions	1/3/2014
	Panel members provide Battelle with draft BackCheck Responses	1/9/2014
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	1/10/2014

SCHEDULE, continued

Task	Action	Due Date
IEPR: Comment/ Response Process	Battelle convenes Comment-Response Teleconference with panel members and ENLACE	1/13/2014
	ENLACE inputs final Evaluator Responses into DrChecks	1/17/2014
	Battelle provides final Evaluator Responses to panel members	1/23/2014
	Panel members provide Battelle with final BackCheck Responses	1/28/2014
	Battelle inputs final BackCheck Responses into DrChecks	1/30/2014
	*Battelle submits pdf printout of DrChecks project file to ENLACE	1/31/2014

CHARGE FOR PEER REVIEW

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

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

General Charge Guidance

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

1. Your response to the charge questions should not be limited to a "yes" or "no." Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and

uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.

4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable
7. Please focus the review on assumptions, data, methods, and models.

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

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

Please submit your comments in electronic form to Julian Digialleonardo, DigialleonardoJ@battelle.org no later than November 14, 2013, 10 pm ET.

Independent External Peer Review of the

Draft Feasibility Report and Environmental Impact Statement for the Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico Charge Questions and Relevant Sections as Supplied by ENLACE

General Questions

1. Based on your experience, are the recommendations comprehensive and adequate? Are there sufficient analyses upon which to base the recommendation? What, if anything, is missing?
2. Are the assumptions made for the planning, economic, engineering, and environmental analyses sound?
3. Are the economic, engineering, and environmental methods, models, and analyses used adequate, acceptable, and sufficient to support the recommended plan?
4. In general terms, are the planning methods sound?
5. Comment on whether there is enough detail in, and the accuracy of the project background/history.
6. Please comment on whether the document has clearly and completely described both the purpose of and the need for the proposed restoration.
7. Do you have any important concerns with the document or its appendices not covered by other questions?

Plan Formulation

8. Do the Performance Measures adequately represent and characterize the intended purpose and objectives of the proposed project? Is there any conflict between them?
9. Have an adequate number of alternatives been evaluated?
10. Are the problems, opportunities, objectives, and constraints adequately and correctly defined?

11. Was a reasonably complete array of possible measures considered in the development of alternatives? Were any measures screened out too early?
12. Please comment on the screening of the proposed alternative. Are the screening criteria appropriate? Are the results of the screening acceptable?
13. Was the initial array of alternatives sufficient in number and focus to address all practical solutions for the problems?
14. Comment on whether the information, analysis and formulation support the selected alternative. Does the plan recommended meet the study objectives and avoid violating the study constraints?
15. Please comment on the likelihood of the recommended plan achieving the expected outputs.

Engineering

16. Is the Level of Design in the Engineering appendix adequate to access the performance of the Recommended Plan?
17. Are all models' capabilities and limitations clearly defined?
18. Were the technical assumptions used to determine the preferred alternative valid?

Cost

19. Was the methodology used to develop the baseline cost estimate adequate and valid?
20. Are the key assumptions used to complete the cost and schedule risk analysis adequate? Is anything missing? In your expert opinion, do the major findings of the cost risk analysis provide adequate support for scheduling, budgeting, and project control purposes?
21. Comment on the extent to which the cost estimates are clearly explained, adequate, and reasonable.

Environmental

22. Are the scope and detail of the potential adverse effects that may arise as a result of project implementation sufficiently described and comprehensive?
23. Is the documentation of compliance with Federal laws and regulations clear and complete?

24. Are the Cultural Resources adequately identified, well defined, and impacts sufficiently documented?
25. Have all the concepts for the ecological integrity and restoration of the project area been considered? What, if anything, is missing?
26. Comment on the environmental considerations of the project and the predicted impacts. What, if anything, is missing?
27. Comment on the accuracy and comprehensiveness of the discussion of threatened and endangered species in the study area.
28. Comment on the accuracy and comprehensiveness of the discussion of fish and wildlife in the study area.
29. Comment on the accuracy and comprehensiveness of the discussion of water quality in the study area.

Economic Analysis

30. Do you agree with the general analyses of the existing socio-economic resources in the study area? What, if anything, is missing?
31. Was the methodology used to conduct the incremental cost analysis adequate and valid?

Monitoring and AM

32. Are the proposed monitoring procedures clear and appropriate?
33. Is the proposed monitoring adequate to determine project success or adaptive management needs?
34. Are the costs for administering a monitoring and assessment program reasonable?
35. Is adaptive management adequately addressed?
36. Are monitoring capabilities and limitations clearly defined?

Summary Questions

37. Please identify the most critical concerns (up to 5) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.
38. Please provide positive feedback on the project and/or review documents.