DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080
http://www.mvd.usace.army.mil/

REPLY TO
ATTENTION OF:

CEMVD-PD-N

5 May 2008

MEMORAMDUM FOR Commander, North Atlantic Division (CENAD-PSD-P), 302 General Lee Avenue, Fort Hamilton Military Community, Brooklyn, NY 11252-6700

SUBJECT: ECO-PCX Endorsement of External Peer Review for the Middle Chesapeake Bay Islands Restoration Project.

1. The National Ecosystem Planning Center of Expertise (ECO-PCX) managed the External Peer Review (EPR) for the Middle Chesapeake Bay Island Restoration Project in the Baltimore District. The External Peer Review was conducted by Battelle Corporation through their contract with the Army Research Office. The EPR panel consisted of 4 individuals selected by Battelle with technical expertise in engineering (environmental, geotechnical); hydraulics/sedimentation; dredging and dredged materials management; economics and plan formulation; hydrology/coastal hydrology; biology/ecology with Chesapeake Bay/estuarine experience; habitat evaluation/ecological modeling; estuarine wetland restoration; coastal erosion/shoreline protection; and experience with the review of EISs and Dredged Material Management Plans (DMMPs). Overall, 14 final EPR comments were identified and documented. Of the 14 final comments, 2 were classified as of high significance and 8 were categorized as medium significance. Four comments were identified as having a low level of significance. The report of the EPR panel is entitled, "Final External Peer Review Report for Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation, January 23, 2008."

2. Responses to the EPR comments have been prepared by NAB and coordinated with the vertical team. Following signing of the Chief's Report, NAB should post the enclosed report and the coordinated responses on their website and the ECO-PCX, NAD, and CECW-P should establish links to this website.

3. In summary, the EPR for the Middle Chesapeake Bay Islands Restoration Project was conducted in accordance with EC 1105-2-408, has been fully coordinated with the ECO-PCX, and the ECO-PCX endorses the "Final External Peer Review Report for Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation, January 23, 2008."

Encl

RAYFORD E. WILBANKS
Director, National Ecosystem
Planning Center of Expertise

CF:
CENAB-PL (Pace)
CENAB-PL-P (Guise)
CENAB-PP-C (Brennan)
CEMP-NAD (Jester)
CECW-PC (Ware)
CECW-CP (Kitch)
CEMVD-RB-T (Vigh)
CEMVR-PM-F (Staebell)

DEPARTMENT OF THE ARMY
NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS
FORT HAMILTON MILITARY COMMUNITY
BROOKLYN, NY 11252-6700

REPLY TO
ATTENTION OF

CENAD-PDS-P 9 April 2008

MEMORANDUM FOR: Commander Baltimore District ATTN: CENAD-PL-P (Pace)

SUBJECT: Transmittal of Final Responses to the Mid-Chesapeake Bay Island Ecosystem Restoration, Maryland Final Peer Review (EPR) Review Report Comments

1. References:

a. Battelle Corporation memorandum, dated 23 January 2008, transmitting the Finals EPR Report for the Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement and Supporting Documentation.

b. CENAB memorandum, dated 26 March 2008, transmitting the final responses to the EPR comments to CENAD for review and approval (enclosed).

2. As described in reference 1(b), the Baltimore district staff has prepared detailed responses to the fourteen EPR report comments. It is noted that particular attention has been made to provide background information regarding the analysis used and where applicable, providing additional information on the plan formulation rationale. As indicated in the cited reference, additional narrative discussion, along with information related to additional analyses, will be provided to better explain the plan formulation process selection process and conclusions. These changes will be fully incorporated in the project report as appropriate with text additions or amendments to the report.

3. Division staff has reviewed reference 1(b) and concurs that questions or issues raised by the EPR comments have been fully addressed by the district responses.

4. Please contact, Mr. Peter Doukas of my staff at 718.765.7068 should you have any questions require additional information.

Encl
as

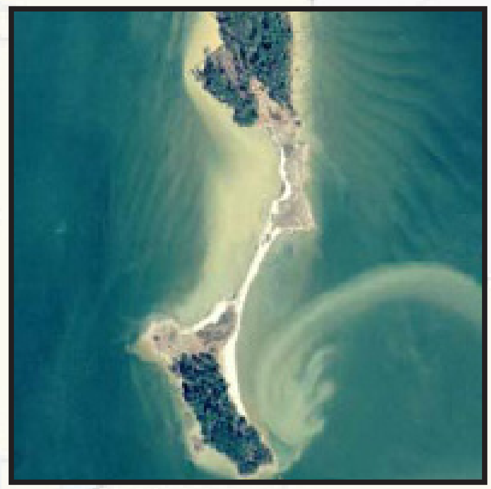
JOSEPH R. VIETRI
Chief, Planning & Policy
Program Support Division
Programs Directorate

cc: CEMP-PC(Jester)
CEMVR-PM-P(Staebel)
CEMVD-PD-N(Wibanks)

Battelle
The Business *of* Innovation

Final External Peer Review Report for Mid-Chesapeake Bay Islands Ecosystem Restoration Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation

January 23, 2008



Prepared by

Battelle
505 King Avenue
Columbus, Ohio 43201

Prepared for
U.S. Army Corps of Engineers
North Atlantic Division
New England District
and
Mississippi Valley Division
Rock Island District

Contract Number: DACW33-03-D-0004

FINAL
EXTERNAL PEER REVIEW REPORT

for

Mid-Chesapeake Bay Islands Ecosystem Restoration
Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation

Prepared by

Battelle
505 King Avenue
Columbus, Ohio 43201

for

Department of the Army
U.S. Army Corps of Engineers
North Atlantic Division
New England District
and
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Rock Island District

January 23, 2008

Contract Number: DACW33-03-D-0004
Delivery Order: DA01

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FINAL
EXTERNAL PEER REVIEW REPORT

for

Mid-Chesapeake Bay Islands Ecosystem Restoration
Final Integrated Feasibility Report and Environmental Impact Statement (EIS) and Supporting Documentation

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE) has joined in an agreement with the State of Maryland Department of Transportation, Maryland Port Administration to conduct a feasibility study and prepare an Integrated Feasibility Report and Environmental Impact Statement (EIS) for restoration of islands and associated habitats through beneficial use of dredged material in the Mid-Chesapeake Bay. The Mid-Chesapeake Bay is located in the eastern half of Chesapeake Bay, from the Chester River to the Maryland/Virginia state line. In order to strengthen quality control processes and help ensure that the Mid-Chesapeake Bay Island Ecosystem Restoration Project (Mid-Bay) is supported by the best scientific and technical information, an external peer review (EPR) process has been implemented by USACE to complement the internal technical review (ITR). This final report describes the EPR process, summarizes final comments of the EPR panel, and describes the panel members and their selection. The results of this EPR report will be taken into consideration in preparation of the Chief of Engineer's Report.

Four panel members were selected for the EPR from nearly 25 identified candidates. The potential external reviewers were screened for potential conflicts of interest and expertise relative to predetermined technical criteria. These criteria focused on estuarine ecology, estuarine/coastal processes, engineering with expertise in placement of dredged material in a confined placement facility, and plan formulation. The reviewers selected were from academe or were independent engineering consultants. Corresponding to the technical content of the Final Integrated Feasibility Report and EIS, the areas of technical expertise of the selected peer reviewers included: engineering (environmental, geotechnical); hydraulics/sedimentation; dredging and dredged materials management; economics and plan formulation; hydrology/coastal hydrology; biology/ecology with Chesapeake Bay/estuarine experience; habitat evaluation/ecological modeling; estuarine wetland restoration; coastal erosion/shoreline protection; and experience with the review of EISs and Dredged Material Management Plans (DMMPs).

The peer reviewers were provided an electronic version of the Final Integrated Feasibility Report and EIS and supporting documentation (i.e., appendices and Issue Paper No. 1) on November 1, 2007, along with a charge that solicited their comments on specific sections of the documents that were to be reviewed. The peer reviewers had eight weeks for the review of the documents. Nearly 300 individual comments were received from the EPR panel in response to the charge questions.

Following the individual reviews of the Final Integrated Feasibility Report and EIS and supporting documentation by the EPR panel members, a consensus discussion was conducted to review key technical comments, discuss charge questions in which there were conflicting responses, and reach consensus on the final comments to be provided to USACE. The final comments were documented according to a five-part format that included, (1) nature of the comment, (2) basis for the comment, (3) significance of the comment (high, medium, and low), (4) comment cross-referencing if related to another comment, and (5) a recommendation on how to resolve the comment. Overall, 14 final EPR comments were identified and documented. Of the 14 final comments, two were classified as of high significance and eight were categorized as medium significance. Four comments were identified as having a low level of significance.

Table ES-1 summarizes the final comments by level of significance. Clarifications of each comment are contained in Appendix A of this report.

Table ES-1. Overview of 14 Final Comments Identified by the Mid-Bay EPR Panel

Significance – High	
#	Comment
1	The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.
2	Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.
Significance – Medium	
3	The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.
4	It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.
5	It is overly optimistic to assume that the marsh will be fully functioning in five years.
6	The report should make it clear that the "need" for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than based on the incremental cost and incremental benefits.
7	The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.
8	Connectivity between the salt marsh and estuary is unclear both during and post construction.
9	The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.
10	National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.
Significance – Low	

11	Address how climate change will influence the engineering design.
12	To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.
13	Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.
14	The "Most Probable Future Without-Project Conditions" (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.

Overall, the external peer reviewers find the report to be well written and presented in a logical, thoughtful structure. Although cast as a restoration project, the report actually describes a beneficial use of dredged material important for Chesapeake Bay and surrounding regions, and this distinction should be made clear in the report. The analytic methods for the gross benefit approach used in plan formulation are carefully detailed and well documented. USACE policies and guidelines, however, require an analysis of <u>net</u> benefits, balancing habitat gains with habitat losses during construction. The EPR panel emphasized that more focused analyses of the turbidity and sedimentation generated during construction are needed to provide confidence that key estuarine habitats (submerged aquatic vegetation and natural oyster beds) will be safe from injury. Overall, the EPR panel felt these additional considerations are crucial to assure the maximum net environmental benefits per unit cost, and to justify the selection of the preferred alternative.

1. INTRODUCTION

1.1 Background of Report Reviewed

The U.S. Army Corps of Engineers (USACE) has joined in an agreement with the State of Maryland Department of Transportation, Maryland Port Administration to conduct a feasibility study and prepare an Integrated Feasibility Report and Environmental Impact Statement (EIS) for restoration of islands and associated habitats through beneficial use of dredged material in the Mid-Chesapeake Bay. The Mid-Chesapeake Bay is located in the eastern half of Chesapeake Bay, from the Chester River to the Maryland/Virginia state line. The proposed Mid-Chesapeake Bay Island Ecosystem Restoration Project (Mid-Bay) is intended to restore and protect valuable, but threatened Mid-Chesapeake Bay island ecosystems through the beneficial use of dredged material. There is also the opportunity to provide capacity for placement of dredged material.

As authorized by the Senate Committee on Environment and Public Works resolution, dated June 5, 1997, USACE has reviewed previous USACE reports on the Chesapeake Bay and other pertinent reports with a view to conduct watershed management studies of water resources improvements in the interest of navigation, environmental restoration, and other interests. The Eastern Shore, Maryland (MD) and Delaware (DE) Section 905(b) analysis concluded that a Federal interest existed to assess the needs and opportunities within the study area and recommended a variety of potential projects for further study including a study to evaluate protecting and/or restoring island habitat loss because of erosion and subsidence through the beneficial use of dredged material.

The recommended plan for the Mid-Bay project includes restoration at two islands – James Island and Barren Island – using dredged material from the Upper Chesapeake Bay Approach Channels to the Port of Baltimore. Some features of the recommended project include the following:

- Restore 2,072 acres of remote island habitat at James Island.
- Restore 72 acres of remote island habitat and protect 1,325 acres of submerged aquatic vegetation habitat at Barren Island.
- Provide 90 to 95 million cubic yards (mcy) of dredged material placement capacity.

The recommended plan would restore 2,144 acres of habitat. It would protect 623 acres of existing island ecosystem habitat, including 352 acres of critical submerged aquatic vegetation.

This report describes the external peer review (EPR) process that was conducted, and summarizes comments on the Final Integrated Feasibility Report and EIS and supporting documentation, including Issue Paper No. 1, that were received from the external peer reviewers. Detailed information on the comments is provided in Appendix A.

1.2 Purpose of External Peer Review

The purpose of EPR, in general, is to strengthen USACE's quality control processes for the development of decision documents in support of its Civil Works program. Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analyses.

To help ensure that USACE documents are supported by the best scientific and technical information, a peer review process has been implemented by USACE that utilizes EPR to complement the internal technical review (ITR), as described in the Department of the Army, U.S. Army Corps of Engineers, guidance *Peer Review of Decision Documents* (EC 1105-2-408) dated May 31, 2005, and CECW-CP Memorandum dated March 30, 2007. In this case, the EPR of the Mid-Bay Final Integrated Feasibility Report and EIS was conducted and managed using contract support from an independent 501(c)(3) organization (Battelle Memorial Institute; hereafter Battelle) to ensure independent objectivity, along with a high degree of flexibility and responsiveness, which was essential for USACE to meet deadlines.

2. METHODOLOGY

This section describes the methodology followed in selecting external peer reviewers, and in planning and conducting the EPR. The EPR was conducted following procedures described in USACE's guidance cited above (Section 1.2) and in accordance with the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, released December 16, 2004. Supplemental guidance on evaluation for conflicts of interest used the National Academies' *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports*, dated May 12, 2003.

2.1 Planning and Schedule

Table 1 defines the schedule followed in execution of the EPR.

2.2 Identification and Selection of External Peer Reviewers

Battelle initially identified nearly 25 potential peer reviewers, confirmed their availability, evaluated their technical expertise, and inquired about potential conflicts of interest. Of those initially contacted, 10 external peer review candidates confirmed their interest and availability, and 12 candidates declined either due to the schedule and anticipated level of effort, or because of disclosed conflicts of interest.

Preliminary information about the 10 available reviewers, including their expertise, level of previous engagement in applied evaluations, and requested rates of compensation, was evaluated in consultation with USACE. The reviewers were primarily from academic institutions, but consultants (company-affiliated and independent) or experts associated with industry, non-governmental organizations, and non-USACE government agencies were also considered.

Table 1. Schedule

Action	Completed by Date
Notice to proceed received	September 28, 2007
Potential external peer reviewers identified and screened	October 11, 2007
EPR panel selected and contracts completed	November 2, 2007
Final Integrated Feasibility Report and EIS, supporting documentation, and draft charge sent to EPR panel	November 1, 2007
Final charge sent to EPR panel	November 16, 2007
Individual comments from the EPR panel completed	December 31, 2007
EPR panel consensus meeting	January 7, 2008
Final EPR comments completed	January 14, 2008
Working draft peer review report completed	January 16, 2008
EPR panel provides comments on working draft peer review report	January 21, 2008
Final peer review report submitted to USACE	January 23, 2008

The credentials of the peer reviewers were evaluated according to the overall scope of the Mid-Bay Final Integrated Feasibility Report and EIS, focusing on two key areas: 1) dredged material placement and 2) habitat management and restoration. Detail on these technical criteria, as well as other areas of expertise considered, is provided in Table 2.

Table 2. Technical Criteria/Areas of Expertise for Potential External Peer Reviewers

Dredged material placement	Habitat Management and Restoration	Other Desirable Areas of Expertise
• Engineering (environmental, geotechnical) • Hydraulics/sedimentation • Dike construction • Dredging and dredged materials management	• Biology/ecology with Chesapeake Bay/estuarine experience • Habitat evaluation/ecological modeling • Estuarine wetland restoration • Submerged aquatic vegetation (SAV) restoration/protection • Natural oyster beds (NOBs)	• Economic analysis (resource economics) • Experience with review of Environmental Impact Statements and Dredged Material Management Plans • Coastal erosion/shoreline protection

The following additional factors were considered:
- Participation in previous USACE technical review committees;
- Other technical review panel experience; and
- Chesapeake Bay experience.

The peer reviewers were additionally screened for the following *potential* exclusion criteria or conflicts of interest:
- Involved in producing the Final Integrated Feasibility Report and EIS or supporting documentation;
- Current USACE employee;
- Involvement in any USACE projects in the Chesapeake Bay region or relating to the Mid-Bay Island restoration;
- Other USACE affiliation [Scientist employed by the USACE (except as described in NAS criteria, see EC 1105-2-4 section 9d)][a];
- Current or future financial interests in Chesapeake or Mid-Bay Island contracts/awards from USACE[a];
- Other possible perceived conflict of interest for consideration, e.g.,
    - Former USACE employee
    - Repeatedly served as USACE technical reviewer
    - A significant portion of personal or company revenues within the last 3 years came from USACE contracts
    - Made a publicly documented statement advocating for or against the subject project.

In selecting final peer reviewers from the list of potential peer review candidates, an effort was also made to select experts who best fit the criteria presented in Table 2 and the factors described above. Based on these considerations, four peer reviewers were selected from the potential list (see Section 3 for names and biographical information on the selected peer reviewers). Battelle established subcontracts with the peer reviewers indicating their willingness to participate and confirmed the absence of conflicts of interest (through a signed conflict of interest form).

2.3 Preparation of the Charge and Conduct of the Peer Review

A charge for peer review, which contained specific questions regarding the Final Integrated Feasibility Report and EIS and supporting documentation, was developed to assist the EPR panel. The draft charge was prepared by Battelle with input from USACE and guidance provided in USACE's guidance *Peer Review of Decision Documents* (EC1105-2-408) and the

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[a] Note: 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 the OMB memo 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."

Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, released December 16, 2004. A draft charge was submitted to the USACE for consideration and evaluation. The USACE edited the draft questions and recommended eliminating some questions. The charge was finalized based on the USACE's input. The charge was presented in comment response table format, and was organized according to the order of the documents to be reviewed. The charge consisted of approximately 80 specific questions on the Final Integrated Feasibility Report and EIS and supporting documentation. The EPR panel was instructed to respond to the charge questions within the comment response form table. The final charge is shown in Appendix B of this report.

The peer reviewers were provided with electronic copies of the draft final charge, Final Integrated Feasibility Report and EIS and supporting documentation on November 1, 2007.[b] The peer reviewers had eight weeks for the review of the documents.

2.4 Review of Verbatim Comments

Nearly 300 verbatim (i.e., individual) comments in response to the charge questions were received from the individual EPR panel members. Battelle reviewed these comments to identify overall recurring themes, potential areas of conflict, and other impressions of the report. As a result of this review, Battelle developed a preliminary list of 28 overall comments and discussion points that emerged from the EPR panelists' verbatim comments. Each reviewer's verbatim comments were shared with the EPR panel.

2.5 External Peer Review Panel Consensus Discussion

Battelle convened a consensus discussion conference call with the EPR panel on January 7, 2008. The purpose of the consensus discussion was to allow the exchange of technical information among the panel experts, many of whom are from diverse scientific backgrounds. This information exchange ensured that the EPR report represents the synergy of the panel and avoided isolated or conflicting information and analyses. The main goal of the consensus discussion was to review the overall comments and ascertain and confirm their importance to the EPR panel, remove points having a lack of consensus, identify and add any missing issues of high-level importance to the EPR panel, and finally, reach consensus on the final comments to be provided to USACE.

The panel discussion resulted in 15 overall consensus comments. A summary explaining each consensus comment organized by level of significance, as defined by the EPR panel, was also prepared and distributed to the EPR panel by Battelle in a memorandum dated January 7, 2008. The memorandum provided a detailed approach for developing the final comments for the Final Integrated Feasibility Report and EIS and supporting documentation.

In addition to reaching consensus on the final comments to be provided to USACE, the EPR panel discussed responses to about a half-dozen specific charge questions where there appeared to be disagreement among the reviewers. The disagreement was resolved and the comment was

[b] The final charge was provided to the peer reviewers on November 16 after receiving comments from USACE.

either incorporated into the final comments or determined to stand as is (i.e., was not important enough to include as a final comment).

2.6 Preparation of Final Comments

The EPR panel used the 15 overall consensus comments as a basis for preparing the final comments. A memorandum was distributed on January 7, 2008, to the EPR panel providing detailed instructions on developing the final comments. A summary of the directive is provided below:

- Lead Responsibility: A lead reviewer was assigned for each consensus comment. A lead was responsible for coordinating the development of the final comment and submitting it to Battelle by January 14, 2008. Lead assignments were modified by Battelle at the direction of the EPR panel. To assist each lead in the development of the final comments, Battelle distributed individual verbatim comments in the comment response form table format, a summary detailing each consensus comment (in the memorandum), an example final comment following the five-part structure (described below), and a template for the preparation of the final comments.

- Directive to the Lead: Each lead was encouraged to communicate directly with other reviewers, as needed, to contribute to a particular consensus comment. If a significant comment was identified that was not covered by one of the original 15 overall consensus comments, the appropriate lead was instructed to draft a new consensus comment. For this EPR, no additional comments were identified by the EPR panel; however, two consensus comments were consolidated into one comment, resulting in 14 final comments. If a consensus comment was related to another consensus comment, the lead was to cross-reference them.

- Format for Final Comments: Each final comment was presented as part of a five-part structure, including:

  1. Nature of comment (i.e., succinct summary statement of concern)
  2. Basis for comment (i.e., details regarding the concern)
  3. Significance (high, medium, low) (see description below)
  4. Comment cross-referencing
  5. Recommendation (see description below).

- Criteria for Significance: The following were used as criteria for assigning a significance level to each final comment:

  - High — Describes a fundamental problem with the project that could affect the recommendation or justification of the project
  - Medium — Affects the completeness or understanding of the reports/project
  - Low — Affects the technical quality of the reports but will not affect the recommendation of the project.

- Guidance for Developing the Recommendation: The recommendation was to include specific actions that the USACE should consider to resolve the 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, etc.).

As a result of this process, 14 final comments were prepared. Battelle reviewed and edited all final comments for clarity and adherence to the requested final comment template format. The final EPR comments were assembled and are presented in Appendix A.

3. BIOGRAPHICAL INFORMATION ON EXTERNAL PEER REVIEWERS

Potential peer review candidates were identified through Battelle's EPR Database, targeted internet searches using key words (e.g., technical area, geographic region), search of websites of local universities or other compiled expert sites, and through referrals from candidates who declined. A draft list of screened (for availability, technical background, conflict) potential reviewers was prepared by Battelle and provided to USACE. The final list of peer reviewers was agreed upon based on Battelle recommendations and USACE input.

An overview of the credentials of the four reviewers selected for the EPR panel and their qualifications in relation to the technical evaluation criteria is presented in Table 3. Reviewer identities were unknown to the USACE authors of the Final Integrated Feasibility Report and EIS and supporting documentation during the EPR process. More detailed biographical information regarding each candidate and his or her technical areas of expertise is presented following the table.

Table 3. EPR Panel: Technical Criteria and Areas of Expertise

Name	Affiliation	Engineering				Biology/Ecology			Economics	
		Environmental, civil, geotechnical	Hydraulics/sedimentation	Dredging and dredged material management	Coastal erosion/shoreline protection	Biology/ecology with Chesapeake Bay/estuarine experience	Habitat evaluation/ecological modeling	Estuarine wetland restoration	Economic analysis	Plan formulation
	totals -->	1	1	1	1	1	2	2	1	1
Chris Craft	Indiana University				1		1	1		
Don Hayes	University of Louisiana at Lafayette	1	1	1						
Charles "Pete" Peterson	University of North Carolina at Chapel Hill					1	1	1		
Dan Smith	The Tioga Group, Inc.								1	1

Christopher B. Craft, Ph.D.
Role: This reviewer was chosen primarily for his expertise in estuarine wetland restoration.
Affiliation: Indiana University, Bloomington, IN

Dr. Craft is Associate Professor in the School of Public and Environmental Affairs at Indiana University Bloomington where he teaches courses in Wetlands Ecology, Restoration Ecology, and Applied Ecology. He has nearly 25 years of experience working in estuarine and freshwater wetlands, including tidal marsh creation on dredged material and eroding shorelines. Dr. Craft has published more than 60 peer-reviewed papers on creation and restoration of wetlands, wetland eutrophication and nutrient enrichment and effects of climate change and sea level rise on tidal wetlands. He is Associate Editor of the journals, *Wetlands* and *Soil Science Society of America Journal* and is President-elect (2007-2008) of the Society of Wetland Scientists, a 3500-member international organization that promotes sound wetland science, policy and management.

Donald F, Hayes, Ph.D., P.E., D.E.E.
Role: This reviewer was chosen primarily for his expertise in dredged material management and engineering.
Affiliation: University of Louisiana at Lafayette, Lafayette, LA

Dr. Hayes is Director, Institute for Coastal Ecology and Engineering and is UNOCAL/BORSF Professor of Civil Engineering at the University of Louisiana at Lafayette. His areas of expertise include the environmental impacts of dredging, managing contaminated sediments, use of dredged sediments for restoration, and engineering design of wetlands restoration projects. He has authored numerous technical reports and journal publications, refereed conference publications, and serves on several engineering committees and societies. He is also the author of several Automated Dredging and Disposal Alternatives Management System (ADDAMS) modules – software distributed by the USACE to manage dredging projects and dredged material placement. He serves on the editorial board of the Western Dredging Association's *Journal of Dredging Engineering*. With over 25 years of experience, Dr. Hayes has delivered presentations to the international community and is recognized as an expert in the remediation of contaminated sediments and dredged material management as indicated by his consulting work and testimony for industry and government. He received his M.S. in civil engineering from Mississippi State University and a Ph.D. in civil engineering from Colorado State University.

Charles H. (Pete) Peterson, Ph.D.
Role: This reviewer was chosen primarily for his expertise in estuarine biology/ecology.
Affiliation University of North Carolina at Chapel Hill, Morehead City, NC

Dr. Peterson has been a professor in academia for 36 years and is now Alumni Distinguished Professor at the University of North Carolina at Chapel Hill. He has over 160 peer-reviewed publications on marine and estuarine ecology and has done research on estuarine habitat valuation and compensatory restoration, on ecological responses to shoreline erosion and to engineering measures designed to stabilize estuarine shorelines, and on how flow regimes and sedimentation affect estuarine organisms and habitats. Dr. Peterson has served on several panels of the National Academy of Sciences, as editor of several ecological journals, and as reviewer of many ecological restoration projects. He has testified before Congress and the North Carolina Legislature on environmental issues. He has been appointed to and provided 36 person-years of service on the North Carolina Environmental Management Commission, the North Carolina Marine Fisheries Commission, the North Carolina Sedimentation Control Commission, and the Steering Committee for the North Carolina Coastal Habitat Protection Plan.

Daniel S. Smith
Role: This reviewer was chosen primarily for his expertise in economics and plan formulation.
Affiliation: The Tioga Group, Inc., Moraga, CA

Mr. Smith is a Principal and Co-Founder of The Tioga Group, a consulting firm specializing in freight transportation and logistics whose clients include ports, railroads, shippers, leasing companies, industry organizations, and government agencies. Mr. Smith has over 25 years of consulting experience in freight transportation operations, economic, policy, and planning, with special emphasis on truck, rail, and marine intermodal transportation. He has authored numerous articles in trade journals, is a contributor to industry conferences and publications, and is a member of the Intermodal Association of North America. He has testified before Congress on the economic conditions in the world shipping industry. He received his M.S. from the Graduate School of Public Policy at the University of California at Berkeley and did further postgraduate work in transportation economics and policy.

4. Results ─ Summary of Peer Review Comments

Overall, the external peer reviewers find the report to be well written and presented in a logical, thoughtful structure. Although cast as a restoration project, the report actually describes a beneficial use of dredged material important for Chesapeake Bay and surrounding regions, and this distinction should be made clear in the report. The analytic methods for the gross benefit approach used in plan formulation are carefully detailed and well documented. USACE policies and guidelines, however, require an analysis of net benefits, balancing habitat gains with habitat losses during construction. The EPR panel emphasized that more focused analyses of the turbidity and sedimentation generated during construction are needed to provide confidence that key estuarine habitats (submerged aquatic vegetation and natural oyster beds) will be safe from injury. Overall, the EPR panel felt these additional considerations are crucial to assure the maximum net environmental benefits per unit cost, and to justify the selection of the preferred alternative.

As a result of the consensus discussion process, the EPR panel identified 14 final comments, segmented into rankings of high, medium, and low significance. In total, as shown in Table 4, two were classified as of high significance and eight were categorized as medium significance, while four comments were identified as having a low level of significance.

Table 4. Overview of 14 Final Comments Identified by the Mid-Bay EPR Panel

#	Comment
Significance – High	
1	The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.
2	Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.
Significance – Medium	
3	The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.
4	It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.
5	It is overly optimistic to assume that the marsh will be fully functioning in five years.
6	The report should make it clear that the “need” for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than based on the incremental cost and incremental benefits.
7	The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.
8	Connectivity between the salt marsh and estuary is unclear both during and post construction.
9	The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.
10	National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.
Significance – Low	
11	Address how climate change will influence the engineering design.
12	To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.
13	Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.
14	The “Most Probable Future Without-Project Conditions” (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.

As indicated in Table 4, the majority of the comments focus on areas viewed by the reviewers as needing improvement. The final EPR comments in their entirety are included in Appendix A.

APPENDIX A

FINAL PEER REVIEW COMMENTS FROM THE MID-BAY FINAL INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT (EIS) AND SUPPORTING DOCUMENTATION

Comment 1:
The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.
Basis for Comment:
This comment is based upon (1) recognition that whereas gross benefits of island creation are assessed in a detailed set of analyses, which even include benefits of SAV protection in the nearby bay, the injuries (costs) of filling water column and benthic habitats are not included in these analyses and thus net environmental benefits of each alternative alignment are never computed, (2) information that the benthic habitat around James Island differs from that around Barren Island by containing much higher densities of a small bivalve of high value as fish and crab food, (3) existence of established, published methods of estimating such habitat injury of filling, and (4) recognition that without incorporating such injuries (costs) of filling and computing net environmental benefits, the method used to select the preferred alignment for the project is flawed by use of gross instead of net environmental benefits and thus produces unreliable outcomes. **Gross vs. Net Environmental Benefits**. In conducting a very detailed analysis of environmental benefits using the ICU (Island Community Units) approach, this report includes only the positive (gross) environmental benefits of the project. Filling of water column and benthic habitats induces large injuries to existing environmental resources and ecosystem services that are completely ignored in the ICU method. This process must be redone to include these environmental costs of filling so as to produce a means of assessing net environmental benefits of the entire island restoration project and of each potentially viable alignment alternative that leads to an unbiased choice of the optimal alignment option. USACE plan formulation guidelines emphasize <u>net</u> benefits, whether monetarized as National Economic Development (NED) benefits or otherwise quantified as National Environmental Resource (NER) benefits. Our review of project documentation to date indicates that the loss of existing marine (water column and benthic) or upland habitat resulting from project construction has <u>not</u> been quantified and that the project benefit analyses use gross rather than net restoration gains. The analysis must take explicit account of habitat <u>lost</u> as well as habitat gained. Even if the environmental value of the habitat lost was identical (as for the water column) for each alternative, the comparison must still be made to distinguish net from gross benefits. Where the environmental value of the habitat lost varies among alternatives (as for the benthic habitat), the analysis of net benefits may re-order the priorities. **Quantifying Environmental Injuries of Filling**. Methods of quantifying habitat injury from filling exist and one of them, Habitat Equivalency Analysis (HEA), is described in published scientific literature (e.g., see pages 173-307 in Volume 264 of Marine Ecology Progress Series from 2003) and is widely used by NOAA and other federal agencies. In addition, Peterson & Associates (2003) provided an analysis of impacts and compensatory mitigation options using HEA to the Norfolk Office of the USACE through Craig Seltzer for a project involving expansion of the Craney Island port in the Elizabeth River of the Virginia portion of the

Basis for Comment (Continued):
Chesapeake Bay (copy of document included in individual review by Peterson). This method estimates the secondary production lost by filling and measures benefits by quantifying the secondary production gained through habitat restoration. The logical basis for choice of this production metric to quantify environmental gains and losses is that these estuarine habitats provide the ecosystem service of food chain support, which has acknowledged high value. Production of the invertebrates at the base of the estuarine food chain provides a means of quantifying the forage base that leads to valued higher trophic levels, such as blue crabs, demersal (bottom-feeding) fishes, birds, turtles, and mammals. The currently included analysis of gross benefits is based only on positive impacts (largely to birds), while ignoring negative injuries (largely to crabs and fishes). By doing an analysis on net environmental benefits, this bias of ignoring estuarine injuries to crabs and fishes would be removed. **Likely Outcome of Including Environmental Costs of Filling in the ICU Analysis**. Sampling of the benthic invertebrates within the island fill footprint around the alternative James and Barren Island alignments revealed that the benthic macro-invertebrate communities differed between islands. The bay bottom in the fill footprint around James Island contained a benthic community that possessed a lower Benthic Index of Biological Integrity (B-IBI) than the analogous benthic community around Barren Island. On those grounds, this report concluded that the loss of benthos from filling would be greater if Barren Island received the bulk of the fill than if James Island were chosen for most of the fill. This use of the B-IBI fails to recognize that the benthic community in the James Island fill footprint had a lower B-IBI in large part because of high abundance and dominance of a small bivalve mollusk, *Gemma gemma*, which is highly productive and represents high-quality prey for blue crabs and bottom-feeding fishes. Consequently, if the secondary production method used widely in HEA analyses were employed here to quantify the losses of food for important fisheries, it is likely that environmental costs of filling would be greater at James Island than at Barren per unit of benthic habitat area covered by fill. Because the environmental injuries associated with loss of water column habitat would not be likely to differ much between islands, the analysis of benthic habitat injuries would likely be the primary contributor to differences in environmental costs associated with different project alignments. When the ICU analysis is redone to involve analysis of net (not gross) environmental benefits, the preferred option yielding the most environmental benefits may be different from the preferred option now indicated by using gross environmental benefits. Because filling around James Island removes production of an important food for blue crabs and demersal fishes, redoing the ICU analysis on net environmental benefits is likely to alter the choice of alignments in a way that fills more around Barren Island and less around James Island. Only upon completion of re-analysis will we know for sure.

Significance – High:
This comment is of High Significance because it addresses the very basis on which the entire island restoration project is justified and, even more critically, on which the preferred island alignment is selected. There is evidence from sampling the benthic habitat around James and Barren Islands that their benthic invertebrate communities differ in a fashion that makes filling around James Island more injurious to blue crab and demersal fish production than filling around Barren Island, the opposite of what is now assumed in the absence of quantification of environmental losses from filling. Computation of net environmental benefits, including costs of habitat filling, could lead to changing the preferred alignment such that more filling is done around Barren than James Island.
Comment Cross-referencing:
(10) Comment: *National Economic Development (NED) outcomes (e.g. ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.* This comment links to Consensus Comment #10 on how the flows of environmental benefits are projected out over the project lifetime. Specifically, all analyses of environmental benefits and how they accrue over years must use net, not gross, environmental benefits. This has not been done.
Recommendations for Resolution:
To resolve the concerns raised by this comment, the report would need to include: • Application of a rigorous quantitative method (probably HEA) to estimate environmental injuries (losses) that will arise from filling water column and benthic habitats for each alternative island alignment under careful consideration. • Inclusion of these environmental injuries into the ISU computation process such that analyses can be based on net environmental benefits, computed by subtracting the newly computed costs from the gross benefits, which are what the report now uses. This will result in analyses focused on net habitat gain, balancing habitat lost in project construction with habitat gained by restoration. • Re-assessment of the selection of the preferred island alignment so that it can be based upon maximizing net environmental benefits not gross benefits.

Comment 2:
Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.
Basis for Comment:
The most significant water quality concerns will probably arise during construction when sediment releases to the water column due to placement activities or erosion from unprotected banks potentially threaten SAV and NOB in the vicinity. Unfortunately, the 2D hydrodynamic and water quality modeling consider only general sediment transport and flow regimes for pre- and post-construction conditions. Further, the reported 2D modeling efforts are probably inappropriate for evaluating these impacts. SAV increases flow resistance and results in significant non-uniform vertical velocity profiles. The reduced near-bottom velocities can increase settling and retention of solids.
Significance – High:
The potential for construction impacts could mitigate all other project benefits; thus, the resolution of this concern is essential to project selection and implementation.
Comment Cross-referencing:
No other related comments
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A simplistic assessment of sediment resuspension, transport, and deposition during construction. • If the simplistic evaluation can not definitively prove that SAV and NOB impacts are manageable, 3D hydrodynamic and sediment transport modeling may be necessary.

Comment 3:
The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The Preferred Alternative should be incorporated in the CE/ICA process.
Basis for Comment:
The Mid-Chesapeake plan formulation, i.e. the choice of a preferred alternative, depends on cost-effectiveness (CE) analysis and incremental cost analysis (ICA) rather than the usual cost-benefit analysis. The CE/ICA approach is appropriate in this application since the project results cannot be readily monetarized. The Final Integrated Feasibility Report and EIS of July 2007 generally follows USACE guidelines for Cost Effectiveness and Incremental Cost Analysis (CE/ICA) as set forth in *Evaluation of Environmental Investment Procedures Manual* (IWR Report 95-R-1, May 1995). The guidelines encourage the development of new alternatives by combining features of existing options. To retain the integrity of the CE/ICA, however, such new alternatives must be evaluated side-by-side with existing alternatives and be subjected to the same analytic methods and scrutiny. The project development team appears to have had a very valuable "Hey, what if we…" moment, resulting in the James 5/Barren E alternative after the original CE/ICA analysis was complete. At a minimum, however, the Project Development Team (PDT) should re-formulate the CE/ICA analysis to include the new alternative. Otherwise throwing in another alternative at the end (however attractive it may be) voids the CE/ICA process. Report Appendix B notes *"Although James Alignment 5 plus Barren Alignment E was not evaluated during the incremental cost analysis, based on its average annual costs of $32,500,000 (total cost is $941,658,000) and 813 average annual ICUs (total ICUs of 40,650), it would have remained in the final array of cost effective plans."* (page B-70). Inclusion of the preferred alternative in the full CE/ICA process is therefore unlikely to change the plan formulation outcomes, but would strengthen the Plan Formulation.* Inclusion in the full CE/ICs process is fundamentally a procedural issue, but an important one than appears to be easily addressed. **** As Comment 1 indicates, however, consideration of net benefits after loss of existing habitat could conceivably change plan recommendations. This observation increases the need to incorporate the preferred alternative in the CE/ICA process on the same basis as the other options.***

Significance – Medium (assuming Comment 1 addressed)
Including the preferred alternative in the fill CE/ICA process would strengthen the plan formulation and project justification, but is itself unlikely to affect alternative rankings.
Comment Cross-referencing:
(1) Comment: *The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.* Comment 1 regarding net versus gross benefits should be addressed in conjunction with this comment (3).
Recommendations for Resolution:
To resolve these concerns, the report would need to be revised to include the preferred alternative in the CE/ICA Analysis and the appropriate report tables. • Reformulate the CE/ICA analysis to consider the preferred alternative alongside the other alternatives. • The preferred alternative should be incorporated in the CE/ICA analysis starting with Alternatives Formulation and Screening (Item B.4 in Appendix B). • The preferred alternative should be carried through the analysis up to the Re-Evaluation of the Two Island Alternative (Item B.10 in Appendix B, page B-70). The reevaluation section might be usefully moved forward to the Alternatives Formulation section. • Appropriate text and tables in the main report body and executive summary should be updated accordingly.

Comment 4:

It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.

Basis for Comment:

Sensitivity analysis is required by USACE guidelines to assist the project team in identifying and assessing sources of risk and uncertainty. The reports reviewed to date reveal numerous sources of uncertainty regarding project costs, timing, or outcomes.

Some sources of uncertainty are mentioned in the text. Other sources of uncertainty, such as the exact amount of dredging material to be placed or the time required for colonization of new habitat, are inherent in this or any similar project. Both types of uncertainty must be addressed.

Risk and uncertainty are addressed in USACE's Economic And Environmental Principles And Guidelines For Water And Related Land Resources Implementation Studies, 1983. Section 1.4.13 Risk and Uncertainty—Sensitivity Analysis, notes, in part:

(a) Plans and their effects should be examined to determine the uncertainty inherent in the data or various assumptions of future economic, demographic, social, attitudinal, environmental, and technological trends. A limited number of reasonable alternative forecasts that would, if realized, appreciably affect plan design should be considered.

(b) The planner's primary role in dealing with risk and uncertainty is to identify the areas of sensitivity and describe them clearly so that decisions can be made with knowledge of the degree of reliability of available information.

The Principles & Guidelines give additional detail.

Significance – Medium:

Sensitivity analysis is required by USACE guidelines to address issues of risk and uncertainty. Without a sensitivity analysis the project may be vulnerable to unanticipated outcomes, increasing costs or jeopardizing anticipated environmental benefits.

Comment Cross-referencing:

Comments 5, 9, 10, and 11 illustrate sources of unaddressed uncertainty that could affect project justification or realization of anticipated benefits.

(5) Comment: *It is overly optimistic to assume that the marsh will be fully functioning in five years.*

(9) Comment: *The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.*

(10) Comment: *National Economic Development (NED) outcomes (e.g. ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.*

(11) Comment: *Address how climate change will influence the engineering design.*

Recommendations for Resolution:

To resolve these concerns, a four-step analysis is recommended:

- Review of project plans and reports to identify and document all sources of uncertainty.
- Screening (documented) to distinguish significant from insignificant sources of uncertainty.
- In-depth analysis as required to establish the sensitivity of plan costs and outcomes/benefits to significant sources of uncertainty.
- Follow-up research, data collection, etc., to assist the project team in analyzing and/or reducing sources of uncertainty.

The Principles & Guidelines note that *"Methods of dealing with risk and uncertainty include:*

(1) Collecting more detailed data to reduce measurement error.

(2) Using more refined analytic techniques.

(3) Increasing safety factors in design.

(4) Selecting measures with better known performance characteristics.

(5) Reducing the irreversible or irretrievable commitments of resources.

(6) Performing a sensitivity analysis of the estimated benefits and costs of alternative plans."

Comment 5:
It is overly optimistic to assume that the marsh will be fully functioning in five years.
Basis for Comment:
Numerous published studies have shown that development of a fully functioning tidal marsh requires more than five years. While above ground biomass develops to levels found in natural marshes within 3-5 years, other biological components (belowground biomass, algae, benthic invertebrates, heterotrophic microbial activity) take longer and physical components (e.g. soils) take even longer (Craft et al., 2003). Studies of tidal marshes created on dredge material in North Carolina indicate that algae, benthic and heterotrophic microbial activity take about 5 to 10 years to achieve equivalence to natural marshes in the area (Zheng et al., 2004; Craft et al., 2003; Cornell et al., 2007). Development of fully functioning benthic invertebrate communities requires as much as 20 years to become equivalent (Craft and Sacco, 2003). We suggest that 10 years is a more realistic timeline for the development of (mostly) fully functioning tidal marshes at James Island. **References** Cornell, J.A., C. Craft and J.P. Megonigal. 2007. Ecosystem gas exchange across a created salt marsh chronosequence. *Wetlands* 27:240-250. Craft. C.B. and J.N. Sacco. 2003. Long-term succession of benthic infauna communities on constructed *Spartina alterniflora* marshes. *Marine Ecology – Progress Series* 257:45-58. Craft, C.B., J.P. Megonigal, S.W. Broome, J. Cornell, R. Freese, R.J Stevenson, L. Zheng and J. Sacco. 2003. The pace of ecosystem development of constructed *Spartina alterniflora* marshes. *Ecological Applications* 13:1417-1432. Zheng, L., R.J. Stevenson and C. Craft. 2004. Changes in benthic algal attributes during salt marsh restoration. *Wetlands* 24:309-323.
Significance – Medium:
By using a *realistic* timeline of marsh development, accrual of environmental and ecological benefits can be accurately calculated over the life of the project.
Comment Cross-referencing:
(10) Comment: *National Economic Development (NED) outcomes (e.g. ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.* The incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines. (13) Comment: *Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.*

Recommendations for Resolution:
To resolve these concerns, the report would need to be modified by recalculating the rate at which environmental benefits accrue following creation of low marsh and high marsh in the tidal marsh cells using 10 years, rather than 5 years, as the time required for a fully functioning tidal marsh to develop. • This means that Island Community Units (ICU's) would need to be recalculated for the selected alternative (James 5/Barren E) in Section 4.5.4, Island Community Unit Incremental Calculation, but not for the other alternatives since recalculation of ICU's using (10 years rather than 5 years) will not alter the ranking of the sites. • The maturity dates for low and high marshes in table 4.21 also would need to be changed.

Comment 6:
The report should make it clear that the "need" for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than being based on the incremental cost and incremental benefits.
Basis for Comment:
Fundamentally, the project is driven by the amount of dredged material that needs to be placed. The use of CE/ICA presumes that the scope and scale of the project would be determined by a comparison of incremental costs and incremental outputs per *Evaluation of Environmental Investment Procedures Manual* (IWR Report 95-R-1, May 1995). As the procedures manual indicates, the issue of project need and of "where to stop" in project scale are ordinarily approached through a comparison of net incremental environmental benefits and net incremental costs for various alternative project configurations and plans. While the report follows that procedure in general, it does so to choose among alternatives for disposal of a fixed material volume. The analysis is generally valid (although see Comments 1 and 3), but diverges from the procedures manual. It would be more forthcoming (and less risky) to state up front that the habitat creation/restoration project is a secondary driver, and that the scale of the project is determined by the amount of dredging material to be placed.
Significance – Medium:
In the absence of this transparency, the project reports could be criticized as misleading, even though the recommendation may not change.
Comment Cross-referencing:
See Comments 1 and 3 regarding the use of net benefits and the CE/ICA process. (1) Comment: *The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.* (3) Comment: *The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) analysis was completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include a clear explanation of the motivation for the restoration efforts and the determinants of project scope and scale.

Comment 7:

The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.

Basis for Comment:

This comment is based upon (1) recognition that environmental monitoring before and after such a project has several important roles and detailed information about the design is necessary to insure the usefulness of monitoring, (2) vagueness of the monitoring proposed, (3) failure to provide a clear commitment to monitoring of all biological response variables at reference sites, and (4) recognition that, without parallel monitoring at environmentally matching reference sites, adaptive management decisions would be compromised.

Project Monitoring to Assess Performance and Success. Environmental monitoring represents a scientific enterprise that, when applied to environmental restoration, employs performance standards against which success of restoration is judged following restoration. To allow such measurement of environmental/ecological benefits and their development over time, the design of the monitoring must be carefully constructed. The monitoring must include all physical and biological components integrated in time and space so that inferences about mechanisms can be made. Details are required to confirm that such monitoring has sufficient depth and breadth to track accrual of benefits over the project lifetime.

Selection of Reference Sites. Use of multiple reference sites is critical to allow evaluation of success or failure of an environmental restoration and to guide adaptive management. In this document, the methods for selecting reference islands and reference marshes for monitoring are not presented. Reference sites should be environmentally similar to the James and Barren Islands selected for restoration, but practicing this wisdom requires the development of criteria on which to judge similarity and prioritization of criteria. Presumably, selection of reference sites for environmental monitoring has been done for the Poplar Island restoration, yet the experience and lessons learned from that analogous project are not incorporated into this document. To track development of environmental/ecological benefits following restoration, integrated measures of many physical environmental variables and biological responses must be made. The monitoring design does not show that this will be done. Finally, before initiating adaptive management of the restoration project, it is important to know whether the failure to achieve any specific biological benchmark reflects regional changes. That inference is possible only if multiple, environmentally matching reference sites are also monitored along with the restoration sites themselves.

Significance – Medium:

This comment is of Medium Significance because it addresses the basis on which the degree of success or failure of the restoration will be evaluated and it determines to what extent project management adaptations will be needed.

Comment Cross-referencing:
(8) Comment: *Connectivity between the salt marsh and estuary is unclear both during and post construction.* This comment links to Comment 8 on how control structures at the constructed marsh outlets may inhibit the connectivity between marsh and estuary, producing environmental services that fall short of projected benchmarks, requiring consideration of management adaptations to enhance flows of organic detritus into the estuary and enhancing nekton access to and utilization of the restored marsh habitat.
Recommendations for Resolution:
To resolve the concerns raised by this comment, the report would need to include in Section 8 (Adaptive Management and Monitoring) and in Appendix F (Adaptive Management Plan) the following information, probably in a specific section on Selection of Reference Sites: • Detailed monitoring plans for all physical and biological environmental variables, including clear demonstrations that the monitoring design is sufficient to allow tests of alternative hypotheses explaining success or failure of restoration. • Explanation of the criteria on which reference islands and marshes will be chosen for monitoring. • Information about how monitoring designs have been constructed for the analogous Poplar Island restoration and what this previous experience has done to improve monitoring for the James and Barren Island projects. • Discussion of how the monitoring of reference sites will serve in the decision making process on whether to initiate management adaptations when performance thresholds are not met.

Comment 8:
Connectivity between the salt marsh and estuary is unclear both during and post construction.
Basis for Comment:
"Production export" from the proposed James island wetland complex to the estuary is assumed to provide measurable ecological benefits to the Chesapeake Bay ecosystem. The wetland cells would serve as highly productive and protected nursery grounds for a wide range of organisms (some nektonic and some not) that utilize the marsh during some or all of their life cycle. Recreational boat traffic through the tidal channel is also assumed to be beneficial, although the benefits are not assumed to be significant. Ostensibly, both of these benefits will require the salt marsh be connected to the estuary in manner that allows the exchange of organisms and boats between the two. Figure 10 in Appendix C shows a "culvert control structure" at each end of the tidal channel and nine (9) "spillways" along the perimeter dike. It seems that these structures would preclude boat flow and possibly impede the flow of organisms from the salt marsh to the estuary. However, no discussions of post-construction removal of these structures or operational changes that would facilitate connectivity between the salt marsh and the estuary were found in the document.
Significance – Medium:
The proposed control structures at the constructed marsh outlets may inhibit the connectivity between marsh and estuary, producing environmental services that fall short of projected benchmarks, requiring consideration of management adaptations to enhance flows of organic detritus into the estuary and enhancing nekton access to the marsh. Although these benefits might not change the final project decision, it is important to the assessment of the project benefits.
Comment Cross-referencing:
(11) Comment: *Address how climate change will influence the engineering design.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A section on connectivity between the salt marsh and the estuary during and after construction, including how the control structures will be managed.

Comment 9:
The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.
Basis for Comment:
The Adaptive Management Plan contains no discussion as to how climate change (i.e. sea level rise) and colonization of wetland and upland cells by invasive species will be addressed. For example, how will the monitoring plan be designed/used to detect encroachment by invasive species such as *Phragmites communis* into the wetland cells? How will it be eradicated and controlled? And, if herbicides are used, how will potential effects be on non-target species be minimized? Or, if the rate of sea level rise accelerates, how will surface elevations in the wetland cells be maintained to support the desired wetland vegetation? For example, will thin-layer placement of dredge material be used to maintain the appropriate elevation in the wetland cells so they will not be flooded/submerged?
Significance – Medium:
This is important because these stressors may adversely affect the development of environmental and ecological benefits over the 50 year life of the project. Inclusion of this information will help managers anticipate potential problems that may crop up during the 50 year life of the project
Comment Cross-referencing:
(7) Comment: *The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.* (11) Comment: *Address how climate change will influence the engineering design.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be modified by including a discussion of how the Adaptive Management Plan (section 8 of the Final Integrated Feasibility Report and EIS and Appendix F) will address the following issues: • Invasive species detection and control, including a list of known invasive species, including terrestrial, wetland and aquatic invasives, encountered at Poplar Island or that are problematic elsewhere in the Mid-Bay region. • Measures to address how surface elevation in wetland cells will be maintained if sea level rise accelerates during the 50 year life of the project.

Comment 10:

National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.

Basis for Comment:

The Mid-Chesapeake plan formulation, i.e., the choice of a preferred alternative, depends on cost-effectiveness (CE) analysis and incremental cost analysis (ICA) rather than the usual cost-benefit analysis. The CE/ICA approach is appropriate in this application since the project results cannot be readily monetarized. The CE/ICA approach does, however, forgo the analytic convenience of monetary units that can be easily compared and discounted over time.

Since the output units in a CE/ICA approach are not discounted, it is not clear that appropriate account been taken of potential changes in ICU value or equivalence over time. Per USACE CE/ICA guidelines, ICUs are not discounted over time as are monetarized costs and benefits. The analysis therefore implicitly treats an ICU in year one and in year 50 as equally valuable, and a year 10 ICU at one location equivalent to a year 20 ICU at another location. The monetary costs, however, are discounted per USACE guidelines and practice.

It would be a reasonable precaution to try discounting the ICU outputs in parallel with the monetary costs to see if that comparison would shift the rankings of plan alternatives. Review team experience in other projects suggests that a 3% discount rate is appropriate for environmental outcomes. The literature (see Comment 13 should be consulted for best practices.

While a definitive treatment of outcome timing may not be possible, the issue should be explored to avoid having project sponsors blindsided in the future.

Significance – Medium:

This may be regarded as a procedural step, but should be given serious consideration to ensure that benefit timing does not affect plan formulation and alternative choice.

Comment Cross-referencing:

(4) Comment: *It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.*

(13) Comment: *Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.*

Recommendations for Resolution:

To resolve these concerns, the report would need to be expanded to include a discussion of environmental benefit (and environmental loss) timing issues and equivalence over the project lifetime.

Consensus Comment 11:
Address how climate change will influence the engineering design.
Basis for Comment:
Changing climatological conditions may impact some areas of the engineering design. Specific design details are not appropriate for this document, but there should be some discussion of the potential for climate change to influence the engineering design for the project.
Significance – Low:
The failure to address climate change leaves the reader uncertain as to whether the potential consequences of climate change will be considered in the engineering design, but the significance is low since it will not likely influence the final project decision.
Comment Cross-referencing:
(8) Comment: *Connectivity between the salt marsh and estuary is unclear both during and post construction.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • An acknowledgement of the potential for climate change and its influence on the engineering design process including statements about where and when it will be duly considered.

Comment 12:
To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.
Basis for Comment:
Nowhere in the Final Integrated Feasibility Report and EIS is there a diagram or schematic showing the layout or design of the wetland cells. One must go to Appendix C (Engineering Design Analysis) to find this information. This information is essential for evaluating the connectivity of the wetland cells to the Bay and connectivity is important for nekton (fish, motile invertebrates) to access the created wetlands.
Significance – Low:
Inclusion of these figures aids in understanding the connectivity between the wetland cells and the estuary since they clearly show the configurations of the tidal gut that the wetland cells connect to and creeks that connect each cell to the tidal gut.
Comment Cross-referencing:
(8) Comment: *Connectivity between the salt marsh and estuary is unclear both during and post construction.* It seems that the outstructure may be problematic.
Recommendations for Resolution:
These two figures need to be presented in Section 5.0 (Recommended Plan) of the Final Integrated Feasibility Report and EIS. Specifically, the figures should be presented and described in Section 5.4.2.a, James Island – Wetland Cell Development.

Comment 13:
Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.
Basis for Comment:
The report/EIS contains almost no references pertaining to creation of tidal marshes using dredge material, of which here is a large body of published literature, papers and books. Cited below, are several books pertaining to tidal marsh creation and assessment of biological structure and function, including timelines and expectations for achieving equivalence to natural tidal marshes. See also journal articles cross-referenced in Comment 5. **References** Kusler, J.A. and M.E. Kentula (ed.). 1989. Wetland creation and restoration: the status of the science. EPA/600/3-89/038. U.S. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, OR. Lewis, R.R. 1982. Creation and Restoration of Coastal Plant Communities. CRC Press. Boca Raton, FL. Weinstein, M.P. and D.A. Kreeger (ed.). 2000. Concepts and Controversies in Tidal Marsh Ecology. Kluwer Academic Publishers. Dordrecht., The Netherlands. Zedler, J.B. (ed.). 2001. Handbook for restoring Tidal Wetlands. CRC Press. Boca Raton, FL.
Significance – Low:
Inclusion of this material in report informs the reader that the project team is familiar with what is known (and not known) about tidal marsh creation using dredged material as well as the rate at which environmental/ecological benefits develop following creation of these wetlands.
Comment Cross-referencing:
(5) Comment: *It is overly optimistic to assume that the marsh will be fully functioning in five years.*
Recommendations for Resolution:
To resolve these concerns, the report would need to be modified by inclusion of a review of this literature in Sections 1 (Introduction, 1.5.2 – Beneficial Use of Dredged Material), 5 (Recommended Plan, 5.6 – Monitoring and Adaptive Management) and 8 (Adaptive Management and Monitoring, 8.3 – Monitoring Elements).

Comment 14:
The "Most Probable Future Without-Project Conditions" (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.
Basis for Comment:
The report attempts to portray the project as an ecosystem restoration project rather than the dredged sediment placement and beneficial use project that it is. This appears in several places in the report, but the most significant omission is the failure to consider alternatives for dredged sediment placement in the absence of the project. This is a crucial omission for the proper analysis of project benefits.
Significance – Low:
Although important, this is considered of low significance because the additional benefits of dredged sediment placement will not change the final decision.
Comment Cross-referencing:
No other related comments
Recommendations for Resolution:
To resolve these concerns, the report would need to be expanded to include: • A discussion of dredged sediment placement options in the absence of any island creation project.

APPENDIX B

FINAL CHARGE TO THE EXTERNAL PEER REVIEWERS

Mid-Chesapeake Bay Islands Ecosystem Restoration
Final Charge and Specific Focus Questions

Charge and Specific Focus Questions for the Final Integrated Feasibility Report and Environmental Impact Statement (EIS)

Executive Summary

None.

1.0 Introduction

None.

2.0 Problem, Needs, and Opportunities

Please comment on whether or not the problems, needs, and opportunities are correctly defined in terms of environmental and economic considerations.

3.0 Existing Resources

Comment on whether you agree with the general analysis of the existing resources within the study area.

For your particular area of expertise, provide an in-depth review of whether the analysis of the existing resources (both physical and biological) within the project area is sufficient to support the impact analysis in Section 6.0 (and in general, the EIS embedded throughout the Feasibility Study (see Appendix A)).

Given your area of expertise, does this section appropriately address all existing conditions?

Were the surveys conducted to evaluate the existing resources (e.g., fish, avian, benthos, mammals) adequate? If not, what types of surveys should have been conducted?

Were socioeconomic conditions adequately addressed? Were specific socioeconomic issues not addressed?

Please comment on the conclusion of the most probable future without project condition. Do you envision other potential outcomes?

Does the analysis sufficiently describe resources with direct or indirect use values and resources with non-use values?

4.0 Plan Formulation

Comment on whether you agree or disagree with how the selected alternative was derived. Were key policies and guidelines included in the plan formulation?

Comment on the plan formulation. Does it meet the study objectives and avoid violating the study constraints?

Are the future conditions expected to exist in the absence of the proposed project logical and adequately described and documented?

Are the changes between the without and with project conditions adequately described?

Are risks and uncertainties of benefits, costs, and impacts adequately addressed and described?

Please comment on whether you feel the objectives and constraints developed by the PDT at the beginning of the feasibility plan formulation are adequate? Where are they lacking?

Please comment on the Island Ranking Process used to select the islands for restoration. Were the engineering and environmental suitability analyses appropriate? Why or why not?

Please comment on the engineering design and ecological design considerations and constraints used to develop island alignment alternatives. Are there additional factors that need consideration?

Please comment on the screening of the proposed alternatives. Are the screening criteria appropriate? In your professional opinion are the results of the screening acceptable?

Please comment on the adequacy of the Island Community Unit method for quantifying environmental benefits. Is the process adequately described?

Please comment on the Island Community Index (ICI) approach used to identify habitat requirements.

(The next three questions should be considered here and in consideration of the referenced Appendix B.)

Was the economic analysis used for this project consistent with generally accepted economic analysis methodologies? Why or why not?

Are the considerations in the screening phase likely to ensure inclusion of the “Best Buy” restoration alternatives for further planning and in-depth evaluation?

The cost-benefit considerations in this plan are limited to ICU creation/protection and direct restoration costs. Is this limitation appropriate and justified to select the most cost-effective restoration alternatives? If not, what other values might be included?

5.0 Recommended Plan

Please comment on the likelihood of the recommended restoration project to achieve significant ecosystem output.

Please comment on the appropriateness of location, sizing and design of restoration measures.

Please comment on the likelihood of the recommended restoration project to maintain existing submerged aquatic vegetation (SAV) beds and protect the extent of former SAV beds.

Please comment on whether the ICU model was appropriately applied to quantify benefits and whether this application appropriately incorporated the science of estuarine ecology.

In your opinion, are there sufficient analyses upon which to base a recommendation for construction authorization?

6.0 Impacts to Project Area

Are the impacts to the project area as defined in this section consistent with a project of this scope and size?

Please comment on whether the hydrodynamic modeling was sufficient to identify potential impacts.

Please comment on whether the sediment transport analyses conducted for this effort were sufficient to identify potential impacts.

In your professional opinion, do the stated impacts on water quality, sediment quality aquatic and terrestrial resources and rare, threatened and endangered species appear reasonable? Why or why not?

Do the stated socioeconomic, economic (e.g., fisheries), and other impacts appear adequate and reasonable?

Please comment on whether the effects/impacts of the alternative plans are sufficiently considered to allow identification of potentially significant short term and long term costs and benefits.

Please comment on whether any of the identified effects/impacts are of sufficient magnitude to suggest that the economic analysis used to identify the "Best Buy" plans described in Section 3 may be inadequate to select the plan with the greatest net benefit.

7.0 Plan Implementation

Is the total project cost and schedule for the recommended plan appropriate for a project of this scope and size, given the future escalation in fuel and construction costs during the construction of the project?

8.0 Adaptive Management and Monitoring

Based on your expertise, is the adaptive management strategy proposed for this project appropriate? Why or why not?

Are the objectives for the monitoring elements (sediment, wetland vegetation, water quality etc.) reasonable? Should additional monitoring be considered?

9.0 Public Involvement and Agency Coordination

NA

10.0 Recommendations

Is the recommended plan and associated requirements clearly described and consistent with the rest of the report?

Appendix A. Environmental Impact Statement Index

NA.

Appendix B. Plan Formulation Supporting Documentation

Are the site identification, ranking, screening, and selection processes appropriate, comprehensive, and consistent with project goals? In your professional estimation, are the chosen sites the most suitable?

Were engineering and environmental considerations appropriately and comprehensively applied when selecting the alignments for the two sites?

(The next three questions are considered here and in Section 4.)

Was the economic analysis used for this project consistent with generally accepted economic analysis methodologies? Why or why not?

Are the considerations in the screening phase likely to ensure inclusion of the "Best Buy" restoration alternatives for further planning and in-depth evaluation?

The cost-benefit considerations in this plan are limited to ICU creation/protection and direct restoration costs. Is this limitation appropriate and justified to select the most cost-effective restoration alternatives? If not, what other values might be included?

Appendix C. Engineering Design Analysis

Provide an assessment of the overall engineering analysis, including an assessment of its quality, completeness, and feasibility.

Comment on the island engineering ranking and its application to the site selection process.

Does the analysis demonstrate sufficient engineering understanding of the subsurface conditions and impacts, particularly related to foundations and settlement, and existing ecosystems?

Does the analysis demonstrate sufficient engineering understanding of the hydraulics, hydrodynamics, and potential sedimentation of the two study sites?

Comment on the construction sequences and their relation to successful completion of the project with minimal negative environmental impact.

Is the future design effort sufficiently and adequately described in order to clearly define the engineering analysis to be conducted during the preconstruction engineering and design phase?

Appendix D. Real Estate Plan

NA

Appendix E. Environmental Compliance

NA

Appendix F. Adaptive Management Plan

Please comment on the two components (restoration and cell development) in the Adaptive Management Plan. Is the review process and interrelationship between the two components sufficient? Why or why not?

Are the goals and subgoals for each of the two components adequate? Should others be considered?

Appendix G. Public Involvement

NA

Appendix H. Report on Existing Conditions and Impacts to Socioeconomics, Aesthetics, and Recreational Resources

NA

Appendix I. Executive Summaries of Technical Reports

NA

Appendix J. List of Preparers & Reviewers

NA

Appendix K. References

NA

Appendix L. Recreation Justification

Although recreation features are being included in the Mid-Bay project as an additional project benefit only (i.e., they are not part of the overall project benefit cost analysis), does the conceptual plan that is being proposed for recreation purposes on the Mid-Bay Islands appear reasonable?

Appendix M. Formal Response to Comments

NA

ISSUE PAPER No. 1
Mid-Chesapeake Bay Island Ecosystem Restoration
Integrated Feasibility Report and Environmental Impact Statement
Revised August 2007

The report recommends commencing placement of dredged material at James Island in 2018. Do you believe that this is the correct timing based on the pertinent elements of cost, ICU's, capacity requirements, and DMMP recommendations contained in the Issue Paper?

Does the issue paper accurately reflect the optimized use of Poplar and James Islands in terms of accommodating projected dredged material capacity requirements and maximizing ecosystem restoration benefits?

This project does not produce monetary benefits, but rather ecosystem restoration expressed in Island Community Units and therefore does not have a traditional benefit-cost ratio and net benefits. Based on Corps of Engineers guidance for this type of project, are the economic principles employed in the analysis appropriate to support the recommended plan and the conclusion of the Timing analysis?

Mid-Chesapeake Bay Islands Ecosystem Restoration
CENAB responses to EPR comments

High Significance

- Comment 1:

> The analyses of environmental benefits are biased by the failure to subtract quantitative habitat injuries (costs) arising from filling water column and especially benthic habitats, rendering the selection process and justification for the preferred island alignment unreliable.

The team is working with fishery managers from the Plan Formulation Workgroup (Jane Boraczek of EA Engineering, Science, and Technology, and John Nichols of NOAA National Marine Fisheries Service) to quantify negative benefits from filling the water column and benthic habitats. The group is developing additional Island Community Indices (ICI) for the open water column (including benthic habitats) to add to the current Island Community Unit (ICU) methodology. Currently, the ICU method quantifies the benefit of creating island habitat and protecting SAV resources. ICUs will be calculated for the offshore area that would be filled at James and Barren Island. This will allow a net ICU to be calculated. The offshore areas that would be filled to restore an island with dredged material exist because previous islands have eroded. Similar water column and benthic areas are abundant in the Chesapeake Bay. The acreage to be filled is miniscule (2072 ac) compared to similar mesohaline acreage (1, 477, 638 ac).

The team will provide a discussion to support their conclusions produced by the plan formulation selection process. The team will use the net ICU calculation, monitoring data, and the written justification to support their recommended plan selection. Specific responses to issues such as the importance of particular ecosystem components (e.g. gem clams) will be included in the modified ICU analysis and supporting documentation.

At the beginning of the Mid-Bay project, the PDT decided that individual species would not be used to quantify environmental benefits. Rather than individual species, the team decided to base the evaluation of benefits on the fish and wildlife communities that would inhabit the restored island ecosystem. The ICU method was developed for Mid-Bay to capture the value of the island habitat diversity and the benefit to the communities that inhabit remote islands.

The ICU method was just one piece of the plan formulation process. ICUs were developed to assign a national ecosystem restoration (NER) benefit to the final set of alternatives. The plan formulation included a study area screening, an island ranking process based on engineering and environmental suitability, a GIS analysis based on engineering and ecological design considerations, a screening of proposed alternatives, and a refinement of the screening results, followed by assigning benefits using the ICU method. The benefits of ecosystem restoration projects can be quantified using a variety of measures, such as acres of habitat produced or miles of shoreline restored. Indices that combine separate measurements can also be used, and offer the advantage of lumping multiple types of benefits together into one unit. This ability of indices to capture varying types of benefits into one comparable unit is what made this method suitable to evaluate the diverse island ecosystems being planned in the Mid-Bay project.

ICUs are similar in concept to the Habitat Evaluation Procedure (HEP) and its associated Habitat Units and Habitat Suitability Units developed by USFWS. Similar to HEP, the main foundation is quality (indices) multiplied by quantity. However, ICUs provide the advantage for this project by allowing quantification of benefits to communities of wildlife rather than an individual species. The PDT did not want to focus the benefits quantification on a single species as the remote islands provide benefits to a wide range of species. These benefits vary functionally and seasonally depending on the species or community. That is, some communities will use the islands for foraging habitat, some for mating/nesting habitat, and others for resting and refuge. Habitat use changes seasonally and is dependent upon the life cycles and migration patterns of species. Furthermore, the ICU method was able to account for changes to benefits as the project developed and habitats matured.

The development of the ICU and its associated Island Community Indices was performed with a work group involving regional agency resource managers. The process relied on the input and best professional judgment of a number of resource experts and available scientific literature. The ICUs were intended to estimate benefits, but were not meant to serve as a quantitative research project.

The EPR reviewers suggested using a Habitat Equivalency Analysis (HEA) or productivity model to quantify the environmental injuries of filling the offshore areas. Data requirements for the HEA method include net gain in primary production expected from restoration, the food web structure, energetic transfer efficiencies (McCay and Rowe 2003), and site-specific kinetic data (e.g. wet-dry ratios, average kcal/species). Some of the detailed data needed to run the HEA are not available for Mid-Bay such as the kinetic data. Efforts to use these methods in the Chesapeake Bay region (explained below) have shown these methods are of limited value if detailed information is not available, which is the case for Mid-Bay.

The Masonville Dredged Material Confined Facility (DMCF) Permit Application is one effort that attempted to use these methods in the Chesapeake Bay region. For the DMCF in the Baltimore Harbor of the Patapsco River, it was suggested that a productivity model (along the lines of that used for the Craney Island EIS in Virginia) be used to assess the functional losses of filling 130 acres of open water with approximately 0.5 Mcy of dredged material annually. (Craney Island is a DMCF in the Elizabeth River that is undergoing a 580 acre expansion to provide a marine terminal.) As a conservative assumption, the water column (zooplankton including icthyoplankton and invertebrates) productivity was assumed to be similar between the Masonville and Craney Island sites even though the Masonville site lies in an area with much lower salinity and lower overall plankton productivity. The resource agencies accepted this conservative approach for the water column losses. However, applying the productivity modeling to the epibenthic community met with professional criticism. The productivity calculations are based on ecosystem kinetics and are dependent upon a variety of factors, including salinity, species-composition, and current patterns. Without site-specific kinetic data (e.g. wet-dry ratios, average kcal/species), the calculations must be done with surrogate species. The Craney Island model developers reviewed the calculations for the Masonville area and concluded that application of the Craney Island HEA model inputs to other areas of the Bay (particularly with lower salinities such as Masonville) would not be accurately predictive. Therefore, productivity modeling was abandoned. In summary, the lesson learned from Masonville was that reliable results are not achievable from the HEA without site-specific data, as would be the case in applying the HEA to Mid-Bay. Therefore, it was decided that this method was not applicable given the current level of information to the Mid-Bay project.

Although, HEA was not applicable, the Masonville DMCF project did utilize a site-specific modification of NOAA's Habitat Equivalency Analysis,that served as a justification for the compensatory mitigation options (to demonstrate sufficient replacement of ecosystem function). In order to demonstrate that the proposed mitigation options were replacing the values and functions lost to open water filling, a project-specific Habitat Condition Analysis, was developed (based on the NOAA HEA approach). This involved a multi-metric evaluation of the open water impacts and the benefits of the mitigation options based on standard measures of ecological value. The condition factors derived for the analysis came from standard regionally-appropriate and broadly-accepted measures of environmental quality (and were reviewed by local resource regulators/managers). To conduct the actual evaluation, an initial and final condition factor was assessed for the impacted area and the proposed mitigation options. The difference between the initial and final condition was scaled by the amount of acreage affected to yield the amount of compensation needed for the affected area. The same calculation was then completed for each of the mitigation options and the offsets from the mitigation options were balanced against the calculated loss. It was estimated that the aquatic projects generated more mitigation credits than were necessary to compensate for the wetland losses. However, although the Masonville methodology serves as an example the application of a method similar to what the EPR reviewers were suggesting and the method was reviewed by local resource agencies, it was, ultimately, a relatively qualitative approach that would not be compatible with the ICU outputs used to predict the benefits of habitat restoration of the Mid-Bay Islands.

In addition to the data limitations discussed, HEA or productivity methods are not consistent with the Island Community Unit methodology. That is, these methods would not have provided a means to calculate a 'net' ICU value as the output of the methods suggested by the EPR reviewers would not have been in units compatible with the ICU methodology. Further, the Mid-Bay project and the ICU methodology were formulated in conjunction with and have the support of the various resource agencies that ultimately have the responsibility for the island resources, NOAA NMFS, USFWS, MDNR, and MDE. A great deal of work was devoted to developing this project with the resource agencies. Modifying the ICU method that has the buy-in of the resource agencies is more favorable and timely than attempting a new method.

Literature Cited

McCay, Deborah P. and Jill J. Rowe. 2003. Habitat restoration as mitigation for lost production at multiple trophic levels. Marine Ecology Progress Series. 264: 233-247.

- Comment 2

Water quality impacts associated with construction and the potential negative impacts of resettled suspended sediment to submerged aquatic vegetation (SAV) and natural oyster beds (NOBs) were not addressed.

The team prepared a "Simplistic Assessment" as suggested by the EPR reviewers considering sediment resuspension, transport, and deposition, and oyster and SAV requirments to assess construction impacts for both Barren and James Island. The team concluded that there will be no significant turbidity or environmental impacts to the oyster bars or SAV from construction at Barren or James Island. During the development of the Mid-Bay project Federal and State resource were involved in planning and in the assessment of impacts. Their opinions were heeded and their agencies agreed with our findings and decisions regarding the benefits and impacts of the proposed construction. No issues were raised by the assessment to warrant the 3D hydrodynamic and sediment modeling proposed as an additional tool by the EPR reviewers if the simplistic assessment was inconclusive.

The Simplistic Assessments are as follows:

BARREN ISLAND
Given:
1. Distance to SAV and Oyster Bars is approximately 2,500 ft and 2,000 ft, respectively.
2. Construction Technique is mechanical placement and there will be no dredging
3. Time of Year restrictions (1,500 ft during sensitive periods for SAV and Oysters) will apply.
4. Experience level is very high for this application (Poplar Island toe dike and north Barren Island dike construction).

Assumptions:
- Data from the Poplar Island toe dike indicates that sediment would drop out of the water column within 4 hours, prior to it reaching SAV beds and oyster bars (Mid-Bay Report 6-8).
- No dredging will occur at Barren Island to disturb sediments.
- Barges will be small and light-loaded from a larger barge moored offshore for Barren construction. Vessel speed will be low further limiting bottom disturbances.
- Construction will not occur during SAV growing season. It is not known at this time if there will be SAV in breakwater construction area, but SAV surveys performed in 2002 and 2003 did not detect any. Further, SAV surveys by the Virginia Institute of Marine Sciences (VIMS) have not identified any SAV in the breakwater construction area in the last ten years. It is unlikely that SAV would grow in the Phase 2 (9. 5 ac) footprint because of water depths which are deeper than the photic zone (6feet) Phase 1 is the proposed lateral expansion of an existing breakwater. It is possible that some

SAV may occur in the 1.1 acre footprint of Phase 1 which is in 4 foot water depths; however none has been identified.

- 1,300 lb armor stone at Barren will be individually placed. Fabric will be placed on bay bottom prior to placement.
- Very little turbidity will occur and will not disperse far (Mid-Bay p 6-8).
- Breakwaters will be in depths of 4 feet to 6 feet. The photic zone is considered to be from the water surface to approximately 6 feet in depth or 2 meters in the bay.
- Breakwaters would occupy 10.6 acres of Bay bottom if both Phase 1 and 2 are built (p 5-2) while construction would protect 1325 acres of SAV habitat (Mid-Bay p 5-3).
- Flow appears to be sufficient to keep leaves clean of sediment as indicated by thriving SAV in the area.
- Sediment resuspension naturally occurs in the area but the creation of stone breakwaters is not expected to add significantly to turbidity and will help to reduce sediment.
- The Poplar Island test toe dike construction was very similar and no adverse consequences resulted.
- Previous Barren Island construction activities have not produced SAV impacts.
- TOY restrictions would be followed.

Conclusion:
No significant turbidity or environmental impacts from construction at Barren are likely to result to oyster bars and SAV due to distance of project from SAV beds and oyster bars, time of year restrictions and construction techniques.

State and Federal resource agencies were on the Project Delivery Team (PDT) and provided expertise. (NOAA, USFWS, NMFS, USGS, Maryland Department of Natural Resources (MDDNR) Maryland Department of the Environment (MDE), Maryland Geological Survey (MGS), University of Maryland, and University of Virginia.)

JAMES ISLAND
Given:
1. Distance to SAV and Oyster Bars is approximately 1,750 to 2,000 ft, and 500 to 1,000 ft, respectively.
2. Construction Technique. Dredging will occur for the access channel which is 12,720 feet in length. Of the total length, 3, 070 would be within the diked foot print of the project. All dredging for dike construction material will be within the footprint. (Mid-Bay p.5-1). Stone will be mechanically placed over sand cored cloth covered dikes.
3. Time of Year restrictions apply (1,500 ft.?? during sensitive periods for SAV and Oysters).
4. Experience level is very high for this application (Construction of 1,140 acre Poplar Island and approximately 6 miles of dikes).

Assumptions:

- Data from the Poplar Island toe dike indicates that sediment would drop out of the water column within 4 hours, prior to it reaching SAV beds and oyster bars (Mid-Bay Report 6-8).

- Construction will not occur during SAV growing season.
- Turbidity will not disperse far (Mid-Bay p.6-8).

- . Time of Year (TOY) restrictions would be followed

State and Federal resource agencies were on the Project Delivery Team (PDT) and provided expertise. (NOAA, USFWS, NMFS, USGS, Maryland Department of Natural Resources (MDDNR) Maryland Department of the Environment (MDE), Maryland Geological Survey (MGS), University of Maryland, and University of Virginia.)

Other Significant Factors to Consider:
1. The Poplar Island Restoration Project has been under construction since 1999. This project is very similar and our experience with its relative absence of significant adverse consequences served as a basis (Poplar Island construction has not produced negative impacts to nearby SAV and oysters) for these assumptions.
2. TOY restrictions will be applied to protect SAV and oysters during sensitive periods.

Conclusion:
No significant turbidity or environmental impacts from construction at Barren are likely to result to oyster bars and SAV due to construction techniques, time of year restrictions, experience and distance from SAV beds and oyster bars.

Medium Significance

- Comment 3

The Preferred Alternative did not undergo the same level of rigor/review as the two original alternatives. The Preferred Alternative was added after the cost-effectiveness (CE) analysis and the incremental cost analysis (ICA) were completed, which theoretically casts doubt on its justification. The preferred alternative should be incorporated in the CE/ICA process.

The preferred alternative was originally included in the CE/ICA. Per HQUSACE guidance as documented in the Project Guidance Memorandum (PGM) of May 2007, the preferred alternative was removed from the CE/ICA as it was an iteration added after the CE/ICA. Section 4.7 was significantly changed, providing detailed information on how the recommended plan was selected. The entire comment from the PGM follows. Language specific to this decision is highlighted.

From p 26 of the May 2007 PGM:
1) HQUSACE Comment: Formulation Rationale. The rationale for linking the formulation of the two island features is not evident and results in some confusion in the incremental analysis. These islands are physically separated by about 14 miles, would utilize different navigation projects as a source of material, their scales and costs are vastly different (James Island restores 2072 acres, Barren Island restores 72), and their authorization is being sought under separate processes and authorities. Therefore, it is unclear why the formulation and CE/ICA analyses are linked and whether that linkage

affects the incremental justification of the features. Further rationale is needed to support the formulation of the islands, which appear to be separable increments. The scaling of the Barren Island project also needs clarification. The text notes that the scale is limited due to the impacts to the surrounding ecosystem, but it isn't evident how scaling of Barren Island alternatives was accomplished to determine the optimum investment. See section E-36.c. and E-14.g.(2) in ER 1105-2-100.

CENAB Response: (21 March 2006) Need further clarification from HQ at FRC to address comment appropriately. Formulation focused meeting dredged placement needs (3.2 mcy/year) while maximizing environmental benefits. Plans were formulated that were stand alone options, which were then combined to maximize potential benefits. Will review and clarify section 4.3.6.a which describes how scaling down of Barren Island project was accomplished.

Discussion at FRC: Need to ensure consistency among incremental analysis for one island and multiple island scenarios. Discussion on whether "If/Then" analysis should affect the incremental analysis. Best increment should be used for each island.

CENAB Revised Response: (11 May 2006) Formulation focused on meeting dredged placement needs (3.2 mcy/year) while maximizing environmental benefits. Plans were formulated that were stand alone options, which were then combined to maximize potential benefits. Will review and clarify section 4.3.6.a which describes how scaling down of Barren Island project was accomplished and remove Barren Island E from incremental analysis. "Best Buy" graph will be included in final draft if necessary to communicate results.

Action Required: The plan formulation and selection section of the report needs to be recast. HQ suggests that the text be reviewed and expanded to clearly explain the key assumptions and objectives for each step of formulation. The formulation and selection process needs to address the development of alternative Barren E as well as the timing for construction and filling of James Island, based on needs for dredged material disposal and ecosystem restoration. The If/Then analysis may be helpful to some extent in telling the story. Although linked to an extent by the formulation process and cumulative impacts, each feature must demonstrate that the formulation requirements are satisfied under the authority being recommended. The draft report should be revised to address these points and coordinated with HQ prior to its circulation for public review.

CENAB Response: (11 Aug 2006) Many changes were made to section 4 – Plan Formulation, in an attempt to address this comment. The final array of best buy plans was changed to not include Barren E alignment, as this was iteration after the CE/ICA was conducted (see response to comment B.3 above- 'Location and Timing' analysis). Section 4.7 was significantly changed, providing detailed information on how the recommended plan was selected. These changes include: 1) a more detailed description on the objective comparison in 4.7.2; and 2) an NED/NER trade-off analysis discussion (4.7.5);

HQUSACE Analysis (September 2006): The concern is partially resolved. The early cycle formulation rationale has been edited, but changes/discussion on timing of James need to be included. The revised section 4 text discusses James coming on line in 2018 and Barren ASAP, but the discussion/rationale needs to be expanded. James construction is completed in 2014/2015, but could be delayed three years to avoid overfilling or even longer (if overfilling is acceptable) to 2021. The text should present information on the cost effectiveness of the individual islands- what $/ICU results relative to the timing. Also, the recommendations and implementation sections indicate that materials from the northern shipping channels may be used to accelerate the habitat development at Barren. This would appear to constitute another alternative-the Barren E costs would have to reflect the increased haul costs of dredged material from the northern channels (not the base disposal plan as is the case for the Honga River materials) and the outputs would be accelerated leading to different annual costs and outputs. The outputs for James Island would be affected slightly as a result.

Discussion/Action Required (21 September 2006): HQ wants to compare the life cycle costs of the various start dates as indicated by the timing analysis of James. Inconsistencies between the MCACES for Barren and James led to questions about the incremental costs of outputs for each proposed project in the recommended plan. For example, wetland plantings are included at James but not at Barren. The district explained that wetland planting at Barren will be accomplished using volunteer efforts. The final text will strike language about using the material from upper bay channels at Barren Island. The incremental costs per output for the recommended plan at each island will be presented in the report. The analysis of timing for development of James Island will be addressed. See Comment 3.b.3 on Location and Timing.

CENAB Response (23 May 2007): Language referring to placement of material from the upper channels at Barren has been struck from the document. The wetland plantings for the stand alone Barren alternatives included in the CE/ICA are not different from those at James. The only difference in costs for the alternative analysis is the distance it takes to haul the material to Barren vs. James. In terms of benefits, there is no difference in the way benefits were calculated for James or Barren. The same method was applied, so no bias towards one alternative over another was made. The Barren Island E alignment was a reiteration of one of the best buy plans, James 5/Barren D. This iteration is explained in Section 4.6.9. Therefore, the volunteer planting option at Barren was not a part of the plans included in the CE/ICA, and would not be an option for any of the Barren Island alignments used in that phase of the plan formulation. Timing analysis is included in Attachment 1 of this PGM. The incremental costs per ICU and acre for the recommended plan at each island are included in the Executive Summary and in Section 4. See Attachment 2, Issue Paper No. 2, of this PGM for more documentation on the linking of these two sites and projects.

- Comment 4

It appears that the sensitivity analysis was not conducted, and sources of risk and uncertainty and their impact on plan formulation are not documented.

Recent Corps guidance requires that any decision documents after 1 Oct 2007 which are over $40M that go to Congress for funding will require a risk analysis. To meet this new requirement the Corps has initiated a cost and schedule risk analysis. The project delivery team has met and brainstormed to identify project risk elements. Risk elements are any aspects of the project which could cause the cost and/or schedule to vary from the estimators' cost estimate and schedule. The cost and schedule risk assessment will utilize Crystal Ball software in order to conduct a risk analysis. Walla Walla District is performing the Crystal Ball analysis. Results are due on February 29, 2008.

In addition, risk and uncertainty was addressed in other comment-responses herein as it relates to the timeframe to develop a fully functioning marsh, sea level rise, and adaptive management.

- Comment 5

It is overly optimistic to assume that the marsh will be fully functioning in five years.

CENAB agrees fully with comment. The cited references provided by reviewers (and listed below) have been reviewed. Wetland cells, in fact, do continue to increase in value through 10 years in the current ICU quantification. Wetland maturity was not clearly communicated. The five year marker identified in the Feasibility Report was specific to vegetation development. In addition, the findings of Cornell et al. 2007 suggest that most major carbon fluxes are likely established in less than 5 years. However, additional wetlands function was accounted for and ICU increases do occur through year 10 as the benthic community develops. In the current formulation, the wetland cells gain nearly 20% of their value between years 5 and 10 as the benthic community matures. This was poorly communicated. The increase in benefits from benthic development was identified only in a footnote in Table B-17. Table B-17 will be corrected to state that wetlands mature fully in 10 years, not 5 years. No changes will be made to the ICU calculations as they do account for what the reviewers were requesting.

Cornell, J.A., C. Craft and J.P. Megonigal. 2007. Ecosystem gas exchange across a created salt marsh chronosequence. *Wetlands* 27:240-250.

Craft. C.B. and J.N. Sacco. 2003. Long-term succession of benthic infauna communities on constructed *Spartina alterniflora* marshes. *Marine Ecology – Progress Series* 257:45-58.

Zheng, L., R.J. Stevenson and C. Craft. 2004. Changes in benthic algal attributes during salt marsh restoration. *Wetlands* 24:309-323.

- Comment 6

The report should make it clear that the "need" for the project and the final project scale are both determined by the need to dispose of a target volume of dredged material rather than based on the incremental cost and incremental benefits.

The dredged material disposal 'need' for the project is quantified in Objective 3 which states: Provide capacity for placement of dredge material (3.2 mcy/y). (Federal DMMP identified a need to place 30 to 70 mcy of material over a 20-year period.) The placement capacity was considered at two steps in the plan formulation, 1) during the island ranking process as an engineering suitability criteria (Section 4.3.2a) and 2) as an engineering design consideration when developing island alignments (Section 4.4.1).

CENAB will reiterate the placement capacity needed (3.2 mcy/y and 30-70 mcy) throughout the report and more adequately stress the need to provide a project that sufficiently provides the needed placement capacity. The sections to be updated include:

Report Summary- Study Objectives- Problems and Opportunities
- Planning Objectives

Section 1.3- Study Purpose and Need
Section 2.1.2- Dredged Material Placement Needs
Section 4.1.1 Federal Objective

An explanation will also be added to the Recommended Plan sections of the Report Summary and main report to communicate why the recommended plan (28-30 mcy/y over 28-30 years) exceeds the projected placement capacity needs as identified in Objective 3. The reasons for recommending a project with the ability to handle a greater capacity of dredged material include the ability to accommodate risk and uncertainty surrounding annual dredging needs (3.2 mcy/y is an average), provide a factor of safety in the plans, and be able to manage increased placement needs if existing channels are enlarged to authorized widths (currently many channels are below authorized widths).

- Comment 7

The design of the environmental monitoring to be conducted after initiation of the project is not described in sufficient detail to guarantee that the purposes of such monitoring can all be fulfilled.

USACE and the Maryland Port Administration have contracted with ARCADIS to develop Mid-Bay Island Ecological Design Criteria and a Habitat Development Work Plan in support of the Mid-Bay Adaptive Management Framework. The detailed monitoring plan will be based upon the selection of reference ecosystems within the similar environmental conditions as the constructed systems. A detailed monitoring plan will be developed at a later time and will rely upon review of published results dealing with the use of dredged material in wetland construction and wetland restoration. A large repository of literature related to dredged material as wetland substrate is at the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi in the 1980-1990's. The effort was directed by Dr. Mary C. Landin and her colleagues and is the basis of the effort being proposed around the nation. Over 100,000 acres have been created using dredged material over the last two decades (Landin 1997). Data from the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island (Poplar Island) will be utilized where acceptable. References associated with east coast marsh restoration will be reviewed and incorporated into the detailed monitoring plan as well as obtaining reference sites as close as possible to the site (Kusler and Kentula 1989, Craft et al 1999, Weinstein et al 2000).

The importance of the reference marshes is to identify naturally occurring changes in the environment that would affect restoration success; therefore the reference marshes have to be subjected to similar conditions and the use of ecological benchmarks (Shisler 1989, Shisler et al 2007). The Poplar Island data will be reviewed to identify potential issues that will allow the development of strategies in the Adaptive Management Plan (AMP).

Literature Cited:

Craft, C., J. Reader, J.N. Sacco and S.W. Broome. 1999. Twenty-five years of ecosystem development of constructed *Spartina alterniflora* (Loisel) marshes. Ecological Applications 96:1405-1419.

Landin, M.C. 1997. Twenty-five years of long-term monitoring of wetland projects constructed with dredged material, with comparisons to natural wetlands, throughout U.S. waterways. pp. 26-29. In: Landin, M.C. (editor). 1997. *Proceedings: International Workshop on Dredged Material Beneficial Uses.*

Mohan, R.K., J.K. Shisler, W.J. Dinicola, T.J. Iannuzzi and D.F. Ludwig. In press. Design and construction considerations for wetland restoration using dredged material. *Journal of Dredging Engineering*.

Shisler, J.K. 1989. Creation and restoration of coastal wetlands of the Northeastern United States. pp. 145-165 In Wetlands Creation and Restoration: The status of the Science, Vol I. ed. J.A. Kusler and M.E. Kentula (editors). Island Press.

Shisler, J.K., T.J. Iannuzzi, A.D. Standbridge, J.M. Gonzalez and D.F. Ludwig. In Press. Ecological benchmarking in an urbanized estuarine river system. *Urban Restoration.*

Teal, J.M. and L. Weishar. 2005. Ecological engineering, adaptive management, and restoration management in Delaware Bay salt marsh restoration. *Ecological Engineering* 25:304-314.

- Comment 8

Connectivity between the salt marsh and estuary is unclear both during and post construction.

The issue of connectivity also arises at the Poplar Island Environmental Restoration project and has been addressed by the Workgroup and the Habitat sub-group. Concur that connectivity, fish access, and climate changes are issues that need to be addressed and these issues are being considered by the Mid-Bay project. It should be noted that many of the members of the Mid-Bay team have worked to address these issues at Poplar.

Figures 10 and possibly 16 in the Engineering Appendix will be revised to clarify possible options for connectivity and will also be presented in the Main Report. The spillways shown on Figure 10 were misinterpreted as connection structures. These act only to decant water during filling of cells with dredge material. Cells may connect directly to estuary or the tidal gut(s).

Climate change is being addressed at Poplar by increasing the elevations of the wetlands planting.

The issue of inlet size and design is being worked on now at Poplar. Efforts are underway to maximize large fish ingress and egress while permitting wetlands establishment and construction activities at the site. The Poplar marshes have performed as well as reference marshes in terms of forage fish production and some predatory fish have started to utilize the marshes. It is expected that detrital export will occur from the marshes once the wetlands vegetation has really established. However, given the uncertain information on climate change the Poplar team is aiming for more of a flood dominated rather than an ebb dominated regime.

- Comment 9

The Adaptive Management Plan needs to include a discussion on how climate change, sea level rise, and invasive species will be addressed.

Concur. The AMP will include a discussion on how these issues will be addressed. Titus (1990a, 1990b) identified the impacts of sea level rise as a documented factor affecting coastal areas as result of climate warming with documented loss of coastal wetlands (Gornitz et al 2002). The sea level rise impacts on salt marsh ecosystems have been identified to be most aggressive in the high marsh habitats (Warren and Niering 1993, Rogers et al 1998, Orson et al 1998, Donnelly and Bertness 2001, Miller et al 2001); therefore to address these impacts would be to adjust the proposed percentage of low to high marsh. The adjustment will have to be addressed in the evaluation of the engineering design. Marsh accretion is a method of addressing sea level rise which mostly occurs by mineral sedimentation (Callaway et 1996, Callaway et al 1997); therefore long range consideration would be the periodic application of a thin layer of approved dredged material to selected areas that are identified in the Adaptive Management Plan (AMP). The current draft ecological design criteria for the Adaptive Management Plan include attributes for meeting habitat goals and monitoring marsh accretion rates, elevation, and subsidence.

The AMP will be similar to the concept addressed in Weinstein et al (2000) that address methods of monitoring of salt marsh habitats and development of attainable objectives (Thom 2000, Teal and Weishar 2005). The construction of wetlands creates an opportunity for aggressive invasive species to dominate created systems over a period of time (Daiber 1986, Odum 1988). *Phragmites australis* (common reed) has become a major problem in constructed wetlands (Roman 1984, Havens et al 1997); therefore a *P. australis* component in the AMP will be to monitor the species colonization and implement control strategies on the site. One of the methods would be the application of glyphosate which has been demonstrated as an effective means of control with minimum impacts to the non-target species. The restoration of *P. australis* marshes have documented increased to the salt marsh ecosystem (Warren et al 2002, Seigel et al 2005). A number of plant and animal invasive species are documented in the area; the current draft of the ecological design criteria for the AMP will address these species and make recommendations for control to insure long range success.

Literature Cited:

Callaway, J.C., J.A. Nyman and R.D. DeLaune. 1996. Sediment accretion in coastal wetlands: a review of a simulation processes. *Current Topics in Wetland Biogeochemistry* 2:2-23.

Callaway, J.C., R.D. DeLaune and W.H. Patrick, Jr. 1997. Sediment accretion rates from four coastal wetlands along the Gulf of Mexico. *Journal of Coastal Research* 13:181-191.

Daiber, F.C. 1986. Conservation of Tidal Marshes. Van Nostrand Reinhold Co., NY. NY.

Donnelly, J.P. and M.D. Bertness. 2001. Rapid shoreward encroachment of salt marsh cordgrass in response to accelerated sea-level rise. *Proc. National Academy of Sciences of United States of America* 98:14218-14223.

Gornitz, V., S. Couch and E.K. Hartig. 2002. Impacts of sea level rise in the New York City metropolitan area. Global and Planetary Changes 32:61-88.

Havens, K.J., W.I. Preist and H. Serquist. 1997. Investigation of long-term monitoring of *Phragmites australis* within Virginia's constructed wetland sites. *Environmental Management* 21:599-605.

Miller, W.D., S.C. Neubauer and I.C. Anderson. 2001. Effects of sea level induced disturbances on high salt marsh metabolism. *Estuaries* 24:357-367.

Orson, R.A., R.S. Warren and W.A. Niering. 1998. Interpreting sea level rise and rates of vertical marsh accretion in a southern New England tidal salt marsh. *Estuarine, Coastal Shelf Science* 47:419-429.

Rogers, J., J. Harris and I. Valiela. 1998. Interaction of nitrogen supply, sea level rise, and elevation on species form and composition of salt marsh plants. *Biological Bulletin* 195:235-237.

Roman, C.T., W.A. Niering and R.S. Warren. 1984. Salt marsh vegetation change in response to tidal restriction. *Environmental Management* 8:141-150.

Siegel, A., C. Hatfield and J.M. Hartman. 2005. Avian response to restoration of urban tidal marshes in the Hackensack Meadowlands, New Jersey. *Urban Habitats* 3:87-116.

Teal, J.M. and L. Weishar. 2005. Ecological engineering, adaptive management, and restoration management in Delaware Bay salt marsh restoration. *Ecological Engineering* 25:304-314.

Titus, J.G. 1990a. Greenhouse effect, sea level rise, and land use. *Land Use Policy* 7:138-153.

Titus, J.G. 1990b. Greenhouse effect, sea level rise, and barrier islands: Case study of Long Beach Island, New Jersey. *Coastal Management* 18:65-90.

Thom, R,M. 2000. Adaptive management of coastal ecosystem restoration projects. *Ecological Engineering* 15:365-372.

Warren, R.S. and W.A. Niering. 1993. Vegetation change on the northeast tidal marsh: interaction of sea-level rise and marsh accretion. Ecology 74:96-103.

Warren, R.S. P.E. Pell, J.L. Grimsby, E.L. Buck, G.C. Rilling and R.A. Fertik. 2001. Rates, patterns, and impacts of *Phragmites australis* expansion and effects of experimental *Phragmites* control on vegetation, macroinvertebrates, and fish within tidelands of the lower Connecticut River. *Estuaries* 24:90-107.

Weinstein, M.P., J.M. Teal, J.H. Balletto and J.H. Strait. 2000. Restoration principles emerging from the world's largest tidal marsh restoration project. *Wetlands Ecology and Management* 8:1-21.

- Comment 10

National Economic Development (NED) outcomes (e.g., Island Community Units, or ICUs) are not discounted over time like monetary costs. Yet the incidence of environmental benefits over the project lifetime may be uneven and should be considered in alternative plan formulation timelines.

USACE guidance states that environmental benefits are not to be discounted. In fact, guidance dictates that environmental benefits are to be averaged over the life of the project. Since the project alternatives generally has ever increasing ecosystem outputs as time goes on, and since they all had the same project start date, discounting benefits would not yield a change in the selected plan. Further, since the benefits are not monetary and there is to be no benefit-cost-ratio calculated discounting is not critical to determining an "apples to apples" benefit as compared to the monetary cost.

The study did not initially consider variation in the start date, or base year, of the project alternatives. The Federal Dredged Material Management Plan (DMMP) for the Port of Baltimore concluded that a new site would be required in 2018. It was not until after completion of the draft report and coordination with HQUSACE about the PGM that the issue of other base years was considered. Since a delay in project start will reduce the annual cost of a project due to discounting, but benefits are unaffected, a later start date compares unfairly to the earlier project. This is not logical since the earlier ecosystem benefits are realized, the better. During consideration of various project start dates, NAB was not able, due to the existing guidance, to discount benefits and allow for a fair comparison. That being stated, it would be improper to undergo this analysis unless directed by HQUSACE due to the implications to existing guidance.

Low Significance

- Comment 11

Address how climate change will influence the engineering design.

The report will be revised to acknowledge the potential for climate change and what influence relative sea level rise would have on the engineering design. Statements will be added to address how it may impact the project and the measures needed to accommodate relative sea level rise. Consideration will be given to increasing the width of the perimeter dikes to allow future raising of the top of the dikes without impact to operations. The impact on design of the dike armor stone with regard to size and elevation will also be assessed. The dike armor would most likely be extended up the slope if dike raising is required. The operation and maintenance costs would be adjusted as required to account for these future actions. The elevation ranges and percentages of high and low marsh will be assessed to possibly accommodate a limited rise in sea level. Detailed considerations of climate change will occur during detailed design of project features.

Clarifying question posed to reviewers: For climate change we will be considering sea level rise as a factor in our design of the wetlands during the Pre-construction Engineering and Design Phase. We are not sure if the comment is for us to consider climate change as it relates to the wetland designs; the dikes design; or both.

- Comment 12

To better illustrate the connectivity between the salt marsh and open water, duplicate Figures 10 and 16 of Appendix C in the appropriate section of the main body of the report.

Concur that Figures 10 and 16 should be shown in main body of the report. In addition, Figure 10 will be revised to better indicate the division of the salt marsh into cells that are connected either to tidal guts or directly to the bay.

Clarifying question posed to reviewers: You refer to a diagram in Appendix C of the Engineering Design Analysis for wetland cells. Are you interpreting the spillways shown in the diagram as the connection of the wetlands to the bay?

- Comment 13

Since this project is presented as a restoration, some attention needs to be paid to literature on the subject.

Concur. There are numerous citations provided in Appendix K of the Feasibility Study. The development of the Ecological Development Criteria that will be used in island design and development of the AMP relies heavily on the scientific literature, but was not provided to the reviewers. This work cites over 200 scientific publications on ecology, engineering, macrofauna, microfauna, macroflora, microflora, soil, water quality, Chesapeake Bay flow dynamics, dredged material placement, and ecological restoration with dredged material. While the team feels that scientific literature has been considered, it should be recognized that from the Poplar Island Restoration Project, USACE-Baltimore is at the forefront of environmental restoration using dredged material within the Mid-Atlantic region. Much information and experience specific to building islands within the Chesapeake Bay has been achieved through that project that is not available through any other sources of scientific literature.

- Comment 14

The "Most Probable Future Without-Project Conditions" (Section 3.5) does not specify where the dredged sediment will be placed if the project does not occur.

Currently, Section 3-5 states 'Further placement sites will need to be identified and online by 2016 in order to accommodate a 57-million cubic yard shortfall in dredged material placement capacity for C&D Canal approach channels and Chesapeake Bay approach channel maintenance, which is discussed in Section 2.' Additional language will be added to Section 3.5 ('Most Probable Future Without-Project Conditions') that explains that if the proposed project does not proceed, the DMMP will need to be revisited. Other strategies will need to be devised to handle the shortfall in dredged material placement capacity. Under a worse case scenario, if no other alternatives are developed, ocean dumping could be used to dispose of the sediments. However, the cost of this practice is very high and is not Federally cost-shared.