Second Addendum to Final Independent External Peer Review Report Port Everglades Harbor Feasibility Study, Broward County, Florida

Prepared by
Battelle Memorial Institute

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

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LIST OF ACRONYMS

DrChecks	Design Review and Checking System
EC	Engineer Circular
HEA	Habitat Equivalency Analysis
IEPR	Independent External Peer Review
OMB	Office of Management and Budget
PDT	Project Delivery Team
USACE	United States Army Corps of Engineers

1. INTRODUCTION

This second addendum is a supplement to the Final Independent External Peer Review Report for the Port Everglades Harbor Feasibility Study, Broward County, Florida (hereinafter Port Everglades Feasibility Study Final IEPR Report) submitted on August 15, 2013, by Battelle. This addendum was prepared to document activities associated with the IEPR Panel's environmental members' review of the Port Everglades Navigation Improvements-Draft Comprehensive Mitigation Plan and Incremental Cost Analysis.

The two environmental members of the Panel reviewed the Mitigation Plan as well as two appendices to the Plan: Appendix E-3 (entitled Mitigation Requirements Analysis for Hardbottom Resources Associated with Port Everglades Harbor Navigation Improvements) and Appendix E-5 (entitled Port Everglades Expansion Monitoring and Adaptive Management Plan). Hereinafter, the documents that were reviewed for this second addendum will be referred to as the "Mitigation Plan", unless a specific Appendix is being referenced.

Prior to the review of the Mitigation Plan by the environmental members of the Panel, all work items listed in Task 7 (Response to the Independent External Peer Review Report) had been completed. U.S. Army Corps of Engineers (USACE) Evaluator Responses and Panel BackCheck Responses had been entered into USACE's Design Review and Checking System (DrChecks) for the original 22 Final Panel Comments (Appendix A of Port Everglades Feasibility Study Final IEPR Report) developed by the Panel. Battelle also had provided USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a deliverable and record of the IEPR results.

In addition, a first addendum to the Final IEPR Report had been submitted on October 20, 2014. This first addendum was prepared to document activities associated with the IEPR Panel's (the Panel's) review of revisions to the Environmental Impact Statement (EIS), revisions to the Economics Appendix to the Feasibility Report, and the public and agency comments. The Evaluator and BackCheck Responses associated with this review of revised documents are still pending.

Battelle received the Mitigation Plan from USACE and Battelle provided the Mitigation Plan to the environmental members of the Panel. The environmental members of the Panel were asked to determine if additional discipline-specific technical concerns existed in the Mitigation Plan. The environmental members of the Panel identified five new issues and subsequently generated five Final Panel Comments summarizing the concerns.

This second addendum contains the additional Final Panel Comments (presented in Section 4) and briefly details the IEPR process that determined the need for, and led to the generation of, these comments. The Final Panel Comment numbering in this second addendum begins with Final Panel Comment 16, and continues the Final Panel Comment numbering presented in the first report addendum, which stopped at Final Panel Comment 15.

2. METHODS

The section summarizes the activities associated with the review of the Mitigation Plan conducted for this project.

It is anticipated that Battelle will enter the additional Final Panel Comments developed by the environmental members of the Panel into DrChecks, a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the additional Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the Mitigation Plan review document IEPR results.

2.1 Conduct of the Mitigation Plan Review

The environmental members of the IEPR Panel received the Mitigation Plan from Battelle on November 20, 2014. The documents and files in bold font were provided for review.

- **Port Everglades Navigation Improvements-Draft Comprehensive Mitigation Plan and Incremental Cost Analysis**
- **Appendix E-3: Mitigation Requirements Analysis for Hardbottom Resources Associated with Port Everglades Harbor Navigation Improvements**
- **Appendix E-5: Port Everglades Expansion Monitoring and Adaptive Management Plan.**

The environmental members of the Panel reviewed the Mitigation Plan to assess the “adequacy and acceptability of the environmental methods, models, and analyses used” (EC 1165-2-214; p. D-4).The environmental members of the Panel were “charged” with keeping in mind one technical question that had been asked during the previous review of the revised documents (as documented in the first addendum to the Final IEPR Report).

1. **Comment on the ability of the proposed mitigation plan to address adverse impacts from the project.**

In order to capture a complete review of the Mitigation Plan, Battelle also asked the environmental members of the Panel to share overall impressions of the document. Battelle facilitated a two-hour teleconference with the environmental members of the Panel so that technical information could be exchanged. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Second Addendum to the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Second Addendum to the Final IEPR Report would accurately represent the Panel’s environmental members’ assessment of the Mitigation Plan. The environmental members of the Panel engaged in a thorough discussion of the overall findings, added any missing issues of significant importance to the findings, and merged any related individual comments. At the end of these discussions, the Panel identified five comments and discussion points that should be brought forward as Final Panel Comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

Following the teleconference, Battelle asked the environmental members of the Panel to prepare the four-part Final Panel Comment following guidance previously described in the Final IEPR Report. Battelle reviewed and edited the Final Panel Comments for clarity, consistency, and adherence to guidance on the Panel's overall charge. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The additional Final Panel Comments are presented in Section 4 of this Second Addendum.

4. FINAL PANEL COMMENTS

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

Final Panel Comment 16

The monitoring plan for coral reef recovery is not linked to recovery estimates and, therefore, might not be sufficient to determine long-term success and confirm the assumptions of the HEA analysis.

Basis for Comment

Coral nurseries are a new and developing form of mitigation; hence it is important to have an effective, long term monitoring program to evaluate the assumptions. Yet monitoring is limited to three years for nursery outplanting areas and five years for mitigation reefs. Based on the recovery estimates, the Panel believes that the success of the mitigation efforts needs to be conclusively determined in long-term monitoring efforts.

The Mitigation Plan (Appendix E to the Environmental Impact Statement) includes a blended approach to coral reef restoration, using different methods associated with different recovery periods. Approximately 2.03 acres would receive coral transplants that have been relocated from dredging impact areas and transplanted to boulders at a density commensurate with the impacts (1.4 corals/m^2) (p. 33) The Mitigation Plan states that the coral propagation contractor shall be required to monitor the outplanted corals for a 3-year period for each outplanting area. After three years of monitoring each outplanting area and five years of monitoring the mitigation reefs, the final determination of success for the outplanting area and mitigation reefs will be made and those areas will no longer be monitored. (Mitigation Plan, p.33). This sentence is repeated again in the Monitoring and Adaptive Management Plan (Appendix E-5, p.46)

Throughout the document (e.g., Mitigation Plan, Table 11, p. 36), the expected time for reef recovery is defined as 35-50 years. There is discussion in the September 26, 2007 Habitat Equivalency Analysis (HEA) conference summary notes (Appendix E-3) about this timeframe being adequate, as some research suggests equilibrium will occur over a 100-year period. In the Mitigation Plan, Section 4.6.2, it was assumed that the mitigation boulders would naturally recover to 100% full reef services in 50 years. However, they would recover to 100% full services in *less* time by transplanting corals onto the boulders. A similar rationale and methodology was included in this HEA for the Port Everglades Outer Entrance Channel expansion project. For the Port Everglades feasibility study HEA, the recovery timeline was assumed to be 50 years without coral transplantation as a worst-case scenario. This timeframe would be reduced to approximately 30 years with coral transplantation from the impact site (pg.25). Given this, it is not clear why monitoring efforts will stop after 3-5 years, when the success of the reef restoration will be in its infancy. The long-term ability of the reef to restore full function and structure must be monitored for the project duration.

Other places in the document also state that the timeframe for meaningful recovery will be substantially longer than the defined monitoring period. For example, it states:

- “Any ecologically significant recovery of newly dredged substrates may take decades.”

(Maragos 1974; Precht 1998). (Appendix E-3, p.19)

- Because the recovery projections for both octocoral and sponge assemblages (15 years) are more rapid than stony corals, the NCRI (2003) method underestimates the value of the benthic resources at the landscape scale, and therefore, was dismissed as a viable method for the Port Everglades evaluation. (Appendix E-3, p.5)
- "The project will mitigate upfront for a 2% loss of function. This is broken down as 1% during construction, 0.5% for up to 20 years after construction and 0.5% for years 21-50 after construction." (Appendix E-3, p.17). This suggests that impacts may continue to occur, although these are not defined. Therefore, it is not clear why the monitoring period does not cover this timeframe.

Regarding monitoring the recovery, the Monitoring and Adaptive Management Plan states that "If mitigation is not trending towards success by Year 3 following implementation of mitigation, corrective measures will be engaged; among them, transplantation of additional corals from coral nurseries and deployment of additional reef material." (p.46) The defined monitoring period may not provide adequate time to perform this planned evaluation. Further, the specific threshold that will trigger additional measures after 3 years is not defined.

The document states (Mitigation Plan, p. 42) that the determination for the need for corrective measures (i.e., adaptive management) will be made by a committee (consisting of members of USACE, the National Marine Fisheries Service [NMFS], the implementing partner (the Port), and other applicable resource agencies) but does not explain this process. It is not clear if the committee needs to be unanimous. In Appendix E-3 (p. 4), it is stated "Consensus as to which values to use for the various [HEA] input parameters was never achieved between the panel and the Corps science staff. Disparate parameters included everything from the discount rate to recovery projections." Given the inability to reach consensus on the HEA input parameters, the Panel is concerned that other committee-based decisions (i.e., those to determine whether adaptive management is required) may not be conclusively consensual. Therefore, the Panel believes that an independent committee should be convened to make adaptive management decisions to ensure that conflicts of interest do not occur in evaluating the mitigation success and the methods.

Significance – Medium

The coupling of mitigation monitoring and the anticipated recovery period is important for evaluating the long-term success of the mitigation efforts and for confirming HEA assumptions and overall impact assessment.

Recommendations for Resolution

1. Revise the required monitoring period to provide sufficient timeframes for monitoring in conjunction with the defined recovery estimates (i.e., 20, 35-50 years).
2. Include additional monitoring requirements if the reefs are not meeting defined success criteria after 3 or 5 years (i.e., 80 percent assemblage resemblance based on the Bray

Curtis Similarity coefficient).

3. Require 5-year monitoring events over the long term (50-year project duration) to enable assessments of the assumptions presented in this plan comparing the two mitigation methods and their likely recovery timeframes.
4. Define the specific threshold that will trigger additional measures for adaptive management after 3 years.
5. Include independent experts on the committee to determine adaptive management measures, as needed.

Final Panel Comment 17

The mitigation success criteria are inconsistent and the statistical approach to validate success of the mitigation is poorly defined.

Basis for Comment

The Port Everglades Mitigation Plan reports, “success of the mitigation reefs in establishing a similar community structure will be a finding of no significant difference in the rank abundance orders of species between mitigation and control reefs of each type. Statistical comparisons between mitigation and control reefs will be made using the Wilcoxon Rank-Sum (Zar 1984) or similar nonparametric test at p=0.05” (Mitigation Plan, p. 45). It is also stated that, “1. The mitigation area and impact site must have biota with 75% species similarity by the time of the final, proposed (i.e., fifth year) monitoring event. 2. Percent-cover of major functional groups at the mitigation area will be similar to that of the impact site (80% similarity) by the time of the final, proposed (i.e., fifth-year) monitoring event” (Mitigation Plan, p. 50).

The success criteria should be consistent, shouldn’t jump between statistical methods, and should use a single success value (80%). Success criteria should also be well defined because of the importance of the criteria to the coral reef recovery as well as the decisions made by the Adaptive Management Review Committee. Univariate-parametric methods (of the sort proposed in the Mitigation Plan) are not robust for this application because they can’t handle multiple zero variable values, assumptions about randomness, and normality in distribution of these data. In many different applications, Clarke et al. (2014, chapter 14) documented the superiority of multivariate statistical methods to univariate in impact-disturbance studies.

The statistical approach should be robust and well defined. For example, success of a particular mitigation element should be evaluated by comparing resemblance of the mitigation samples (abundance, biomass, percent cover, relative frequency) to the reference samples using a quantitative resemblance coefficient, such as the Bray Curtis Similarity Coefficient (or one of the Bray Curtis family of resemblance coefficients). Mitigation success should be proven using a threshold that the samples are at least 80% similar. Additionally, clustering-classification, non-metric Multidimensional Scaling ordination, and Analysis of Similarity (ANOSIM) may be employed to corroborate the findings (Clarke et al. 2006, 2014).

Significance – Medium

The statistical approach is a key component for validating HEA assumptions and confirming restoration success.

Recommendations for Resolution

1. Define consistent mitigation success criteria in the FEIS and the Port Everglades Mitigation Plan.
2. Employ and describe a multivariate status and trends statistical approach for verifying

success of mitigation components in the FEIS, the Port Everglades Mitigation Plan, and appendices.

Literature Cited:

Clarke KR, Somerfield PJ, Chapman MG. 2006. On resemblance measures for ecological studies, including taxonomic dissimilarities and a zero-adjusted Bray-Curtis coefficient for denuded assemblages. J Exp Mar Biol Ecol. 330:55-80. http://dx.doi.org/10.1016/j.jembe.2005.12.017

Clarke KR, Gorley RN, Somerfield PJ, Warwick RM. 2014. Change in marine communities: an approach to statistical analysis and interpretation. 3d ed. PRIMER-E Ltd. Plymouth, UK: Plymouth Marine Lab., 260 pp.

Final Panel Comment 18

Using diver deployed measuring tapes to evaluate boulder reef structure settlement and sediment is not safe or accurate method.

Basis for Comment

"Settling and/or sand covering will be assessed by measuring the relief at each of the permanent quadrat stations established as outlined below. Measurements will be taken with a weighted flexible tape from a point one meter shoreward of the quadrat benchmark to the surface of the water and from the top of the reef structure at the benchmark to the surface of the water, with the difference being the relief. The mean of five such measurements will be used to assess the degree of settling and/or sand covering of the materials." (Mitigation Plan, p. 44).

For a multitude of reasons including vessel traffic as well as currents and their effect on safe ascent rates, it is virtually impossible for a diver in open water to extend a measuring tape perpendicular to the seabed. Other projects using boulder mitigation have employed seismic technologies to assess settlement and sedimentation. To compensate for pipeline construction perturbation, Gulfstream natural gas pipeline constructed multiple mitigation sites in 15 to 37 m depths offshore of Tampa Bay (27°34'- 27° 45'N, 82° 58- 83°32'W). Each site was a 2.3 hectare (5.7 acre) area and received an average of 14,600 tons of limestone boulders (0.5 to 1.5 m length and width) per site. Additionally, 16 to 17 prefabricated modules (limestone boulders set in a concrete base with internal tunnels) were deployed in nine locations; 16 to17 m depths, 27° 33'-27°34'N, 82°58'-83°04W'. The sites were monitored for settlement using seismic and photograph/video methods (Jaap et al., 2014). Other alternatives include driving marked reference stakes into the sea bed adjacent to the boulder structure, and photograph the stakes and boulder to examine settlement and sediment movement.

Significance – Low

The potentially unsafe and physically challenging boulder settlement monitoring technique has implications for project accuracy.

Recommendations for Resolution

1. Adopt an alternative method to evaluate boulder settlement.

Literature Cited:

Jaap WC, Ross SW, Brook S, Arnold WS (2014). Factors Affecting Coral Reef Fisheries in the Eastern Gulf of Mexico. Pp 83-112 and color figures 6.1-6.5 *in* Bortone S. (Ed), Interrelationships between corals and fisheries. Taylor and Francis, CRC Press, Boca Raton.

Final Panel Comment 19

The purpose of collecting video data along each transect is unclear.

Basis for Comment

"Vertical-format quantitative digital video data will be collected along each transect with the camera positioned 40 cm above and perpendicular to the substrate. This will yield an approximately 40-cm wide video field-of-view. The video camera will be equipped with lights and a measuring stick or calibrated lasers to ensure the camera remains at the 40-cm distance to the bottom. The diver will swim the camera along each transect at a speed of no greater than approximately 5-meters per minute. This method will be used to evaluate both the coral health and potential sedimentation stress during construction at both the dredge location site and the control monitoring station sites" (Mitigation Plan, p. 2).

There is no information on how these videos will be used. If video will be used for qualitative observations and will not be used for point count image analysis, the method is satisfactory. However, if the imagery will be used in quantitative analysis, a digital still camera (5 to 12 megapixel) would be more efficient. Still photography eliminates the time consuming task of frame grabbing images from the video and the images are superior to video images.

Significance – Low

Video post-processing for point count image analysis can reduce the efficiency of data collection.

Recommendations for Resolution

1. State the purpose of taking video transects in the Port Everglades Mitigation Plan.
2. If the videos will be used for quantitative analysis, consider using a still camera instead to increase efficiency.

Final Panel Comment 20

The recording of coral health observations in potential poor visibility and strong current conditions is not effective.

Basis for Comment

Attempting to record coral observations *in situ* could compromise the accuracy and efficiency of the data. “The position of each colony also will be mapped relative to the location of the net sediment accumulation block (distance and bearing) and recorded to allow relocation on subsequent surveys. Coral health assessment parameters will include bleaching, excess mucus production, polyp extension, and disease. Each selected coral colony will be assessed for each of the health parameters and assigned a health level of either "0" or "1" for each parameter. A score of "0" would indicate no observed bleaching, excess mucus production, polyp extension, or disease, while a "1" would be assigned for each parameter with a positive indication. The score for each parameter for each coral colony will be recorded, and the coral health observations” (Mitigation Plan, p. 3).

In situ written observations in currents and poor visibility are difficult to execute and not a good investment in time. An alternative is that each of the targeted corals should be photographed using a digital camera with at least a five mega pixel resolution (see image below from Team W, 2012).

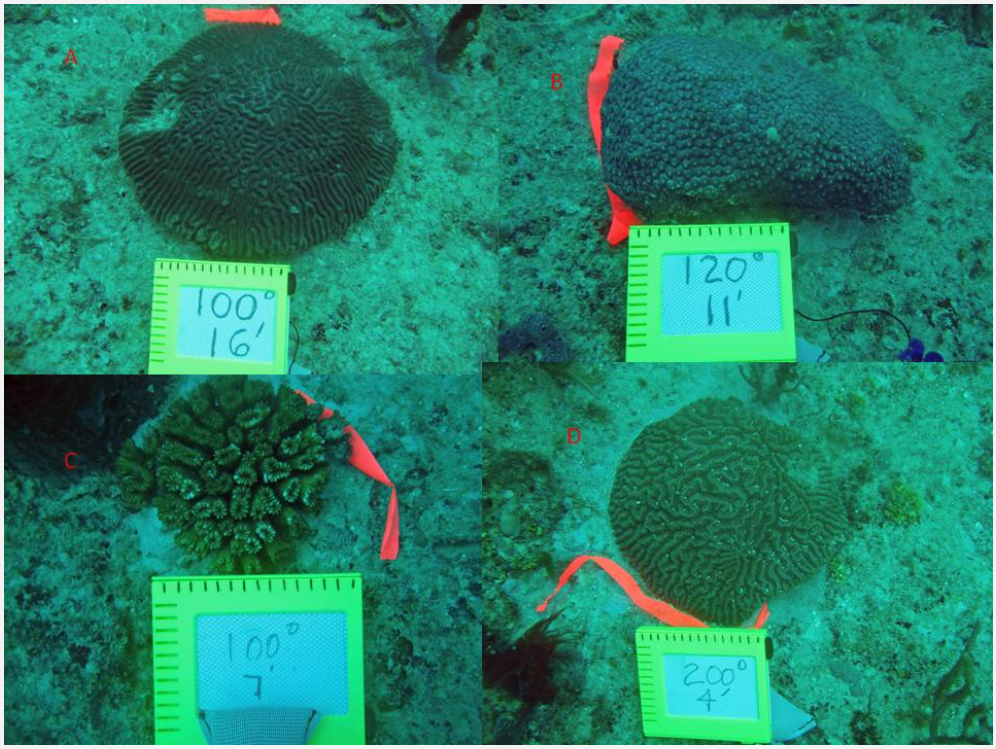

Image of four transplanted corals, *Gabon* anchor incident. The EtchSketch tablet provides information on the location (bearing and distance) of each coral relative to a reference marker. The camera was positioned a fixed distance from the corals. A*: Diploria strigosa*, B: *Montastraea cavernos*a, C: *Eusmilia fastigiata*, D: *Colpophyllia natans*.

The diver and assistant would use reference markers and show these data in the photo using an etch-sketch tablet to document important metadata (species ID, distance and bearing from reference). A compass and depth gauge can be attached to the tablet to provide those data in the coral photograph. The photos can be evaluated and scored for vitality (bleaching, disease infection, physical injuries, predation, growth, sediment issues, etc.).

Level of Significance – Low

Trying to record coral observations *in situ* could compromise the accuracy and efficiency of the data.

Recommendations for Resolution

1. Consider the use of reference markers and still photography in coral health observations.

Literature Cited:

Team W, 2012. Survey, assessment, and primary restoration, UAL *Gabon,* seaward of John U. Lloyd State Park, Broward County, Florida. Report to the Florida Department of Environmental Protection. 24 pages.

5. REFERENCES

Clarke KR, Somerfield PJ, Chapman MG. 2006. On resemblance measures for ecological studies, including taxonomic dissimilarities and a zero-adjusted Bray-Curtis coefficient for denuded assemblages. J Exp Mar Biol Ecol. 330:55-80. http://dx.doi.org/10.1016/j.jembe.2005.12.017

Clarke KR, Gorley RN, Somerfield PJ, Warwick RM. 2014. Change in marine communities: an approach to statistical analysis and interpretation. 3d ed. PRIMER-E Ltd. Plymouth, UK: Plymouth Marine Lab., 260 pp.

Jaap WC, Ross SW, Brook S, Arnold WS (2014). Factors Affecting Coral Reef Fisheries in the Eastern Gulf of Mexico. Pp 83-112 and color figures 6.1-6.5 *in* Bortone S. (Ed), Interrelationships between corals and fisheries. Taylor and Francis, CRC Press, Boca Raton.

Team W, 2012. Survey, assessment, and primary restoration, UAL *Gabon,* seaward of John U. Lloyd State Park, Broward County, Florida. Report to the Florida Department of Environmental Protection. 24 pages.

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