Comprehensive Everglades Restoration Plan (CERP)
Biscayne Bay Coastal Wetlands
Project Implementation Report (PIR) and Environmental Impact Statement (EIS)

USACE (U.S. Army Corps of Engineers) Responses to Independent External Peer Review (IEPR)
20 July 2011

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the WRDA 2007, EC 1105-2-410,33 CFR §385.12(d) for Comprehensive Everglades Restoration Plan (CERP) projects and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review (2004).*

The purpose of the Biscayne Bay Coastal Wetlands project is to contribute to the restoration of Biscayne Bay and adjacent wetlands as part of a comprehensive plan for restoring the south Florida ecosystem. The project intends to restore the ecosystem function in southeastern Florida by rehydrating coastal wetlands and reducing point source freshwater discharges into Biscayne Bay by replacing lost overland flow and partially compensating for the reduction in groundwater seepage by redistributing, through a spreader system, available surface water entering the area from regional canals. This project will also help restore saltwater wetlands and the nearshore bay through the re-establishment of optimal salinity concentrations for fish and shellfish nursery habitat.

The IEPR was conducted by the Battelle Memorial Institute through their contract with the Army Research Office. The IEPR panel consisted of five individuals selected by Battelle with the technical expertise in the following categories: Design and construction cost engineering, civil works planning, coastal/estuarine ecology, hydraulic engineering, and economics.

The IEPR panel reviewed the Draft Biscayne Bay Coastal Wetlands Project PIR/EIS. The Final Report from the IEPR Panel was issued 1 December 2009. Overall, 19 final comments were identified and documented. Of the 19 total comments, 2 were identified as having high significance, 15 were identified as having medium significance, and 2 were identified as having low significance.

The following discussions present the USACE Final Response to all of the IEPR comments. Further details on each comment, such as the Basis for Comment, Significance, Comments Cross-Reference, and Recommendations for Resolution can be found in the IEPR Final Report referenced above.

1. IEPR Comment – High Significance: The discussion of forecast and future conditions, especially with regard to sea level rise and water availability, is not comprehensive and needs to be expanded to include more quantitative analysis and graphical explanation.

USACE Response: Partially Adopted. Response curves for the three habitat types will be placed in the document. Recommendation #1. ADOPT. A discussion of forecasted conditions for FWO and with project conditions has been included in the Sea Level Rise Analysis (7.13.2.3) for time = 0 years, 20 years, 50 years, and 100 years. #2. ADOPT. The following was added to Section 7.13.2.3 this section: "For the sea level rise analysis, the timing of project construction and benefit accrual is based upon having construction complete by 2012. Given the delayed ecological response to project induced changes, the restoration benefits resulting from this project are expected to ramp up from zero benefits at time of construction to maximum project benefits at 10 years post construction. Taking into account sea level rise, the period of maximal project benefits will occur during the period between 10 and 20 years post construction. After 20 years until the end of the project life 30 years later, project benefits are expected to decrease as a result of SLR." #3. PARTIALLY ADOPT. As the furthest downstream project, the BBCW project has limited influence on upstream CERP projects. Additional information will be added to this in Section 7.11.1.1. "It is important to note that the BBCW project study area is furthest downstream of the CERP components. As such, this project has little to no impact on the achievement of CERP system-wide benefits that occur upstream of the BBCW study area. #4. ADOPT. A sea level rise analysis was added. (Section 7.13.2.3) . Recommendation #5. ADOPT. The SLR analysis includes the required three projections. Limited information exists regarding quantitative changes in future temperature and precipitation. A discussion of climate change will be added to Section 4.2.1 Climate (Future Without Conditions Chapter) Recommendation #6. ADOPT. There are several locations within the document that inappropriately tie wetland loss to future water supply demands. Wetland loss within the project area is generally not regarded to be a result of excessive water demands but rather the result of land use and flood protection actions resulting from the operation of drainage canals. The SFWMD, has recently put in place a consumptive use permitting strategy that greatly restricts future increases in consumptive use groundwater withdrawal permitting within Miami Dade County. A discussion of these facts has been added to the document in the HH and water supply sections. Recommendation #7. ADOPT. See comment above for water demand/wetland discussion. As for incidental water supply benefits, none of the with project alternatives are located close enough to municipal wellfields to have any impact on the water supply. This discussion of incidental water supply benefits has been added to in Section 6.1.13 . #8. ADOPT. The revised document includes improved descriptions of the project alternatives.

2. IEPR Comment – High Significance: Further clarification is needed on the relationship between the water available for diversion and the hydrologic regimes necessary to achieve the target level of wetland area/function.

USACE Response: Adopted. Concur. The selected alternative does not purport to restore freshwater wetland plant communities to a historical condition that may have existed prior to the canal system. The vast majority of water diverted is redirected from canals into salt intruded wetlands that are heavily dominated by a salt tolerant mangrove community. Previous studies such as Ross et al. (2003) have demonstrated that established mangroves are unaffected by freshwater flow. The project diverts and impounds water within a few acres of mixed wetlands and upland forest within the Deering Estate, and about 400 acres of freshwater wetlands south of

the C-103 Canal. Both of these areas contain viable wetland vegetative communities, but are impacted during the dry season by low water levels. The primary purpose of these impoundments is to create temporary storage. In both cases, water elevation is controlled at about two feet above surface as this has been demonstrated to not cause undue negative effects on the existing vegetation. Because of the high seepage rates, water is not expected to remain within these impoundments more than a few days. Models do not exist for these areas that can accurately predict how often the wetlands will be inundated at a two-foot level, but is likely to occur only during storm events. By virtue of the increased hydration of these areas, the proliferation of woody vegetation, including nuisance exotics should be impeded. The primary benefit to wetland vegetation will be during the dry season when occasional freshwater inputs will maintain soil moisture, and thus maintain vegetative productivity. The Tentatively Selected Plan Section will be enhanced to include a discussion on the intent of impounding water in wetlands. The ecological monitoring plan contained in Annex E includes monitoring of water levels within both of the impounded wetlands, and transects that will document baseline and any future changes to the vegetative communities. As stated in responses to comments #5 and 13, the monitoring plan will be enhanced, per the recommendations of the panel, to verify assumptions while reducing project risks and uncertainties. Additional narratives will be provided in Section 3 (Existing Conditions) and the Executive Summary to discuss the effects of existing hydroperiods on vegetative communities, with an emphasis on the comparison to hydroperiod targets and the anticipated vegetative responses under a with-project scenario. Much of this information is contained in the performance measure sheets developed during the planning process; this information will be presented to better demonstrate the relationships between hydrology, salinity, and wetland vegetation. Ross, M.S., J.F. Meeder, E. Gaiser, P.L. Ruiz, J.P. Sah, D.L. Reed, J. Walters, G.T. Telsnicki, A.

Team will add information regarding impact of hydrology on target wetlands and nearshore areas. The info will strengthen the link between hydrology and vegetation response as well as salinity conditions.

3. IEPR Comment - Medium Significance: The habitat units for each measure need to be clarified, and it should be clear whether habitat units for a given measurement represent relative or actual magnitudes.

USACE Response: Partially Adopted. Recommendation #1. ADOPT. Additional description of three habitat units has been added to section 6.3 ECOLOGICAL BENEFITS EVALUATION. Recommendation #2. ADOPT. Additional description will be provided where relative magnitudes and actual magnitudes are reported in the text. To resolve this comment, a short discussion of how habitat lift acreages were derived for the project will be included in the executive summary and elsewhere as needed. • Recommendation #3. ADOPT. Table 5-5 was amended to include a description of the three habitat units. This regards Table 6-2 in the revised report (Section 6.3). Footnotes have been added to the bottom of this table to describe the make up of the three habitat unit types. • Nearshore Habitat Lift is computed by averaging the three sub-indices and multiplying this result by the total available nearshore acreage. The three sub-indices are: 1) Percent of available water diverted from coastal structure, 2) The average of the percent nitrogen and phosphorus load targets achieved, 3) Percent of nearshore acres within 500

meters of the shoreline meeting the target salinity conditions. This habitat lift is measured in units of "acres of lift". ** Saltwater Wetland Habitat Lift is computed by averaging the two sub-indices and multiplying this result by the total saltwater wetland acreage. The two sub-metrics are 1) Percent of available water diverted directly to saltwater wetlands, and 2) Percent of saltwater wetland acreage meeting the target salinity condition. This habitat lifts is measured in units of "acres of lift". *** Freshwater Wetland Habitat Lift is computed by averaging two sub-indices and multiplying this result by the total freshwater wetland acreage. The two sub-indices are 1) Acres of freshwater wetland with sufficient water, and 2) the acreage of freshwater wetland free of invasives and exotics. This habitat lift is measured in units of "acres of lift". Recommendation #4. ADOPT. The various units will be reported in the tables and in the text. Table 6-2 has been modified by adding "(acre lift) to describe measure of habitat unit. Recommendation #5. ADOPT. The revised report will include a definition of "nearshore indices' and HU lift. This has been added to Section 6.3 of revised report. Recommendation #6. PARTIALLY ADOPT. The maps used in the real estate report to estimate land requirements generally reflect the largest potential footprint for the saltwater and freshwater wetlands targeted for each alternative. These maps are referenced in the document where benefits are discussed (Section 6.1.7). Recommendation #7. ADOPT. The revised report will include more detail regarding the weight assigned to each of the three habitat types.

4. IEPR Comment – Medium Significance: The BBCW PIR main report needs to be revised to significantly reduce the references to the Appendices and to improve the quality and clarity of the graphics.

USACE Response: Adopted. The draft report has been rewritten to follow the planning process and therefore should now be much easier to understand. The format does not EXACTLY follow Attachment 1-C of the CERP Programmatic Regulations because that format does not allow the proper "telling of the story". It does however contain all the information in Attachment 1-C and mirrors the 6 steps of the planning process. Figures have also been reworked and should now be easier to read and understand. Any additional suggestions for improvement of the flow and readability of the report can be incorporated into the final report.

5. IEPR Comment – Medium Significance: The effects of the BBCW project and the resulting changes in hydrologic regime on "downstream" foundation species (e.g., mangroves) should be assessed.

USACE Response: Adopted. Concur. The comment addresses an important component of the intertidal wetlands--the effects of the project on dwarf mangrove forest. In their study on dwarf mangrove communities that are part south Florida's ecological "white zone," Ross et al. (1992) notes several factors that may contribute to this low-productivity community type, including: (1) wide seasonal fluctuations in salinity and moisture content, and (2) absence of freshwater input from upstream sources. The project is anticipated to alleviate the wide salinity fluctuations and increase freshwater input from upstream sources, which should result in an increase in productivity and habitat quality in these areas. Historically, the area presently occupied by dwarf mangrove forest was graminoid marsh. Ideally, the dwarf mangrove system would gradually be

replaced by a healthy graminoid marsh in response to reestablishing appropriate hydrologic and salinity conditions. An enhanced discussion on project effects to dwarf mangrove communities will be included in the PIR. Regarding the possible effects on "edge " mangroves, it is highly unlikely that project-related increases in freshwater flowing across the wetlands will affect fringing mangroves (i.e., those along the edge of the bay) because healthy fringing mangroves existed historically when salinity conditions in the coastal wetlands were much fresher than conditions this project is anticipated to achieve. The comment also notes that the project-level monitoring plan includes only "minor assessments of periphyton" in the intertidal wetlands. In fact, the project's monitoring plan includes detailed vegetation monitoring in those wetlands along 8 transects. The density of plots along each transect will be at 150-300 m intervals, with an average of 10 plots per transect. Exact plot locations will be fixed once the vegetation maps are available, with the aim of achieving higher sampling intensity near the borders separating adjacent vegetation types than in the centers of the mapping units. Vegetation sampling at the selected locations will be implemented within a nested, permanent-plot design. The largest unit will be a 10 x 10 m tree plot, subdivided into four 5 x 5 m cells, with corners marked by rebar driven into the bedrock. Trees (>5 cm DBH) will be tagged, identified to species, their DBH measured, and their position estimated to the nearest meter. The cover of shrubs (?1 m height) and lianas will be estimated by species in two of the 5 x 5 m cells. Percentage cover of plants in the herb layer (<1 m height), as well as the density of tree seedlings, will be recorded for 2 randomly selected 1 x 1 m quadrats within each cell (8 per plot). This sampling scheme should be able to detect subtle changes in vegetation changes. Also, this monitoring will augment the larger-scale aerial mapping that RECOVER will be conducting, as noted in the project-level monitoring plan. It should be noted that during the development of the plan, severe restrictions on funding allowed for project-level monitoring (no greater than 1% of total project cost) precluded additional monitoring in the intertidal wetlands. Recently, however, revised guidance has been developed that allows for a longer duration of monitoring (up to 10 years) with an emphasis on measuring project success. As a result of this guidance and discussions with Corps Headquarters, the ecological monitoring plan will be expanded, as needed, to better measure changes and trends over time in mangrove communities and adjacent wetlands. A revised ecological monitoring plan will be developed with input from resource agencies and the co-sponsor, and coordinated with Corps Headquarters prior to the completion of the final PIR/EIS. Reference: Ross, M.S, et al. 2002. Multi-taxon analysis of the "White Zone," a common ecotonal feature of south Florida coastal wetlands. In Porter and Porter (eds.), The Everglades, Florida Bay, and Coral Reefs of the Florida Keys, CRC Press, Boca Raton, FL.

6. IEPR Comment – Medium Significance: The quantification of long-term reductions in nutrient loading is unclear as it relates to benefits and changes over time.

USACE Response: Adopted. Discussion of benefited areas will include reference to project maps. Recommendation #1. ADOPT. A discussion of nutrient removal assumptions and analytical methodology will be added to the document. Added to Appendix C.1.1.7, and Section 6.3.3 Recommendation #2. ADOPT. The nutrient removal calculations took into account the maximum wetland area available and the volume of water available on a given day. (Subsequent to this comment, the CBEEM estimator was rerun after altering the wetland acreage estimates for

WQ treatment lands. The new estimates of freshwater acreage were taken from the freshwater wetland acreage rehydration values computed for the freshwater wetland habitat units. The saltwater wetland acreage estimates were derived from the freshwater wetland rehydration estimates for each basin taking into account the relative pump capacity assigned to the saltwater wetlands. The change in wetland treatment acreage resulted in a decrease of YB total habitat lift by 12%, Q by 9%, M by 1%, and O by 1.5%. Based on this analysis, this change would not have altered the results of the Cost Effectiveness / Incremental Cost Analysis or changed the selected plan. No change to the existing benefits assessment appears warranted though a discussion of these land estimates will be included in the CBEEM writeup and potentially in the risk / uncertainty discussion. Discussion will be added to section 6.3.3. and Appendix C.) Recommendation #3. ADOPT. The rational for the selected nitrate removal rate will be provided in the document as well as the justification for weighting the nitrate and phosphorus removal components. The following additional discussion will be included CBEEM text: "The nitrate removal rate was estimated by using the reduction rate of 35 m/yr provided on page 430 of Kadlec and Kight for surface treatment systems. This rate is for treatment systems operating at 20° C so it was adjusted using the denitrification temperature adjustment coefficient for a reasonable estimate of annual average South Florida operating temperature of 25° C. The temperature adjustment equation is: K25 = K20*1.08^(25-20) . This will be noted in Appendix C. A discussion of weighting of the two WQ sub-metrics will be included in Appendix C.

7. IEPR Comment – Medium Significance: The process by which the management measures were developed, screened, and combined into alternatives was not clearly described.

USACE Response: Adopted. A description of how all the management measures considered for this project were identified, evaluated, and screened is in Section 5.3.4 (Management Measures) of the draft report and are further developed in the alternative plans formulation sections that follow. These sections of the report were completely rewritten to make it more understandable and to make it conform to policies regarding the planning process. These sections include tables and figures to summarize the information. Regarding the last comment wanting additional best buy plans: There were five alternatives in the final array of alternatives. The relationship between outputs and costs are not linear for these alternatives. These plans are incrementally built. Starting with the Alt O-Phase 1 features (which are considered minimal features to complete objectives) and adding or substituting components to build larger alternatives. This would account for the perception of linear relationships, but upon completion of the cost effectiveness analysis it can be noted that there are at least two cost effective plans for the combined habitat units, freshwater and nearshore zones. There is only one for the saltwater ecological zone. The alternatives were created independent of the economic analysis and it would not be proper to presuppose the outcome of the cost/effective incremental cost analysis. It is also not possible or prudent to formulate additional plans or model these plans in the hopes that additional cost effective plans rise to the surface. Having a more narrow array of best buy plans further emphasizes that the plan selected is by far the most efficient at producing the given output. A discussion of the number of best buys will be added to CE/ICA section.

8. IEPR Comment – Medium Significance: The hydrology sections do not provide sufficient information to evaluate the effects of implementing the proposed plan compared to the baseline.

USACE Response: Adopted. Recommendation #1. ADOPT. The hydrology section 2.1.4 will be amended to discuss the general hydrologic conditions within the freshwater and saltwater wetlands as well as the nearshore tidal area.The existing conditions discussion in chapter 3 (Section 3.1.3 Hydrology) has been amended to include a water availability analysis for the four basins (exceedance probability plots). Monthly flow volume return frequencies were computed using the 1986-2006 period of record. In the evaluation and comparison chapter (chapter 6) , graphs of the monthly diverted flow volume return frequencies were added to the hydrology discussion. Benefit assessment writeup (Section 6.3) has been amended to include wet and dry season estimates as well as dry year and average year estimates per committee suggestion. Recommendation #2. ADOPT. The revised report includes a sea level rise analysis per EC 1165-2-211. This analysis is based upon the Key West NOAA tide station. Based on the historic record at this station, the analysis is based upon eustatic conditions (land elevation is not changing.) Land subsidence is considered to be insignificant. Recommendation #3. ADOPT. Additional discussion of the modeling work done on this project will be provided. A discussion of the models used in this project has been added to the chapter 6, Evaluation and Comparison of Alternative Plans (Section 6.1.3 Hydrology) A discussion of the risk/reliability of the simplified wetlands rehydration method used in CBEEM has been added to Section 6 and Appendix C. Additional wetland rehydration analysis using the Miami-Dade County Test Wetland Site at Military Canal will be performed to supplement current estimation methods.

9. IEPR Comment – Medium Significance: The water quality analyses need to focus more on extreme values and ranges of salinity, dissolved oxygen, and nutrients rather than just averages.

USACE Response: Adopted. #1 . The range of expected nutrient concentrations and salinity concentrations as available will be provided in Appendix C and in section 4 of the document. The risk / uncertainty discussion will also be amended to include a discussion of the use of averages as boundary conditions and average responses as a measure of the project benefits. The Appendix C benefits write up and the risk/ uncertainty section will include the results of the recently completed benefits assessment for water supply conditions representing the 10% and 90% exceedance frequency canal flows. Recommendation #2. ADOPT. A discussion of drought year impacts to wetlands and downstream salinity will be added to the report. Exceedance probability plots for available and diverted water for the selected plan have been added to Section 6.1.3 Hydrology (in chapter 6, Evaluation and Comparison of Alternative Plans). A discussion of the availability of water to divert to the project features was included in this hydrology discussion. The risk/uncertainty section will also include discussion of variability in water supply for the project features.

10. IEPR Comment – Medium Significance: The BBCW PIR needs to address how sufficient, long-term dispersion of flow will be achieved across the maximum extent of the

project area, while avoiding the development of concentrated flows and short-circuiting around microtopographic features.

USACE Response: Partially Adopted. Recommendation #1. PARTILLY ADOPT. It is presumed this comment is targeted at diverted freshwater flow into the salt intruded wetlands. The assumption that uniform spreading of the freshwater over large areas of the saltwater wetlands is critical for restoration is false. The historical regime consisted of multiple natural channelized flows, or small creeks or streams. Studies have identified more than 20 such creeks existed in or near the project area. Some of these, such as Black Creek were relatively large. An objective of the project is to simulate creek flows through the wetlands, not to spread water uniformly over them. The original creek systems have converted into linear tree islands since the freshwater flow has been eliminated, and it not desirable to dredge, or otherwise disturb the tree islands. Instead, flow is expected to create new creeks based on the microtopography. Since this topography cannot be discerned easily, it is difficult to predict where these creeks will form exactly. This discussion will be added to the main report in Section 6.3 and in Appendix C and in Adaptive Management section of report. Recommendation #2. ADOPT. Addressed in response to recommendation #1. Recommendation #3. PARTIALLY ADOPT. Monitoring within the saltwater wetland zone can be difficult to implement. Data from such monitoring can be difficult to evaluate given a tidal signal that influences groundwater stages and salinity. Extensive monitoring within the wetlands using traditional methods is not viable without causing impacts to the wetlands themselves, therefore, results from the salinity monitoring along the shoreline will provide evidence of how much water is exiting the wetlands into Biscayne Bay at any given point. These results will be compared to salinity performance ranges to ensure that water is distributed north to south to optimize nearshore salinity targets by controlling operations upstream. Most of these adjustments to flow should occur during the initial operating period, but will also be monitored over the long term by observations made at the transect and water level monitoring sites. This discussion will be added to the main report and to the monitoring plan. Recommendation #4. PARTIALLY ADOPT. While effective dispersion of water across the targeted wetlands is desirable at the western side of the saltwater wetlands, flow concentration into tidal creeks is preferred at the eastern interface with the shoreline. A discussion of this will be added to the adaptive management plan.

11. IEPR Comment – Medium Significance: The scientific basis for categorizing "low-functioning wetlands" and "high-functioning wetlands" as a function of the Criterion Based Ecological Evaluation Matrix (CBEEM) and the aerial extent of the benefits for each of the final array need to be clarified.

USACE Response: Partially Adopted. Recommendation #1. PARTIALLY ADOPT. Wetland functional values were determined using the vegetation type presently occurring in each of the 3 evaluation components. Functional values for each vegetation type were scored based mainly on whether or not the vegetation type was historically in this part of the project area. Historic vegetation conditions, as defined by the Davis (1943) vegetation map, were used to guide the analysis and set the maximum function values (Figure 2). According to the Davis (1943) map, the predominant vegetation type in the Alternative Q delineated area was "southern coast marsh prairies" with "bay tree forests" scattered as tree islands throughout the prairies. Davis's map

agrees closely with another historic map that covered the Model Lands part of the project area (Egler 1952). Vegetation types that closely match Davis's two classes are scored the maximum (1.0). Habitat types that probably occurred in the project area (e.g., freshwater marshes) are scored 0.8. If the habitat type was not historically in the project area then it is considered generally undesirable because it does not support the suite of species that would be supported by the historic habitat type, even though the habitat may be generally considered of good value in other parts of the south Florida landscape (score = 0.4). Mixed classes that include an historic vegetation type and a non-historic type (but not non-native) are scored 0.7. Any habitat type that also has non-natives (Melaleuca, Brazilian pepper, or Australian pine) is penalized by 0.1 points. Row crops and developed areas are scored zeros. This discussion will be added to the main report. Recommendation #2. ADOPT. One or more maps showing the primary habitat types will be added to the main report. Recommendation #3. PARTIALLY ADOPT. The CBEEM methodology does not provide geographically explicit mapping of the benefitted areas since it is an aggregation of the multiple performance metrics. Discussion of benefited area in Section 6.3 now references real estate maps to give reader of general location of expected benefits. Recommendation #4. ADOPT. Much of the CBEEM write up has been condensed and included in the revised main report. The executive summary will be amended to include a short summary of the benefits estimation methodology. Recommendation #5. ADOPT. The revised benefits assessment section will include a clearer description of CBEEM output and benefited areas. Additional maps may be included (or referenced if already in the document).

12. IEPR Comment – Medium Significance: Risk and uncertainty are not addressed in sufficient detail to meet the requirements of the CERP Program Regulations.

USACE Response: Partially Adopted. Recommendation #1. ADOPT. Additional discussion of the risk/uncertainty associated with water availability, sea level rise, and ecosystem response will be added to the document. A sea level rise analysis has been incorporated into the document. Additional information regarding water availability has been added to chapters 3 and 6 (existing conditions, plan evaluation) using monthly water flow data as well as 10 and 90 percent exceedance analysis. Additional discussion of ecosystem response will be added to risk/uncertainty section. Recommendation #2. PARTIALLY ADOPT. The present risk assessment will be modified to include quantitative analysis to the extent that a quantitative risk-based estimates can be derived given the underlying structure of the available models (hydrologic and benefits) and their inputs. (The entirety of the CERP plan is based upon simulations using a 35 year period of record that is stationary. The Corps and the SFWMD are studying the implications of climate change to water resource planning; however, at present no guidance exists regarding how hydrologic simulation boundary conditions should account for "non-stationarity". Discussion of non-stationarity added to climate in chapter 2. The benefit assessment tool will be used to calculate benefits for 10% and 90% exceedance frequency flow conditions. This will be used to evaluate stationarity issue. Recommendation #3. ADOPT. The findings of the risk/uncertainty analysis will be included in the executive summary and in the selected plan chapter.

13. IEPR Comment – Medium Significance: The Draft Project Monitoring Plan does not sufficiently address the stated project goals, and if implemented, would not detect changes in the ecosystem and water quality.

USACE Response: Adopted. Recognizing the initial funding restrictions for project-level monitoring the following monitoring parameters were proposed: Water Quality monitoring: The number and location of water quality monitoring sites with the wetlands is admittedly not ideal. Currently, there will be about six sites required by permits. The saltwater wetland soils are very fragile such that the very act of walking through them can cause enough topographical perturbation as to change hydrology, in addition to damaging plants and animal burrows. A very expensive alternative is to construct permanent elevated walkways; however, these also would shade a portion of the wetlands and cause impacts. Much of the wetlands lie within Biscayne National Park which maintains a strict policy of non-disturbance or even the erection of structures. Therefore, less invasive methods have been selected to detect changes in water quality that include monitoring within canals, at the 100 M transects, and in Biscayne Bay where changes in water quality will have the potential for greatest impacts. Oyster monitoring: Experts in the area have deemed that the oysters associated with mangrove prop roots do not constitute a viable population, and they have indicated that monitoring prop root oysters is a difficult, time-consuming, and expensive prospect. As was noted in Comment #5, severe restrictions on funding allowed for project-level monitoring (no greater than 1% of total project cost) precludes additional monitoring in the intertidal wetlands. Aside from these issues, the planning team is most interested in reestablishing viable oyster reefs at creek mouths that historically existed in the project area. To that end, an appropriate monitoring plan has been developed to detect and evaluate the desired end state. However, it can be noted that we anticipate that the oysters associated with prop roots will provide valuable seed/spat to help reestablish oyster beds once appropriate salinity conditions are restored. SAV monitoring: Regarding the frequency of sampling comment, the PDT is not necessarily concerned about seasonal fluctuations in SAV composition and coverage. Local experts are more concerned with establishing a persistent coverage of desirable species. So, it will be important for the annual sampling to be conducted during the same season each year, to eliminate known seasonal differences among the SAV species. The section in the monitoring plan on aerial photo interpretation of SAV is a CERP MAP project that is presently on hold. The MAP also conducts extensive in-water SAV assessments by trained SAV experts. The additional SAV sampling included in the BBCW project-level component is intended to fill some spatial gaps in the CERP MAP monitoring. We believe that MAP monitoring combined with the project-level components will provide ample spatial and temporal resolution to assess project-level changes. The last comment regarding SAV monitoring (adequate metrics and statistical power) is a valid concern. It is true that there are no well-defined targets for SAV at this time. The current target is qualitative--a shift to SAV species that are more indicative of desired lower salinity conditions along the shoreline (i.e., a shift from Thalassia testudinum to Halodule wrightii and Ruppia maritima). These SAV indicator species require relatively low salinity conditions that are consistent with desired salinity conditions in the nearshore areas, as defined by the project's salinity performance measure. It should be noted that the lack of a well-defined SAV target is partly due to the lack of appropriate tools to predict what SAV changes will occur in response to desired salinity targets. Coastal wetlands monitoring: The comment notes that "it will be difficult to link the vegetation changes to changes in the physical variables because (with the exception of a few locations) the physical

variable monitoring is not happening at the same locations as the vegetation monitoring." The physical variables of primary interest are hydroperiod and salinity. What the reviewers may have failed to notice is that the wetland algae monitoring proposed in the BBCW monitoring plan is intended to serve as a surrogate for salinity and other physiochemical variables. Gaiser et al. (2005, 2006) have developed statistically significant relationships between diatom species and salinity. The BBCW monitoring plan notes that: "Surveys throughout Biscayne and Florida Bays found that diatoms could be used to predict salinity within 2 and 5 psu, respectively (Gaiser et al. 2005, 2006). Ample evidence now exists locally and globally to support the use of diatoms in salinity monitoring in wetlands and nearshore habitats. They respond at a time-scale appropriate to monitoring and adaptive management (months to years) and can be sampled at a resolution adequate to detect spatial variation in environmental changes." The monitoring plan also specifies that wetland algae would be sampled at five sites along each of the vegetation monitoring transects, so the linkage between changes in physical variables and vegetation changes could be drawn. As stated in the response to comment # 5, the PDT intends to expand and strengthen the monitoring plan to reduce project risk and uncertainty by incorporating the panel's recommendations. Discussions with Corps Headquarters have already been conducted with their approval to proceed, as necessary.

14. IEPR Comment – Medium Significance: An operational response plan is necessary because there is no backup power for the pumping system.

USACE Response: Adopted. Team agreed to include discussion of power loss on project benefits. This will include analysis of loss of benefits resulting from different periods in which project features are lost. This will be included in risk/uncertainty section.

15. IEPR Comment – Medium Significance: The hydrologic analysis of freshwater wetland rehydration areas should be based on a more complete water balance analysis.

USACE Response: Partially Adopted. Recommendation #1. ADOPT. Additional discussion of the freshwater wetland hydrology and the assumptions used to estimate benefits will be provided in the document. Recommendation #2. PARTIALLY ADOPT. No additional modeling can be done to address this fully; however, a monthly analysis of projected pumpage at the project features will be provided in the document. An analysis of benefits computed using CBEEM for the 10% and 90% exceedance frequency flows will be added to the document to address uncertainty regarding water availability. Monthly water flows are available and now included in the document. Recommendation #3. ADOPT. The uncertainty analysis will be expanded to discuss water availability and seepage estimates. (Benefits will be estimated using the CBEEM tool for the 10% and 90% exceedance frequency flow quantities. This information will be provided in Appendix C and in the risk/uncertainty write up (section 6 or 7)).

16. IEPR Comment – Medium Significance: The calculations of the average annual costs and benefits cannot be reviewed for accuracy without more information.

USACE Response: Adopted. A. Response: The CE/ICA uses planning level cost estimates (ROM) costs. Upon selection of the TSP, the costs are further refined and more detailed cost estimates are conducted. These reflect further engineering design (typically 30%) and more thorough real estate analysis. The discrepancy between the TSP and the CE/ICA will be noted in the report and made clear to the reader. B. Response: Graphs will be inserted in the report depicting the ecological response over the life of the project. The CE/ICA will use a static sea level scenario for plan formulation and identification. The risk and uncertainty section will include scenarios showing the low, intermediate and high impacts of sea level rise and the implications on plan formulation and selection. This will be conducted through a series of cost effective analysis. C. The future without project condition for Nearshore habitat is actually better than the existing condition due to improved water quality that results from changes to land use within the upstream basin, so there is a greater lift in the early years of the project which leads to a higher average annual lift than occurs in the snapshot of the year 2050. D. Habitat Units estimates have now been calculated for each sea level scenario and compared back to the static condition to give an overall assessment of the risk of loss of benefits. A graph showing the expected benefit curve attributed to sea level scenarios will be included in the benefit calculation section. Misc: For the CE/ICA rerun, the annual costs will be updated to reflect the new construction schedule, new interest rate, and IDC will be adjusted accordingly.

17. IEPR Comment – Medium Significance: Some of the uncertainties associated with possible construction activities could add significant costs to the project.

USACE Response: Adopted. Recommendation 1. ADOPT. For the L-31 portion of the project, there has not been any geotechnicalborings done that I am aware of. This, along with surveys, was included as work that would need to be performed in order to develop the plans fully in the PED phase. Geotechnical surveys will be added to the document once complete. For the S-705 and S-709 sites, the concept plan intended for cofferdams to be constructed that were large enough to also serve as access routes across the channels during the construction phase. The reaches between the cofferdams would be dewatered with the discharges going back into the channels on either side of the construction, with turbidity precautions. Then the pumping stations would be constructed in the dry and upon completion, the pull the plugs. For the S-707 siphon, the concept plan shows the siphon offset from the L-31 channel with the intent of doing this work in the dry also, with dewatering probably being necessary. Construction was conceptually proposed to have the horizontal holes bored and the pipes inserted. Once constructed, then the channels would be excavated and connected, the old portion of the channel filled in and the old culverts removed. For the S-703, S-710 and S-711 sites, they are all elevated on the levee. A ring levee/cofferdam was part of the concept for construction, dewater to the extent necessary, build the pump station and then dig the connecting channel as one of the last items. The pump station design itself was a very generic design that was cookie cutter applied to all of the sites, as the site specific information was not available at the time this was done. The design was general enough to cover all of the cases but could be modified for all of the sites. The spreader canal work could be done in the wet or to make it easier, do it during the dry season when these areas are not submerged. In fact for all the projects, doing the work in the

dry season would reduce the need for dewatering and the cofferdams, where needed would tend to be smaller as there would be less likely for a large storm event to occur. For the culverts thru the levees, cofferdams would be needed. Since the pipes would not be down very deep, the chance of hitting limerock would be minimal and if it was encountered, it would probably be softer in nature due to it's proximity to the surface. Recommendation #2. ADOPT. An in depth review of project risks will provide the appropriate contingencies as they relate to specific project uncertainties. A copy of this assessment will be included in the Final PIR.

18. IEPR Comment – Low Significance: The Draft Project Monitoring Plan does not clearly explain which organization or agency will be responsible for monitoring and adaptive management.

USACE Response: Adopted. Concur: The USACE and SFWMD are ultimately responsible for project-level monitoring while RECOVER oversees adaptive management. A breakdown on specifics will be added to Annex E of the PIR.

19. IEPR Comment – Low Significance: Literature references and citations are required throughout the document to evaluate if statements are "thorough" and "accurate."

USACE Response: Adopted. References will be provided for each of the identified sections of the report.