

PAHOKEE RESTORATION
CONTINUING AUTHORITIES PROGRAM
SECTION 1135 PROJECT
FINAL INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL
ASSESSMENT

APPENDIX D

Environmental

Attachment 1 – Habitat Unit Analysis

Attachment 2 – 404(b)(1) Evaluation

Attachment 3 – Monitoring and Adaptive Management Plan

**Attachment 4 – National Environmental Policy Act (NEPA) Public and
Agency Comments and USACE Responses**



**US Army Corps
of Engineers**
Jacksonville District

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1 INTRODUCTION

To facilitate the selection of a preferred alternative and to ensure that the federal government is investing funds in the most cost-effective plans, the U.S. Army Corps of Engineers (USACE) requires that the benefits be quantified so that relative levels of habitat benefit (output) can be compared to the costs. Although approval of planning models under EC 1105-2-412 is not required for Continuing Authorities Program (CAP) projects (Civil Works Policy Memorandum #1 [January 19, 2011]), the principles to ensure quality continue to be necessary. Models and analysis must be compliant with USACE policy, theoretically sound, computationally accurate, and transparent. The variables developed for this model are based upon data in the literature of species habitat requirements and preferences and are inherently based on best professional judgment.

The Pahokee Restoration 1135 CAP Project planning model was specifically developed to evaluate project alternative benefits within the project area. The primary areas to be evaluated in the project area include newly created eco-islands within Lake Okeechobee as well as the immediately surrounding environment, which includes aquatic and terrestrial habitat, plants, fish, and wildlife. The planning model was developed by the USACE, Jacksonville District with input from U.S. Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FWC), and the non-federal sponsor (NFS), Palm Beach County. Members of the project delivery team include scientists and engineers with experience working in south Florida environmental systems, ecology, hydrology, engineering, and planning. The planning model was reviewed by subject matter experts on Lake Okeechobee flora and fauna.

2 PROJECT OVERVIEW

2.1 PROJECT LOCATION

The Pahokee Restoration 1135 CAP Project is located in Lake Okeechobee near Pahokee in Palm Beach County, Florida (see **Figure 1** and **Figure 2**).



Figure 1. Project location, vicinity (Pahokee, Palm Beach County, Florida).



Figure 2. Project location, zoomed, showing TSP and Route 2 (Pahoee, Palm Beach County, Florida).

2.2 PROJECT BACKGROUND

Prior to the 1900s, the surface area of Lake Okeechobee was greater than 750 square miles. The southern end of Lake Okeechobee was covered by dense stands of pond apple (O'Dell, Sharfstein, and Gornak 2005). A natural overflow from the lake provided water flow south into the Everglades and the floodplain allowed for the expansion and contraction of the lake's littoral zone and plant communities (Johnson et al 2007). The southeastern shore of Lake Okeechobee contained a gentle slope into deeper waters, resulting in a shallow area along the shoreline. This shallow area provided the optimum depth to support littoral zone vegetation and served as a natural breakwater, allowing vegetation to take root. The vegetation provided foraging and breeding habitat for aquatic and terrestrial species. The natural wind and wave break also minimized sediment re-suspension.

Herbert Hoover Dike (HHD), which surrounds Lake Okeechobee, has altered the historic ecosystem of the shoreline in the project area. Construction of HHD resulted in a shoreline with scarce vegetation and a deeper shoreline more susceptible to intense wind and wave energy that is not suitable for the re-establishment of vegetation. As a result, the southeast shore where Pahoee is located is now characterized by a steep slope into deep water, sparse upland and aquatic vegetation, no littoral zone or animal habitat, and turbid water.

2.3 PROJECT OBJECTIVES

The following objectives were developed for the Pahokee Project based on problems, opportunities, goals, and Federal and state objectives and regulations:

- Reduce the effects of wind during tropical storms and storm events in order to shelter a portion of the shoreline in lower Lake Okeechobee;
- Create an area suitable for vegetation, with associated habitat, of at least 1 acre;
- Create habitat for fisheries and birds within 5 years;
- Maintain or improve ecotourism;
- Improve natural lake bottom conditions in the project or adjacent area within 5 years.

2.4 PROJECT ALTERNATIVES

The following table lists the final array of alternatives and brief description:

Table 1. Final Array of Alternatives.

Alt	Final Array	Toe Type	Description	X' (ft)	X (ft)	Y' (ft)
1	Low profile island	Stone	Island constructed in Lake Okeechobee; lakeward of Route 2. Elevation of 11 feet.	300	500	3000
2	Low profile shelf	Rock revetment	Littoral shelf connected to existing shoreline. Elevation of 11 feet.	300	400	3000
3	High profile island	Sand toe	Terraced island constructed in Lake Okeechobee; lakeward of Route 2. Lower elevation of 11 feet and upper elevation of 13 feet.	200	800	1500
3a ¹	High profile island	Rock revetment	Variation of alternative 3: Rock revetment instead of a sand toe and 200 feet less in width.	200	600	1500
4	High profile shelf	Rock revetment	Terraced littoral shelf connected to existing shoreline. Lower elevation of 11 feet and upper elevation of 13 feet.	100	300	3000

¹ Due to the high energy wave environment, USACE and the NFS developed alternative 3a as a suitable variation of alternative 3 in terms of reducing the potential long term maintenance. USACE screened Alternative 3 from further analysis due to the risk of additional future operation and maintenance costs as well as the potential to be less sustainable than other options presented to the NFS. Alternative 3a remained in the final array.

5*	Low profile island + high profile island	Rock revetment and stone	Combination of alternatives 1 and 3.	300, 100	500, 500	1500, 1000
6	Low profile island + low profile shelf	Rock revetment	Combination of alternatives 1 and 2.	300, 300	500, 400	1500, 1500

X' – Denotes width of the silt and sand fill

X – Denotes width of the structure for stability purposes

* - Identifies the Recommended Plan

More detailed information on the final array of alternatives can be found in **chapter 3, Plan Formulation** of the IFR/EA.

2.5 RECOMMENDED PLAN

The Recommended Plan consists of the construction of two structures: a low profile island and a high profile island. The low profile island will be constructed at an elevation of 11.0-feet (ft) North Atlantic Vertical Datum of 1988 (NAVD88). The high profile island includes construction of a terraced island with a lower elevation of 11.0-ft NAVD88 and a higher elevation of 13.0-ft NAVD88. Both islands will consist of an interior mix of sand and finer silt sediment, surrounded by a sand berm for stability. The outer slopes will be armored with riprap (see **Figure 3**).

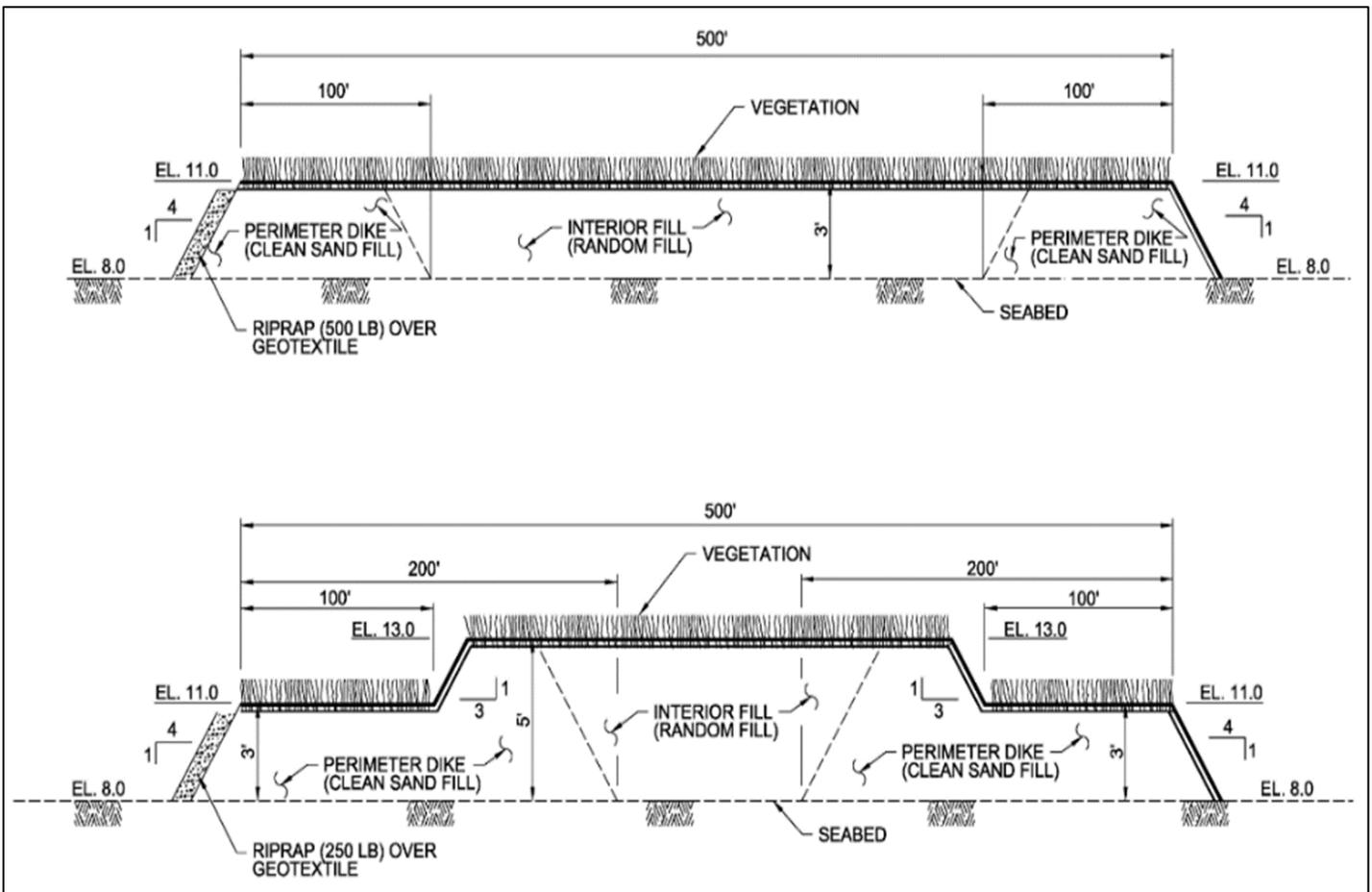


Figure 3. Profiles of the Recommended Plan's low and high profile islands.

3 SPECIES SELECTION

During plan formation of the Pahokee Restoration 1135 CAP Project, species considered for planting were selected based on historical documentation and more recent restoration efforts in Lake Okeechobee. In the early 1900's, the lake levels were higher than they are today, at roughly 19-22 feet at the Lake Okeechobee datum (approximately 17-24 feet National Geodetic Vertical Datum of 1929 (NGVD29), which is within 1.5 feet of today's NGVD29 datum. The pond apple (*Annona glabra*) forest was also at this same elevation and was approximately 1 to 1.5 miles thick and stretched 30 miles along the southern and eastern shoreline according to literature (McVoy et al 2011 and Will 1968). More recent documentation also describes spike rush (*Eleocharis cellulosa*) and bulrush (*Scirpus californicus*) as dominant emergent vegetation in and around Lake Okeechobee. Pond apples, spike rush, and bulrush are listed as indicator species for desired restoration conditions within Lake Okeechobee in the Lake Okeechobee Conceptual Ecological Model (Havens and Gawlik 2005) and by Restoration, Coordination, and Verification (RECOVER). (RECOVER is a multi-agency team tasked with applying scientific and technical information to support the goals and purposes of Comprehensive Everglades Restoration Plan (CERP). RECOVER is comprised of USACE, South Florida Water Management District (SFWMD), National Park Service, USFWS, US Environmental Protection Agency, US Geological Survey, National Oceanic and Atmospheric Administration, Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Services, FWC, Seminole Tribe of Florida, and Miccosukee Tribe.) In addition to compiling existing information to establish the best species to plant in the project area, USACE also consulted with USFWS and FWC.

Two sites, Torrey Island and Kreamer Island, located near the project area were also used as lessons learned for the Pahokee restoration project's conditions (see **Figure 4**). Torrey Island is fortunate to have remnant elevated islands at approximately 12 feet elevation. This island has been successfully re-forested with pond apples through local efforts combined with grants as well as SFWMD plantings in 2005 and 2011. Also near the Pahokee Restoration 1135 CAP Project area is Kreamer Island, which was used as lessons learned for conditions that would not be ideal for the species identified for planting on the project site. Kreamer Island has elevations higher than 13 feet. Although the island was historically used for agriculture purposes, vegetation now grows sparsely in patches.



Figure 4. Location of Torry Island, Kreamer Island, and Ritta Island in relationship to Pahokee, Florida.

Erosion protection and inundation levels are key factors that affect the creation and establishment of the species selected for planting in this project. The key factors are discussed in detail in the following **section 4, Performance Measures**.

4 PERFORMANCE MEASURES

Based on best professional knowledge and available scientific literature (e.g. peer-reviewed literature, technical reports) of the Lake Okeechobee ecosystem, the following performance measures (PM) were developed to measure the five project objectives (see **Table 1**):

- **PM 1: Erosion Protection** – Protection from wind and wave energy required for the establishment and growth of bulrush, spike rush, and pond apples.
- **PM 2: Inundation Levels** – Hydrologic regimes of bulrush, spike rush, and pond apples based on inundation levels and duration.

Table 1 Project Objective Linked Performance Measure (PM)

Study Objectives	Qualitative Analysis	PM 1: Erosion Protection	PM 2: Inundation Levels
1. Reduce the effects of wind during tropical storms and storm events in order to shelter a portion of the shoreline in lower Lake Okeechobee	X		
2. Create an area suitable for vegetation, with associated habitat, of at least 1 acre		X	X
3. Create habitat for fisheries and birds within 5 years		X	X
4. Maintain or improve ecotourism	X		
5. Improve natural lake bottom conditions in the project or adjacent area within 5 years	X		

4.1 QUALITATIVE ANALYSIS

This project provides direct benefits in terms of vegetation and habitat for birds and aquatic species, reduction in wave/wind energy in the immediate area where the islands are constructed, benefit of reducing the amount of silt in the lake system, and recreation. It also provides other benefits such as reduction of wind and wave energy in the lakebed between the island and the shoreline, which could create conditions favorable for other aquatic life; incidental localized water quality improvement due to the plants using nutrients in the water as well as taking silt out of the system to reduce turbidity; and the potential to restore sandy lakeshore bed in some areas through dredging of excess silt on the lake bed. This plan also has potential to provide habitat to threatened and endangered avian species, such as the Snail Kite and Wood Stork. The upland pond apples trees also have the potential to host the threatened Lake Okeechobee Gourd.

Each of the alternatives and the project objectives are discussed in more detail in **chapter 3, Plan Formulation** of the IFR/EA. **Table 3-6** summarizes the evaluation of the alternatives against the objectives, constraints, P&G four accounts, and P&G screening criteria. **Chapter 4, the Tentatively Selected Plan**, discusses the TSP in detail and positive and negative effects are discussed in the IFR/EA's **chapter 5, Effects of the Tentatively Selected Plan**. The effects are similar for all alternatives, except for minor differences in the magnitude of effect.

4.2 PM 1: EROSION PROTECTION

Based on peer-reviewed literature, technical synthesis reports of multiple data sources, and identification of restored conditions in Lake Okeechobee at Torry and Ritta Islands, the soil types of the project site were compared with the preferred soil types of the identified species for planting in the project site. The presence of emergent vegetation (bulrush and spikerush) and pond apples in these

nearby islands are considered a strong indicator that plantings of cornerstone species in sand and sand-silt mix will be successful.

In the shelf and living shoreline alternatives, the lake side of the structure would be lined with rock, then sand, and followed by an interior mix of sand and silt. The eco-island alternatives were conceptualized in a similar manner: rip rap armoring of the lakeward slope, a sand berm surrounding the entire island, and an interior mix of sand and silt.

In SFWMD's technical publication 77-1 (1977) of the major plant communities of Lake Okeechobee and their associated inundation characteristics, bulrush is noted as being typically dependent upon a high energy environment to outcompete other species. Bulrush will be planted on the outer edges of the 11 foot elevations as individual plants are able to withstand intense wave action, indicating a preference for coarser and more frequently inundated soils, such as sand. In areas not subject to frequent wave action, bulrush is usually absent and spike rush is present; therefore, spike rush will be planted on outer edges of the 13 foot elevations. The Institute of Regional Conservation (2016) states that pond apples grow best in poorly to moderately well drained soils which are rich in organics; therefore, pond apples will be planted in the sand-silt mix on the interior of the islands and/or shelves.

4.3 PM 2: INUNDATION LEVELS

Under the 2008 revised Lake Okeechobee Regulation Schedule (LORS), the lake water level is maintained between 12.5 feet NGVD29 and 15.5 feet NGVD29 (or 11.2 feet NAVD88 and 14.2 NAVD88), and maintains stages below 17.25 feet NGVD29 to protect the lake ecology and integrity of the aging HHD. In consideration of LORS levels, alternatives included a low profile and high profile elevation to fit within the lake's water level range, 11 feet NAVD88 and 13 feet NAVD88. Although the regulation schedule in Lake Okeechobee could change, adjustments will consider the Lake Okeechobee performance measures. Dramatic changes that would force lake levels outside of the preferred range could have severe detrimental effects to the existing lake ecology and would be unlikely to be implemented. Vegetation species were selected based on water depth levels at the 11 feet and 13 feet (NAVD88) elevations and the species composition on other islands in the vicinity, specifically Torry Island and Kreamer Island. Torry Island, which has elevations similar to the proposed high and low profile alternatives, has been successfully reforested with pond apples and emergent vegetation. Kreamer Island, which has elevations of 13 feet or higher, is sparsely vegetated. The presence of emergent vegetation and pond apples in the nearby islands are considered a strong indicator that plantings of cornerstone species at the proposed elevations of 11 feet and 13 feet will be successful.

In a study conducted by SFWMD in 1977, the distribution of the bulrush and spike rush was primarily related to land elevation (due to hydroperiods) with soil type having some influence. Bulrush was documented in Lake Okeechobee at elevations of approximately 10-12 feet (NGVD29). Spike rush was documented in Lake Okeechobee at elevations of approximately 10-12 feet (NGVD29) in low wave energy areas and in elevations of approximately 13-14 feet (NGVD29) in higher energy areas.

Table 2. Species inundation levels.

Species	Elevation Range (feet) on Lake Okeechobee (NGVD29)	Inundation Duration	Target - Median Inundation Duration (days/yr)
Pond Apples (<i>Annona glabra</i>)	N/A	100 – 300 ²	200 ²
Spikerush (<i>Eleocharis cellulosa</i>)	Bimodal ³ 10-12 13-14	350-365 ³	357 ³
Bulrush (<i>Scirpus californicus</i>)	9.84-13.12 ⁴	350-365 ³	357 ³

5 HABITAT SUITABILITY INDICES (HSI)

Each performance measure was analyzed using the following Habitat Suitability Indices (HSI) model that was developed following the HEP (Habitat Evaluation Procedures) methodology. HEP was developed by USFWS (1980) to facilitate the identification of impacts from various federal actions on fish and wildlife habitat. HEP can provide numeric scores for existing conditions at a project site, potential future without-project conditions, and various action alternatives for a species or assemblage of species in a particular geographic area. HEP is implemented by the use of one or more HSIs, which are designed to represent the habitat suitability of an area for a single species or assemblage of species as well as different life stages of a species or assemblage of species. A set of variables that represent the habitat requirements for the species (e.g. salinity, water depth, substrate, etc.) is combined into a mathematical model.

The Pahokee Restoration project’s habitat analysis model uses the same principles of HEP by focusing on key variables that indicate and describe how these certain habitat types will succeed based on literature, however, the project’s analysis is based on best professional judgment (**Table 3**) and not a mathematical formula. The variables are then measured and their corresponding index values describe existing habitat suitability. The value is an index score between 0 and 1, with zero being no suitable habitat and one being ideal habitat. Suitable HSI models must include habitat variables for which data collection is possible or already exists. Variables must also show a change in score between the existing and proposed condition. If the project does not affect the suitability index score for a species, it will not be possible to quantify an effect.

The purpose of this project is to identify and implement self-sustaining ecosystem-based habitat improvement actions that would provide the attributes necessary to support flora and fauna species within Lake Okeechobee. Therefore, the HSI was developed to document the linkage between model outputs and ecosystem functions as well as evaluate the degree to which alternative plans meet restoration objectives.

² Engel, V. Renshaw, A., et al. (2009).

³ Johnson, et. al. (2007).

⁴ SFWMD (1977).

5.1 ASSUMPTIONS

The following assumptions were applied to minimize bias during HSI determination:

- Each species is equally valued; one is not considered more significant or rare than the others.
- No suitable habitat currently exists for island alternatives.
- Limited/eroding habitat currently exists for shelf alternatives although little to no emergent vegetation is present.
- Stone toes will not create habitat to be evaluated in the HSI.
- The lake stage is generally at 12 feet (NGVD29).
- Duplication of Torry Island conditions is considered a goal of the Pahokee Restoration 1135 CAP Project.
- HSI value of 0 indicates no viable habitat for species.
- HSI value of 1 indicates ideal habitat for species.
- Sand is a more suitable substrate for emergent vegetation.
- Silt-sand mix is a more suitable substrate for pond apples.
- Existing habitat will continue to linearly degrade with implementation of the project due to continued fine sediment accumulation and erosion.

PM 1: Erosion Protection Assumptions

The project area is exposed to wind-generated waves and boat wakes. Fetch lengths and wave heights contribute to erosion along the existing shoreline. Fine-grained sediments are easily re-suspended and can smother shoreline vegetation or inhibit growth of submerged aquatic vegetation due to the lack of light penetration through the water column. A shelf or living shoreline would be built onto the existing shoreline and continue to take the brunt of the wind and waves. While eco-islands will be subject to the same wind and wave conditions, the islands will be a buffer between the wind effects and the existing adjacent shoreline. This buffer of protection will reduce the amount of sediment resuspension and allow for improved natural lake bottom conditions. In the assignment of HSI values, the existing conditions baseline (ECB) refers to the existing shoreline whereas the future with project conditions (FWP) refers to the alternative's proposed structure shoreline.

PM 2: Inundation Level Assumptions

The proposed shelf alternatives have an added advantage being connected to the existing shoreline. Existing and planted vegetation could expand and migrate into one another whereas island alternatives have a limited spatial availability for habitat to grow and establish.

5.2 ASSIGNMENT OF HSI VALUES

Following the literature review and recommendations from RECOVER experts as well as staff from USFWS and FWC, a narrative description of the HSI value is described in **Table 3**. All alternatives were assigned HSI scores for ECB, future without project (FWO), and FWP conditions (see **Table 4**).

Table 3. HSI narrative explanation.

Habitat Suitability Value (0.0-1.0)	<u>PM 1: Erosion Protection</u>	<u>PM 2: Inundation Levels</u>
0.0	No protection.	No littoral zone.
0.1	No protection.	Scoured shoreline.
0.2	Vegetation is landscaped and provides very little to no protection from wind and wave energy.	No established littoral zone.
0.3	Obstruction offshore provides indirect shoreline protection.	No established littoral zone.
0.4	Emergent vegetation buffers shoreline from wave energy.	Lower or higher end of species tolerant range.
0.5	Emergent vegetation buffers upland vegetation from wave energy.	Lower or higher end of species tolerant range.
0.6	Emergent vegetation buffers upland vegetation from wind and wave energy.	Lower or higher end of species tolerant range. Species can migrate/expand to tie into existing habitat.
0.7	Emergent vegetation buffers upland vegetation from wind and wave energy.	Within species tolerant range.
0.8	50% armored against erosion.	Within species tolerant range.
0.9	50% armored against erosion. Emergent vegetation provides additional protection from wind and wave energy to upland vegetation.	Within species preferred range.
1.0	Armored against erosion. Emergent vegetation provides additional protection from wind and wave energy to upland vegetation.	Within species preferred range. Species can migrate/expand to tie into existing habitat.

Table 4. HSIs for each alternative.

Alternative	Emergent Vegetation			Pond Apples		
	ECB ⁵	FWO ⁶	FWP	ECB ⁵	FWO ⁶	FWP
1	0	0	0.4	0	0	0.5
2	0.2	0.1	0.5	0.2	0.1	0.6
3a	0	0	0.7	0	0	0.9
4	0.2	0.1	0.7	0.2	0.1	1
5	0	0	0.6	0	0	0.7
6	0.2	0.1	0.5	0.2	0.1	0.6

6 HABITAT UNITS

Habitat unit (HU) scores were produced by multiplying the HSI scores by the total acreage of suitable habitat created (see **Table 5**).

Table 5. Calculated HUs for Project Alternatives.

Alternative	Total HU	Total Acreage	Emergent Vegetation			Pond Apples		
			HSI	Acreage	HU	HSI	Acreage	HU
1	15.84	34.44	0.4	13.77	5.51	0.5	20.66	10.33
2	15.84	27.55	0.5	6.89	3.44	0.6	20.66	12.40
3	20.66	27.55	0.7	20.66	14.46	0.9	6.89	6.20
3a	15.84	20.66	0.7	13.77	9.64	0.9	6.89	6.20
4	14.32	16.85	0.7	8.43	5.90	1.0	8.43	8.43
5	18.48	28.70	0.6	16.07	9.64	0.7	12.63	8.84
6	17.56	30.99	0.5	10.33	5.17	0.6	20.66	12.40

The HU values are used in the cost effectiveness and incremental cost analysis for the final array of alternatives, which can be found in **section 3.2.3.2, CE/ICA** of the IFR/EA.

⁵ The ECB is based on the proposed project location. Alternatives 1, 3a, and 5 are island alternatives. The proposed project would be constructed on sub-tidal, benthic habitat. No erosion protection or littoral zone exists at the proposed site. Alternatives 2, 4, and 6 are shelf alternatives. The proposed project would be constructed on existing shoreline. Little to no erosion protection and no established littoral zone currently exists.

⁶ The FWO is based on proposed project location. Alternatives 1, 3a, and 5 are island alternatives. The proposed project would be constructed on sub-tidal benthic habitat. No erosion protection or littoral zone currently exists at the proposed site; therefore, no change would occur. Alternatives 2, 4, and 6 are shelf alternatives. The proposed project would be constructed on existing shoreline. If the proposed project is not implemented, conditions at the existing shoreline would continue to degrade.

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APPENDIX D
Environmental
Attachment 2 – 404(b)(1) Evaluation



**US Army Corps
of Engineers**
Jacksonville District

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**Final Evaluation of 404(b)(1) Guidelines
 Contained in Vol. 45 No. 249 of the
Federal Register dated 24 December 1980**

**Pahokee Eco-Islands 1135 Continuing Authorities Program (CAP) Project
 December 2017**

1. Technical Evaluation Factors

a. Physical and Chemical Characteristics of the Aquatic Ecosystem (230.20-230.25)(Subpart C)

	N/A	Not Significant	Significant
(1) Substrate impacts	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(2) Suspended particulates/turbidity impacts	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(3) Water Quality Control	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(4) Alteration of current patterns and water circulation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(5) Alteration of normal water fluctuations/hydroperiod	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(6) Alteration of salinity gradients	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The objectives of the Pahokee Eco-Islands project include the following:

- Reduce the effects of wind during tropical storms and storm events in order to shelter a portion of the shoreline in lower Lake Okeechobee;
- Create an area suitable for vegetation, with associated habitat, of at least 1 acre;
- Create habitat for fisheries and birds within 5 years;
- Maintain or improve ecotourism;
- Improve natural lake bottom conditions in the project or adjacent area within 5 years.

The Recommended Plan consists of the construction of two structures: a low profile island and a high profile island. The low profile island will be constructed at an elevation of 11.0-feet (ft) North Atlantic Vertical Datum of 1988 (NAVD 88). The high profile island includes construction of a terraced island with a lower elevation of 11.0-ft NAVD 88 and a higher elevation of 13.0-ft NAVD 88. Both islands will consist of an interior mix of sand and finer silt sediment, surrounded by a sand berm for stability. The outer slopes will be armored with riprap. Temporary turbidity will occur as a result of eco-island creation and dredging. Impacts will be temporary and localized, lasting only as long as construction takes place. Best Management Practices (BMPs) and methods to manage the placement of sand and dredged material will ensure minimized and controlled turbidity. Final details for BMPs and methods will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods.

b. Biological Characteristics of the Aquatic Ecosystem(230.30-230.32) (Subpart D)

	N/A	Not Significant	Significant
(1) Effect on threatened/endangered species and	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

their habitat

(2) Effect on the aquatic food web	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(3) Effect on other wildlife (mammals, birds, reptiles, and amphibians)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

USACE has concluded that the project may affect, but is not likely to adversely affect, the following federally listed species:

- Eastern indigo snake (*Drymarchon corais couperi*);
- Florida panther (*Puma (=felis) concolor coryi*);
- West Indian (Florida) manatee (*Trichechus manatus*).

USACE has concluded that the project will have no effect to the following federally listed species and USFWS designated critical habitat (DCH):

- Everglade snail kite (*Rostrhamus sociabilis plumbeus*);
- Florida bonneted bat (*Eumops floridanus*);
- Northern crested caracara (*Caracara cheriway*);
- Wood stork (*Mycteria americana*);
- Okeechobee gourd (*Cucurbita okeechobeensis* ssp. *okeechobeensis*);
- Everglade snail kite – Florida population DCH;
- West Indian (Florida) manatee – entire population DCH.

c. Special Aquatic Site (230.40-230.45) (Subpart E)

	N/A	Not Significant	Significant
(1) Sanctuaries and refuges	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) Wetlands	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) Mud flats	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) Vegetated shallows	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(5) Coral reefs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(6) Riffle and pool complexes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

There are no special aquatic sites located in the project area; therefore, no impacts are anticipated.

d. Human Use Characteristics (230.50-230.54) (Subpart F)

	N/A	Not Significant	Significant
(1) Effects on municipal and private water supplies	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) Recreational and Commercial fisheries impacts	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(3) Effects on water-related recreation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(4) Aesthetic impacts	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(5) Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Construction of the Recommended Plan will result in improved fisheries habitat and will maintain or improve eco-tourism in the project area.

2. Evaluation of Dredged or Fill Material (230.60) (Subpart G)

- a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. **(Check only those appropriate)**
- (1) Physical characteristics
 - (2) Hydrography in relation to known or anticipated sources of contaminants
 - (3) Results from previous testing of the material in the vicinity of the project
 - (4) Known, significant, sources of persistent pesticides from land runoff or percolation
 - (5) Spill records for petroleum products or designated (Section 311 of CWA) hazardous substances
 - (6) Other public records of significant introduction of contaminants from industries, municipalities or other sources
 - (7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge
 - (8) Other sources (specify)
The structures being constructed are sheetpile weirs with a concrete cap.

The project footprint has no known hazardous, toxic, and radioactive waste (HTRW) problems (e.g., super fund, state records, etc.). The city of Pahokee has several minor pending petroleum cleanup site (e.g., gas stations, etc. as noted on the FDEP Waste Cleanup Contamination Locator Map). These sites are not expected to have any impact to the proposed project footprint. Any fill required for this project will be sourced only from clean, HTRW free areas. There is no history of industrial discharges into or around Lake Okeechobee. Since the project footprint is within a lakebed any concern with past residential or industrial use is eliminated. The main concern with Lake Okeechobee sediments is the relatively high levels of legacy nutrients introduced into the lake by agricultural activities. South and Central Florida have relatively high natural background levels of arsenic in various parts of the state (above residential limits (2.1 mg/kg soil) and in some cases above industrial limits (12mg/kg soil)). Pristine marsh soil cores in the Everglades have yielded results as high as 50 mg/kg. (Limits are based on daily consumption of a small amount of soil throughout an entire year.) Parts of Lake Okeechobee are likely to have some areas with the sediments above the residential limits for arsenic. These levels are not the result of any past industrial activity in or around the lake but are due to the natural geology of the area. Levels above residential limits are commonly found in the Miami area and within the Everglades National Park (i.e., Tamiami Trail 1 mile bridge project). Any sediments moved within the lake to construct this project would be capped with clean fill. The islands created by this project would also reduce re-suspension of sediments by dampening wave energy. This would tend to reduce re-suspension of the lake sediments into the water column which would help dampen nutrient spikes in the project area resulting from wind/wave action.

- b. An evaluation of the appropriate information in 2a above indicated that there is reason to believe the proposed dredged or fill material is not a carrier of contaminants, of that levels of contaminants are substantively similar at extraction and disposal sites and not likely to exceed constraints. The material meets the testing exclusion criteria.

YES NO

3. Disposal Site Delineation (Section 230.11(f))

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

- (1) Depth of water at disposal site
- (2) Current velocity, direction, and variability at disposal site
- (3) Degree of turbulence
- (4) Water volume stratification
- (5) Discharge vessel speed and direction
- (6) Rate of discharge
- (7) Dredged material characteristics (constituents, amount, and type of material, settling velocities)
- (8) Number of discharges per unit of time
- (9) Other factors affecting rates and patterns of mixing (specify)

Sand will be excavated from an upland mine and transported to the Pahokee Marina staging area via truck. A scow barge with 3,000 CY capacity will be used to transport material from shore to site. Two hydraulic excavators and two clamshells will be used for offloading the sand from the barge. A dozer and a grader will be used for grading. One 14" cutter section pipeline dredge will be used to dredge and place silt. Temporary turbidity will occur as a result of eco-island construction. Impacts will be temporary and localized, lasting only as long as construction takes place. Best Management Practices (BMPs) and methods to manage the placement of sand and dredged material will ensure minimized and controlled turbidity. Final details for BMPs and methods will be determined during the permitting and contracting process. The contractor will be given criteria to determine and achieve acceptable means and methods.

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable.

YES NO

4. Actions to Minimize Adverse Effects (Section 230.70-230.77)(Subpart H)

All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.

YES NO

5. Factual Determination (Section 230.11)

A review of appropriate information as identified in items 2-5 above indicates that there is minimal potential for short or long-term environmental effects of the proposed discharge as related to:

- a. Physical substrate at the disposal site (review sections 2a, 3, 4, & 5)
- b. Water circulation, fluctuation & salinity (review sections 2a, 3, 4, & 5)
- c. Suspended particulates/turbidity (review sections 2a, 3, 4, & 5)
- d. Contaminant availability (review sections 2a, 3, & 4)
- e. Aquatic ecosystem structure and function (review sections 2b, c; 3, & 5)
- f. Disposal site (review sections 2, 4, & 5)

- g. Cumulative impact on the aquatic ecosystem
- h. Secondary impacts on the aquatic ecosystem

6. Review of Compliance (230.10(a)-(d) (Subpart B)

A review of the permit application indicates that:

- a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and information gathered for EA alternative);

YES NO
- b. The activity does not appear to 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies);

YES NO
- c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values (if no, see section 2);

YES NO
- d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5);

YES NO

7. Findings

a. The proposed disposal site for discharge of dredged or fill material complies with the Section 404 (b)(1) guidelines

b. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines with the inclusion of the following conditions:

c. The proposed disposal site for discharge of dredged or fill material does not comply with the Section 404(b)(1) guidelines for the following reason(s):

- (1) There is a less damaging practicable alternative
- (2) The proposed discharge will result in significant degradation of the aquatic ecosystem
- (3) The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem

PAHOKEE RESTORATION
CONTINUING AUTHORITIES PROGRAM
SECTION 1135 PROJECT
FINAL INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL
ASSESSMENT

APPENDIX D
Environmental

Attachment 3 – Monitoring and Adaptive Management Plan



**US Army Corps
of Engineers**
Jacksonville District

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1 PURPOSE

Section 2039¹ of Water Resources Development Act (WRDA) 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project (or component of a project) under the U.S. Army Corps of Engineers (USACE) ecosystem restoration mission, that the recommended project includes a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction adaptive management should proceed, if needed. An adaptive management plan is required by U.S. Army Corps of Engineers (USACE) implementation guidance for the Water Resources Development Act (WRDA) 2007 Section 2039².

This monitoring and adaptive management plan will be used following implementation of the Pahokee Restoration Section 1135 Continuing Authorities Program (CAP) project, located in Pahokee, Palm Beach County, Florida. This plan includes a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring. The plan provides strategies to address project uncertainties that will be faced as the project progresses toward achieving restoration goals and objectives while remaining within identified constraints. Each strategy follows a scientific approach that uses performance measures, monitoring, triggers and/or thresholds to inform restoration progress and support decisions regarding the need to adjust to improve restoration performance.

2 INTRODUCTION

Uncertainty exists in every natural resource management and restoration effort. Many processes in the ecosystem are not linear; they work synergistically and will unfold in a future climate that is likely different than the one used to formulate the initial plan. The monitoring and adaptive management plan will address key uncertainties identified during plan formulation that relate to achieving restoration success and making adjustments of project features and operations if determined to be necessary to improve performance.

Definitions that will help the reader in understanding the Pahokee Restoration Section 1135 CAP project monitoring and adaptive management plan include the following:

- **Adaptive Management** – A scientific process for continually improving management policies and practices by learning from their outcomes; Adaptive management links science to decision making to improve restoration performance, efficiency, and probability of success. In the context of the Pahokee 1135 CAP project, adaptive management is a structured approach for addressing uncertainties by testing hypotheses about the best project designs and operations to achieve restoration goals and objectives, linking science to decision making, and adjusting implementation, as necessary, to improve the probability of restoration success.

¹ Title 2, Water Resources Development Act of 2007 § 2039 (2007). <https://www.gpo.gov/fdsys/pkg/PLAW-110publ114/pdf/PLAW-110publ114.pdf>

² USACE, 2009. USACE HQ Implementation Guidance on Section 2039 of Water Resources Development Act. http://www.mvr.usace.army.mil/Portals/48/docs/Environmental/EMP/Key%20Docs/2007_Implementation_Guidance_WRDA07_Sec_2039.pdf

- **Uncertainty** – A question faced during planning or implementation regarding the best actions to achieve desired goals and objectives within constraints, which cannot be fully answered with available data or modeling.
- **Management Options** – Potential structural, non-structural, and operational alternatives to be undertaken to improve restoration performance. Adaptive management plans contain potential management action “options” that may be taken to improve performance if project/program goals and objectives are not met.
- **Strategies** – A plan to address one or more uncertainties identified. The adaptive management strategies fit into the following approaches:
 - *Passive Adaptive Management (Figure E-1)* – All of the Pahokee Restoration Section 1135 CAP project strategies are considered passive adaptive management approaches. One project component or set of operational criteria is implemented to test its ability to achieve desired goals and objectives. Results are monitored, assessed, and communicated to implementing agencies and the appropriate participating agencies to determine how best to adjust project component designs, operations, project contingency options, or inform future environmental restoration projects.

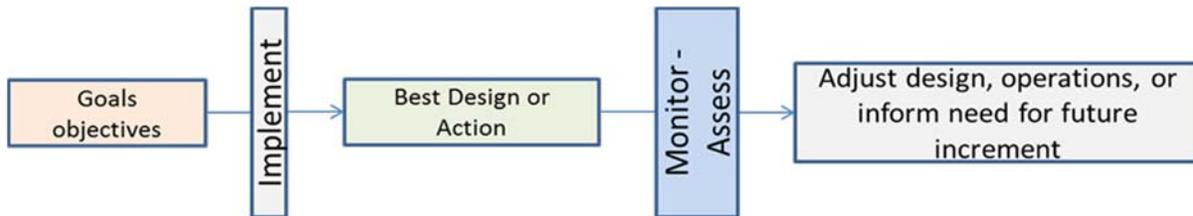


Figure 1. Passive adaptive management.

(The above diagram illustrates that the best design or management action is implemented to achieve project goals and objectives with associated monitoring and results are assessed to adjust other project component designs, adjust operations and inform the need for a future project change.)

Prior to development of this monitoring and adaptive management plan, existing monitoring plans from similar environmental restoration projects were evaluated to provide a frame of reference for the Pahokee project. The monitoring recommended is what is needed beyond the other sources to address key uncertainties (key questions) identified during planning that relate to achieving project goals and objectives. Project specific adaptive management activities will be implemented as necessary in coordination with partner agency monitoring activities.

3 ADAPTIVE MANAGEMENT UNCERTAINTIES AND PROJECT OBJECTIVES

The uncertainties in this section target prioritized needs and opportunities to learn in order to make scientifically sound recommendations to refine the project design, construction, and operations. The strategies and management options provided in the following sections address each uncertainty and are intended to guide the Pahokee Restoration Section 1135 CAP project performance in the face of inevitable unknowns, with existing knowledge and knowledge that will be gained through monitoring and assessment. The strategies are focused on the Pahokee project, but designed to contribute to future changes to environmental restoration projects as well in order to maximize ‘return on investment’ for resources invested in pursuing the adaptive management activities. The monitoring proposed was guided in part by two objectives: to be complete from a project perspective by providing the monitoring required to address the project-specific uncertainties; and to integrate with other environmental monitoring to take advantage of existing

monitoring efforts, knowledge and information and thereby leverage dollars committed and spent elsewhere to avoid redundancies and insure cost-effectiveness. *Where possible, the Pahokee Restoration Section 1135 CAP project adaptive management strategies rely on existing monitoring resources such as physical instrumentation, stations, locations, servicing and analysis efforts funded by partner agencies. Therefore, the monitoring requirements described here are limited to the additional, marginal increase in monitoring resources and analysis efforts needed to address CAP project-specific adaptive management questions.*

3.1 Project Uncertainties

The project plans were reviewed to identify key uncertainties related to achieving project goals and objectives. The project objectives are identified in **Table 1** and constraints are outlined in the project's Management Options Matrix (MOM). The overarching objective of the Pahokee Restoration Section 1135 CAP project is to re-establish biologically productive emergent and submerged habitat lost during construction of the Herbert Hoover Dike and subsequent alteration to the natural water flow. The plan consists of constructing a high profile island and an adjacent low profile island, which support emergent and submerged vegetation tolerant to a variety of water stages, attracting benthic infauna and fisheries. Once established, the islands will also trap sediment, thereby reducing turbidity, protect the adjacent shoreline habitat during storms and improve ecotourism.

Table 1. Pahokee Restoration Section 1135 CAP Project Objectives.

O1	Reduce the effects of wind during tropical storms and storm events in order to shelter a portion of the shoreline in lower Lake Okeechobee
O2	Create an area suitable for vegetation, with associated habitat, or at least 1 acre
O3	Create habitat for fisheries and birds within 5 years
O4	Maintain or improve ecotourism
O5	Improve natural lake bottom conditions in the project or adjacent area within 5 years

The uncertainties of the project implementation are listed here for reference and relate directly to objectives 2 and 3 to create suitable vegetation and habitat for fisheries and birds.

1. *How will the Pahokee Restoration Section 1135 CAP project affect the future occurrence of forested wetland vegetation in the project area?*
2. *How will the Pahokee Restoration Section 1135 CAP project affect the future occurrence of emergent wetland vegetation in the project area?*

4 PROJECT MONITORING AND ADAPTIVE MANAGEMENT STRATEGIES

Strategy descriptions for each uncertainty and suggested management actions to improve restoration performance, as illustrated in **Table 2**, are included in this section. The following strategies describe and address each uncertainty and inform project implementation and operations based on the body of existing scientific knowledge. The strategy write-ups include information on drivers of the uncertainty, restoration targets, and project targets for particular attributes of the ecosystem associated with the uncertainty (such as a key species or ecological features). Additionally, the strategies include monitoring plans for each uncertainty, including how the attributes will be monitored to track progress toward the targets, the timeframe³ in which changes in these attributes will be measurable, and identification of a trigger or threshold that would give early warning that project performance is veering from restoration expectations. An annual summary report will be drafted to briefly summarize the monitoring data and other information collected to determine if adaptive management is needed. A final report will be drafted that details the outcomes of the restoration project.

Following the strategies, the suggested MOM is provided as **Table 3**. The matrix lists suggestions of paths forward and adjustments that can be made in order to keep the project progressing toward the targets, based on specific decision-criteria, e.g., a trigger or threshold is crossed (reflecting unintended effects related to a constraint) or is not crossed (reflecting lack of restoration progress towards restoration goals and objectives). The purpose of the two formats is to provide a background and detail of each strategy and a table reference summary and crosswalk that relates monitoring to specific decision-criteria and potential actions for multiple strategies in a specific area.

³ The “timeframe in which changes will be measurable” does not imply that changes will be *complete* in that timeframe; rather, the timeframes provide an estimate of time needed to *begin* to be able to distinguish effects. For practicality, the screening criteria included the need to have attributes measurable within the timeframe of the monitoring plan, which in some cases necessitated a ‘proxy’ attribute to be measured that would represent expected changes on a longer time scale. In addition, the triggers and thresholds were identified with the best available information, however, these should be updated to keep current with best available science.

Table 2. Pahokee Restoration Section 1135 CAP Project Adaptive Management Strategies: Template and Definitions.

<p>Pahokee Restoration Section 1135 CAP Project Adaptive Management Uncertainty. <i>The uncertainty is a question faced during planning or implementation regarding the best restoration actions to achieve desired goals and objectives within constraints, which cannot be fully answered with available data or modeling.</i></p> <p>Pahokee Restoration Section 1135 CAP Project Objective or Constraint. <i>Uncertainties need to be related to the project's objectives or constraints, among other criteria, to be included in the monitoring and adaptive management plan. This linkage focuses the scope of the monitoring and adaptive management plan.</i></p> <p>Associated Pahokee Restoration Section 1135 CAP Project Features. <i>Structures or measures to which the uncertainty and strategy pertain.</i></p> <p>Expectations or hypotheses to be tested to address the uncertainty, and attribute(s) that will be measured to test each. <i>A scientific approach begins with a well-informed, pointed, detailed statement that will be tested. For the purposes of the Pahokee project's monitoring and adaptive management plan, the statement can be referred to as an expectation or hypothesis. Approaching uncertainties scientifically is efficient because it is targeted; a properly identified hypothesis statement is the most important step to lead to effective, efficient methodology to address an uncertainty. It leads to proper identification of what to measure, how, how often, how to analyze, etc.</i></p> <p>Monitoring methodology for testing each expectation or hypothesis (including frequency of monitoring) and for reporting: <i>More information on what to measure, how, how often, how to analyze, and when and how to report results. PLEASE NOTE: the Pahokee project's monitoring and adaptive management plan varies in the level of methodology detail provided; methodology will be reviewed, updated and adjusted if needed by agency subject experts, before initiation, to best meet the intent of the monitoring and adaptive management plan.</i></p> <p>Triggers/thresholds that indicate good project performance or need for adaptive management action. <i>Triggers or thresholds are a point, range, or limit that signifies when restoration performance is veering away from expectations and is trending toward an unintended outcome. Triggers/thresholds should be described per attribute to be monitored because each should result in an outcome that informs management decisions.</i></p> <p>Management options that may be chosen based on test results. <i>Management options are provided in case a performance trigger or threshold is crossed, which would indicate that the project performance needs to be adjusted. Management options are suggested paths forward and adjustments that can be made to keep the project progressing toward objectives and within constraints.</i></p>

4.1 Forested Wetland Habitat – Pond Apple Trees (*Annona glabra*)

Forested wetland habitat includes many important biological resources. Species, such as pond apples, cypress, and red maple, provide rookery and feeding areas for birds, foraging and nursery habitat for fish, including larvae and juveniles, substrate for epiphytes and algae, provide oxygen, and are instrumental in carbon sequestration. The roots consolidate fine sediments and stabilize the shoreline, thereby reducing potential turbidity and enhancing water clarity, and the canopy serves as a storm buffer. The creation of forested wetland habitat is a primary goal of the Pahokee project.

Pahokee Restoration Section 1135 CAP Project Adaptive Management Uncertainty. *How will the Pahokee Restoration Section 1135 CAP project affect forested wetland habitat in the project area?*

Pahokee Restoration Section 1135 CAP Project Objective or Constraint. This uncertainty is related to project objectives O2 and O3.

Associated Pahokee Restoration Section 1135 CAP Project Features. Pond apple trees (*Annona glabra*), the proposed species for planting for a forested wetland, will thrive at a lake level range of 14.5-15.5 feet (National Geodetic Vertical Datum of 1929 (NGVD29), (13.2-14.2 feet North American Vertical Datum of 1988 (NAVD88)), which is within the Lake Okeechobee Regulation Schedule (LORS) 2008 update.

Expectations and hypotheses to be tested to address uncertainty, and attribute(s) that will be measured to test each. Recruitment of vegetation is dynamic and can vary significantly depending on lake level and wave energy. Forested wetland habitat includes native plant species, such as pond apples, cypress, and red maple. High lake levels have the ability to depress productivity or even eliminate emergent vegetation for short periods. Establishment⁴ of forested wetland vegetation in the Pahokee project area is expected to take approximately 5 years. Restoration projects in this area, specifically the Torry Island restoration project, have been highly successful, therefore, it is expected that establishment of forested wetland vegetation in the Pahokee Restoration Section 1135 CAP project area would also be successful. Following completion of island creation construction, annual monitoring will be performed to assess plant coverage and establishment in the project area.

Monitoring methodology for testing each expectation or hypothesis. Monitoring for plant cover will occur annually and during the months when lake levels are most likely to allow access. Monitoring, which will be defined with scopes of work in a detailed monitoring plan during the Design and Implementation phase of the project, could be performed via transect and quadrant measurements, and/or aerial photography. Monitoring can be performed by a contractor or Palm Beach County (PBC). Annual monitoring will continue for a period of 5 years following completion of construction.

⁴ Species are considered established when no maintenance for survivability is required and the plants are showing signs of new growth and natural recruitment and/or plant propagation.

Triggers/thresholds that indicate good performance or need for adaptive management action. The creation of forested wetland habitat in the Pahokee Restoration 1135 CAP project area will be deemed successful when 80% or more of the planted pond apple trees persist after the conclusion of two annual monitoring periods. Should the plant cover fall below the identified thresholds (as defined in the MOM), additional plantings should be conducted.

Management options that may be chosen based on results. Based on the achieved results at the nearby Torry Islands restoration project, planting at Pahokee Restoration Section 1135 CAP project is expected to be successful. Should the plant cover fall below the identified thresholds (as defined in the MOM), additional plantings should be conducted. If the decline in survivability is linked to lake levels outside of the present LORS, monitoring of natural recruitment and/or additional plantings will be considered once levels return to the present LORS.

4.2 Emergent Wetland Habitat – Spike rush (*Eleocharis cellulosa*) and Bulrush (*Schoenoplectus californicus*)

Emergent wetland vegetation serves important functions in the ecology of Lake Okeechobee. The plants recycle nutrients and promote the nutrient mass balance of freshwater ecosystems. Bulrush, spike rush, and pickerelweed, for example, provide essential food chain resources, foraging habitat for waterfowl, and refuge and foraging habitat for fish. The roots of emergent wetland vegetation stabilizes fine sediments and the shoreline with roots, thereby reducing potential turbidity and enhancing water clarity. The creation of emergent wetland vegetation is a primary goal of Pahokee project.

Pahokee Restoration Section 1135 CAP Project Adaptive Management Uncertainty. *How will the Pahokee Restoration Section 1135 CAP project affect the future occurrence of emergent wetland habitat in the project area?*

Pahokee Restoration Section 1135 CAP Project Objective or Constraint. This uncertainty is related to project objectives O2 and O3.

Associated Pahokee Restoration Section 1135 CAP Project Features. Recruitment of emergent wetland vegetation, such as bulrush, spike rush, and pickerelweed, is dynamic and can vary significantly depending on lake level and wave energy. Emergent wetland plants are hearty and robust and are therefore able to easily survive in Lake Okeechobee given the right elevations. High lake levels have the ability to depress productivity or even eliminate emergent vegetation for short periods. Spike rush (*Eleocharis cellulosa*) and bulrush (*Schoenoplectus californicus*), proposed species for planting on sand perimeters of the islands, will thrive at a lake level range of 12.5-13.5 feet NGVD29 (11.2-12.2 feet NAVD88), which is within the LORS 2008 update.

Expectations and hypotheses to be tested to address uncertainty, and attribute(s) that will be measured to test each. Establishment⁵ of emergent wetland vegetation in the Pahokee Restoration Section 1135 CAP project area is expected to take approximately 5 years following planting. Based on the results of the nearby Torry Island restoration project, planting is expected

⁵ Species are considered established when no maintenance for survivability is required and the plants are showing signs of new growth and natural recruitment and/or plant propagation.

to be successful. Monitoring will be conducted annually after planting to assess and document survival and natural recruitment.

Monitoring methodology for testing each expectation or hypothesis. Monitoring for emergent wetland vegetation will occur annually. Bird and wildlife usage of the eco-islands occurring at the time of monitoring will be documented. Monitoring, which will be defined with scopes of work in a detailed monitoring plan during the Design and Implementation phase of the project, could be performed via transect and quadrant measurements, and/or aerial photography. Monitoring can be performed by a contractor or PBC. Annual monitoring will continue for a period of 5 years following completion of construction.

Triggers/thresholds that indicate good project performance or need for adaptive management action. The creation of emergent wetland habitat in the Pahokee 1135 CAP project area will be deemed successful when 80% coverage is documented for two consecutive annual monitoring events. Should the plant cover fall below the identified thresholds (as defined in the MOM), additional plantings should be conducted.

Management options that may be chosen based on results. Survival of emergent wetland vegetation in the Pahokee Restoration Section 1135 CAP project area is expected due to the success of the nearby Torry Island restoration project. Should the plant cover fall below the identified thresholds (as defined in the MOM), additional plantings should be conducted. If the decline in survivability is linked to lake levels outside of the present LORS, monitoring of natural recruitment and/or additional plantings will be considered once levels return to the present LORS.

5 MANAGEMENT OPTION MATRIX (MOM)

The MOM (**Table 3**) helps link monitoring to decision criteria and suggested management options to consider if monitoring reveals performance issues related to project operations. The management options included in the Pahokee Restoration Section 1135 CAP project monitoring and adaptive management plan can be described as the following:

1. *Informing Pahokee Restoration Section 1135 CAP Project Implementation-* Results of monitoring a project component may inform next phase of project component construction sequencing,
2. *Inform Project Operations-* Results inform project operations or system operating manuals,
3. *Pahokee Restoration Section 1135 CAP Project Adaptive Management Contingency Options-* Monitoring results may suggest a need to implement additional restoration actions, called adaptive management options, pending all required and applicable coordination, policies, and permitting.

The MOM is a quick reference intended to inform decision-makers, partner agencies, and the public on potential actions to improve restoration performance. ***Implementation of adaptive management options is not automatic; the options are suggestions that capture current understanding of potential future issues and solutions. While the monitoring and adaptive management plan and its suggested options are considered part of the recommended plan, all***

applicable policies, permitting, and coordination requirements apply to implementing adaptive management options.

Table 3. Pahokee Restoration Section 1135 CAP Project MOM.

Uncertainty	Timeframe to detect change of attributes*	Attribute or Indicator	Specific Property to be Measured and Frequency	Decision Criteria Trigger(s) for Management Action	Management Action Option(s)
Forested Wetland Habitat	2-4 years	Pond apples	Annual monitoring of planted forested wetland vegetation coverage.	<p>Less than 25% establishment within 2 years.</p> <p>Less than 50% establishment within 4 years.</p> <p>Less than 80% establishment within 5 years.</p>	<p>Evaluate lake stage frequency to determine if lake levels are outside of LORS frequency and whether it affected vegetation success. Resume planting once lake levels return to LORS.</p> <p>Install additional plants.</p>
Emergent Wetland Habitat	1-2 years	Spike rush Bulrush	Annual monitoring of planted emergent wetland vegetation coverage.	<p>Less than 25% establishment within 2 years.</p> <p>Less than 50% establishment within 4 years.</p> <p>Less than 80% establishment within 5 years.</p>	<p>Evaluate lake stage frequency to determine if lake levels are outside of LORS frequency and whether it affected vegetation success. Resume planting once lake levels return to LORS.</p> <p>Install additional plants.</p>

*The “timeframe to detect changes...” does not imply that changes will be complete in that timeframe; rather, they provide an estimate of time needed to begin to be able to distinguish effects of Pahokee project. These time frames are indications of response speeds, not limits on how long the monitoring will be conducted.

5.1 Monitoring Costs and Adaptive Management Strategies

Adaptive management options and monitoring frequency for Pahokee Restoration Section 1135 CAP project are captured within **Table 3**. Costs in **Table 4** were based upon previously completed and similarly scoped restoration projects.

Monitoring lasts for the first five years after construction completion to measure the success of vegetation establishment. If project success is not met during the first five years, adaptive management may be used and could be cost shared between the Federal and non-federal sponsor. It is assumed that adaptive management should not be needed after the five-year monitoring period is complete. However, measures to address operation and maintenance or to address changed site conditions after the five-year monitoring period would be a non-federal responsibility and cost. Adaptive management measures that the non-federal sponsor could employ include thin-layer placement of sediments to raise the islands elevation and/or additional placement of sand and stone revetment to reduce ongoing erosion effects.

Table 4. Pahokee Restoration Section 1135 CAP project monitoring and potential cost-shared adaptive management costs within the first 5 years following construction completion.

Management Action Option	Management Action Option Cost
Monitoring Costs	\$91,000.00 (Total) \$18,200.00 (Annual)
Additional vegetation planting costs*	\$332,000.00 (Total)

*Although not anticipated, this cost assumes a worst-case scenario: total loss of vegetation and replanting to meet the 80% establishment goal.

PAHOKEE RESTORATION
CONTINUING AUTHORITIES PROGRAM
SECTION 1135 PROJECT
FINAL INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL
ASSESSMENT

APPENDIX D
Environmental

**Attachment 4 – National Environmental Policy Act (NEPA) Public and
Agency Comments and USACE Responses**



**US Army Corps
of Engineers**
Jacksonville District

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Table 1 Summary of USACE responses to comments received during the agency and public review and comment period of the draft Finding of No Significant Impact (FONSI) and Integrated Feasibility Report/Environmental Assessment (IFR/EA) for the Pahokee Restoration Section 1135 Continuing Authorities Program (CAP) project in Pahokee, Palm Beach County, Florida

#	Commenter	Comment	Response
1	Environmental Protection Agency (EPA) – Region 4	EPA recommends the USACE discuss the Lake Okeechobee nutrient impairment and inclusion on the 303(d) list.	Section 2.4.5 of the main report has been updated with the recommended changes.
2	EPA – Region 4	EPA also recommends water quality issues associated with re-suspension of nutrients due to wave action and the project construction be discussed within the Final EA.	More information was added section 5.4.5 of the main report.
3	EPA – Region 4	EPA recommends the USACE discuss potential negative impacts associated with removal of silt in the Final EA. Measures to minimize these negative impacts should also be included in the Final EA.	More information was added to section 3.1.2 of the main report, specifically under S-6: Water Quality measure. Water quality effects are discussed in more detail in section 5.4.5.
4	EPA – Region 4	EPA recommends the USACE specifically discuss potential impacts (positive and negative) to EJ communities within the Chapter 5.5 Socio-Economic Environment section.	Section 5.5 of the socio-economics indicates that in the future with-project condition “there is no evidence currently available to suggest a major impact to the socio-economic conditions of Pahokee in the future resulting from the project. It is likely the recreation will increase in quality and as a result there may be some modest growth in ecotourism in the area”. Since EJ communities are a subset of the entire socio-economic environment the project impact to EJ communities is covered within the section 5.5.1 paragraph. A clarifying sentence “including environmental justice communities (as detailed in Section 6.3.22)” will be added.
5	Non-Federal sponsor (NFS) – Palm Beach County (PBC)	The County recommends positioning the high profile island offshore of the low profile island, placement of additional limestone, and consideration of additional	During the February 27, 2018 project team delivery meeting, which included NFS participation, the PDT agreed it is possible to swap the island positions.

#	Commenter	Comment	Response
		design enhancements to ensure long-term stability and success.	Consideration of additional design enhancements would be further evaluated in the project's value engineering workshop.
6	NFS-PBC	The County recommends increasing the elevation by 1 foot to ensure long-term viability of vegetation, while compensating for a continuing trend of higher lake levels.	Increasing elevation will impact time and cost and could require reformulation. This level of impact to cost will push the project beyond the CAP budget limits.
7	NFS-PBC	Due to the difficulty in constructing a silt containment area below the water line, as well as the potential for long-term instability using dredged material, the County recommends that this component be removed from further consideration.	USACE has a successful history of constructing perimeter sand levees in the wet, (e.g. S-375 in STA-1E), which can hold the loading of the internal materials. Filling of the interior area with sand and silt would be completed similar to placement of dredge material into spoil containment areas. The following will be managed during construction, (including but not limited to): 1) As the materials are placed, the solids will settle and the water will remain on the surface (though some will be lost through seepage, evaporation, etc.). Water overflow will be managed through a controlled outlet, placing limiting criteria on the rate of placement to meet water quality standards. 2) The final dimensions of the in-place sand perimeter dike will be dictated by the performance during placement. The variable bottom conditions may require adjustment of the side slopes during construction.
8	NFS-PBC	The County is in support of a project and requests a more active role in the creation of the final plan.	USACE appreciates the active role the County has taken in this project. USACE looks forward to the County's continued support and participation.
9	NFS-PBC	The County concurs with South Florida Water Management District	Noted. Thank you for your comment.

#	Commenter	Comment	Response
		comment letter dated February 27, 2018.	
10	NFS-PBC	Section 4.1.4 of Appendix A concludes that the armor stone is not needed to maintain the 1H:3V upper sand slope of the outboard side of the High Profile Island. It also does not recommend armoring the inboard sand slopes of any of the islands. The report is mute on the north and south sides of the islands, therefore it is assumed that armoring is not included for those slopes. These islands will be subjected to erosive wind driven waves and will require riprap to maintain the indicated 1H:3V and 1H:4V slopes. Failure to protect the sand slopes will result in largescale erosion of the proposed islands. This erosion will result in deflation and ultimately loss of the proposed habitats.	Armoring is included only on the lakeward (west) sides of the islands. A north-south profile has been added to the Appendix A. Consideration of additional design enhancements would be further evaluated in the project's value engineering workshop.
11	NFS-PBC	The County recommends that the island construction should be accomplished entirely through the use of upland materials.	This construction methodology would be further evaluated in the D&I phase of the project.
12	NFS-PBC	Enclosed is a modified design the County believes will better protect the habitat from potential wave and storm generated impacts.	Consideration of design modifications and enhancements would be further evaluated in the project's value engineering workshop. The modified design provided by the County will require a change in the size of the stone from 250-LB to 500-LB, increasing the project cost.
13	NFS-PBC	Please verify fill quantities between section 4.3.1 and Attachment 2 of Appendix A.	Fill quantities were verified. Updates were made to section 4.3.1 of the main report.
14	NFS-PBC	Please provide formulas used in the Table 3-5 (specifically incremental costs of alternatives 3A, 3, and 5) and explain why there is a significant difference between the three alternatives.	The incremental cost of an alternative is determined by subtracting from the cost the closest lesser cost option. For example the incremental cost of 3a is the difference in cost between 3a and the no action plan

#	Commenter	Comment	Response
			(\$411,346 - \$0 = \$411,346); for alternative 5, the incremental cost is the difference between alt 5 and alt 3a (\$422,124 – \$411,346 = \$10,778); and so on. The significant difference comes from the degree in cost change from one alternative to the next.
15	NFS-PBC	The assumption of a lake stage of 12 ft-NGVD29 was used to calculate habitat suitability indices (HSI). Using this elevation in the assumption skews the HSI values towards success.	The average lake level is 13-ft NAVD88 (14.3-ft NGVD29) based on over 40 years of averages collected from Lake Okeechobee Regulation Schedule (LORS) data. The HSI was analyzed based on 12-ft NAVD88 (13.3-ft NGVD29) and was applied uniformly across engineering and environmental analysis. 12-ft NAVD88 (13.3-ft NGVD29) was used because it is the average between the high and low profile island elevations.
16	NFS-PBC	Please explain why no habitat value is assigned to the limestone rock.	Habitat unit analysis was not performed on the limestone rock because the rock is being used as an engineered feature to provide structure stability and erosion protection to the islands. Methods to measure and monitor success are complex and would be very costly to the project. Although the benefits are not quantified as part of the habitat unit analysis, there are incidental benefits that would occur as a result of the placement of limestone rock. These benefits are mentioned in section 3.1.2, 4.1, and 5.4.2 of the main report.
17	NFS-PBC	Section 14 of Appendix A requires the project to be reconstructed at higher elevations if water levels remain high, which is beyond the concept of adaptive management. The engineering analysis indicates a high probability of having to implement this solution to mitigate for impacts.	Changes to LORS is not predictable. Reconstruction by the sponsor will not be necessary. Thin-layer placement of dredged material from Lake Okeechobee would be sufficient for adaptive management.

#	Commenter	Comment	Response
18	NFS-PBC	Please clarify success criteria between Objective O-2 in table E-1 and the management options matrix of the Monitoring and Adaptive Management Plan.	Updates were made to the monitoring and adaptive management plan to ensure consistency in the document.
19	NFS-PBC	Please clarify the D&I responsibilities between Report Section 4.3.2 and in Appendix A, Engineering Section 5.4.	The D&I responsibilities are updated to accurately reflect the same information.
20	NFS-PBC	D&I costs include value engineering, hydrographic survey, sediment probes, construction access in shallow water, silt source search, silt dewatering methods, and sand placement technique; however D&I should also include cultural resources investigation and permitting costs which do not appear elsewhere.	Cultural resources investigation and permitting costs are now included in the draft report's D&I costs.
21	NFS-PBC	<p>Responsibilities in D&I should be further expanded to include the following:</p> <ul style="list-style-type: none"> - Project resilience, additional armoring, gradual transition slopes, and other additional design considerations and enhancements to ensure long-term success of the project; - A full review of the geotechnical data collected by Palm Beach County during the feasibility study should be completed to assist in confirming the best location for construction of the islands; - Maximizing existing topographic features associated with the localized outcropping of a limestone rock ridge; - Design level hydrographic data is required for final siting of primary structural components. 	This information will be added to section 4.3.2 of the report and Appendix A, Engineering Section 5.4.

#	Commenter	Comment	Response
22	NFS-PBC	All elevations should be listed in both NAVD88 and NGVD29.	Elevations will be updated in the report.
23	NFS-PBC	Moving forward there is no equitable division of work. The County is expected to contribute only the funds required for local share as well as 100% of any cost overruns with no control during D&I and construction.	The distribution of work will be negotiated in the drafting of the PPA. The NFS does not have to sign anything that they are not comfortable with. Any changes during design or construction will be discussed with the NFS prior to initiation for their concurrence.
24	NFS-PBC	The County is obligated to operate, maintain, repair, rehabilitate, and replace the project at no cost to the Federal government. Based on concerns with the current design, this project is of considerable financial risk to the County.	A recommended plan will be put forth that USACE can implement within the regulations of the CAP program. O&M is a responsibility of the NFS. If something in the design fails due to a deficiency then USACE will be responsible at 100% Federal cost. The NFS does not have to move forward with a PPA if they are not happy with the recommended plan. USACE has to work within the CAP funding limits and the rules of the process.
25	NFS-PBC	Proposed elevations of islands are not emergent at all times. Per EM 1110-2-5025 (USACE Dredging and Dredged Material Management), new islands should be no smaller than 5 acres and should be emergent at high water levels.	EM 1110-2-5025 describes management and design processes associated with new-work and maintenance dredging related to navigation projects. The Pahokee Restoration 1135 CAP project is ecosystem restoration; therefore, the EM does not apply to this project.
26	NFS-PBC	The project should be designed to adapt to increased lake levels.	The project is designed to be easily adaptable to increased lake stage levels.
27	NFS-PBC	Please clarify why the design slopes do not agree with USACE guidance EM 1110-2-5025 (USACE Dredging and Dredged Material Management).	EM 1110-2-5025 describes management and design processes associated with new-work and maintenance dredging related to navigation projects. The Pahokee Restoration 1135 CAP project is ecosystem restoration; therefore, the EM does not apply to this project.
28	Florida State Clearinghouse	The Department is supportive of the Pahokee CAP;	USACE appreciates the continued support and partnership with DEP.

#	Commenter	Comment	Response
29	Florida State Clearinghouse	Please note that an Environmental Resource Permit (ERP) will be required for this project and should be acquired from the Departments Southeast District office.	Noted. Thank you for your comment.
30	Florida State Clearinghouse	The Department recommends capping the interior material with sand or other suitable material.	"Random fill" includes alternating layers of clean sand and dredged silt. The top layer will be at least 6-12 inches of clean sand to prevent any potential water quality effects.
31	Florida State Clearinghouse	Please demonstrate that the proposed "random fill," as identified in the IFR, is appropriate material for the proposed planted species to become established.	The random fill is alternating layers of clean and dredged silt. It is likely that as the material is placed, the layers will mix, creating a sandy-silt material for the plants to root in. The top layer will be at least 6-12 inches of clean sand, which is appropriate material for the proposed planted species to become established based on information gathered from nursery planting guidelines. In addition, plans and specifications will include planting specific details to ensure maximum potential success for the species that will be planted. USACE is open to any lessons learned or example planting plans that FDEP may have for plantings in and around Lake Okeechobee.
32	Florida State Clearinghouse	At the time of the permit application submittal, the Department recommends a planting plan that details specific species to be planted at the varying elevations.	Plans and specifications will include the same details that would be found in a planting plan. USACE is open to any lessons learned or example planting plans that FDEP may have for plantings in and around Lake Okeechobee.
33	Florida State Clearinghouse	A monitoring plan should accompany the project to ensure the project and plants are successful in providing the intended benefits to Lake Okeechobee.	A monitoring plan is included with the Integrated Feasibility Report/Environmental Assessment as Appendix D3 (Monitoring and Adaptive Management Plan). A detailed monitoring plan, including scopes of work, will be provided during the Design and

#	Commenter	Comment	Response
			Implementation phase of the project.
34	Florida State Clearinghouse	On page 1-4 Section 1.4, the scheduled completion dates for HHD Contracts C-10 and C-12, C-2 and C-12A, and C-3 and C-4A should be updated as necessary.	Updates to the contract dates have been made.
35	Florida State Clearinghouse	On page 4-2 in Figure 4-1, the profile of the Tentatively Selected Plan (Alternative 5) does not include bedding stone between the riprap and the geotextile. USACE should specify the placement of bedding stone during the Design and Implementation Phase of the project.	Bedding stone is typically used to cushion the geotextile against damage from placing large stone. In this case, due to the smaller sized riprap, the use of bedding stone is not anticipated. The need for bedding stone and any applicable requirements will be reviewed during the Design and Implementation Phase of the project.
36	Florida State Clearinghouse	On page 5-12 in Table 5-5, the description of the cumulative effect for water quality should be revised to state "USACE and Palm Beach County are committed..." instead of "USACE and SFWMD area committed..."	The revision was incorporated as recommended.
37	Florida State Clearinghouse	In Appendix A, Note 1 in Figure 5-3 states that the perimeter sand slope may need to be flatter than 1V:4H (e.g., 1V:5H, 1V:6H) depending on the behavior of the soft sediment/muck. FDEP appreciates USACE's focus on the proposed slop of the perimeter berm, which will be a critical factor in the resiliency of the islands and their future maintenance cost.	Noted. Thank you for your comment.
38	South Florida Water Management District (SFWMD)	From the document text, it is interpreted that the cost of a habitat unit was based on an amortized based on 2.75 percent bond or note over a 50-year period. Thus, the cost of the 18.48 habitat units is stated as \$22,842 per unit. It may be less misleading to the public if the stated cost for each habitat unit reflected the "real"	Language has been clarified in the Graphic Executive Summary Section 4.1 to state "This results in a cost-effective means to meet all objectives, providing the best buy of all the alternatives at an average incremental cost of \$4,100 (using average annual screening level costs) and provides net average benefits of 18.48 Habitat Units."

#	Commenter	Comment	Response
		cost, approximately \$646,407 per unit (\$12.5 million/18.48 units).	
39	SFWMD	How can the heavy equipment which is necessary to construct the islands (as described in Section 4.4) be used in areas where the surface lake water is more three feet above final grade?	USACE has a successful history of constructing perimeter sand levees in the wet, (e.g. S-375 in STA-1E), which can hold the loading of the internal materials. Filling of the interior area with sand and silt would be completed similar to placement of dredge material into spoil containment areas. Material will be transported to the project site by scow barge and offloaded via conveyor. (An example of a loading operation is shown in Figure 1 following this comment matrix).
40	SFWMD	It is unclear how islands constructed mostly of dredged sand and finer silt sediment surrounded by a sand berm can successfully be constructed below the water line in an open area of the lake that is frequently exposed to significant wind and wave energy. Even if riprap is used to armor the lakeward slopes, as proposed in Section 4.2, any sand/silt material above the proposed elevation grades would likely have no protection and would rapidly erode causing the project to fail.	USACE has a successful history of constructing perimeter sand levees in the wet, (e.g. S-375 in STA-1E), which can hold the loading of the internal materials. Filling of the interior area with sand and silt would be completed similar to placement of dredge material into spoil containment areas. The following will be managed during construction, (including but not limited to): 1) As the materials are placed, the solids will settle and the water will remain on the surface (though some will be lost through seepage, evaporation, etc.). Water overflow will be managed through a controlled outlet, placing limiting criteria on the rate of placement to meet water quality standards. 2) The final dimensions of the in-place sand perimeter dike will be dictated by the performance during placement. The variable bottom conditions may require adjustment of the side slopes during construction.
41	SFWMD	How will a 3:1 slope (or any engineered slope) connecting the	The island is expected to naturally equilibrate. The slope between the

#	Commenter	Comment	Response
		lower elevation portion of the island to the upper elevation be established and maintained when regularly submerged in multiple feet of water (as depicted in Figure 4-1)?	low and high profile island will not be maintained.
42	SFWMD	Establishing new emergent vegetation (bulrush, spikerush, etc.) at the 11-foot elevation and probably the 13-foot elevation (pond apple trees) in exposed open water will be difficult, especially along the lakeward edge of the islands.	Plants will not be exposed to open water. Planting will occur behind a revetment. USACE is open to any lessons learned that SFWMD may have on best practices for plantings in and around Lake Okeechobee.
43	SFWMD	Regarding planting pond apple- the pond apple that was planted on Torry Island in 2005 and mentioned in Section 4.7, was planted in a protected area (see photograph below) on dry ground and was not exposed to wave action.	Noted. USACE is open to any lessons learned that SFWMD may have on best practices for plantings in Lake Okeechobee.
44	SFWMD	Turbidity is likely to remain elevated in most areas especially during wind events regardless of the islands small influence.	The project is claiming a very localized reduction in turbidity within and adjacent to the project area.
45	SFWMD	Recreational benefits were calculated using the Unit Day Value method (described in Section 5.5). It may not be possible to accurately measure the project benefits using the limited qualitative and “quantitative” criteria described. The calculation is speculative, unsupportive, and should be removed from the document.	An analysis of recreation benefits was specifically requested by Jacksonville District’s Division Leadership on this project. Using Unit Day Value (UDV) in this instance is completely consistent with ER 1105-2-100. It is understood that when using the UDV methodology a certain amount of subjectivity is used in estimating the benefit but the risk of over/underestimation of recreation benefits is commensurate with the recreational benefits’ application in plan selection and justification.
46	SFWMD	Additional design considerations and enhancements are needed before the proposed multiple island construction project near Pahokee can realize long-term success.	Consideration of additional design enhancements will be further evaluated in the project’s value engineering workshop.

#	Commenter	Comment	Response
47	SFWMD	The project may qualify for an Individual Environmental Resource Permit (ERP) from the State of Florida, solely for environmental restoration or enhancement activities, for construction and operation of the project, in accordance with Rule 62-330.054, Florida Administrative Code (FAC).	USACE and/or the non-federal sponsor will obtain all permits and approvals prior to the start of construction.
48	SFWMD	The project may require authorization for the use of state owned sovereign submerged lands, in accordance with Chapter 18-21, FAC.	USACE and/or the non-federal sponsor will obtain all permits and approvals prior to the start of construction.
49	Florida State Historic Preservation Officer (SHPO)	The 2011 Boyer Survey (Florida Master Site File No.: 19282) surveyed an area southwest of this project area and may be helpful to consult to determine the appropriate measures necessary to identify cultural resources in the Area of Potential Effect for this undertaking.	Noted. USACE will consult the 2011 Boyer Survey (Florida Master Site File No.: 19282) conducted southwest of this project area to aid in formulation of survey methodology once the area of potential effect (APE) is established during the Design & Implementation (D&I) phase.
50	Florida SHPO	We will consult further with USACE as the project develops to satisfy the Section 106 review requirements. We look forward to working with USACE to ensure that the project avoids, minimizes, or, if necessary, mitigates potential adverse effects to historic properties.	Noted. USACE looks forward to continuing to work with the SHPO on this project's Section 106 review. Thank you for your comment.
51	Florida Fish and Wildlife Conservation Commission (FWC)	The proposed project will enhance wildlife habitat in Lake Okeechobee and has the potential to create waterfowl habitat on the proposed islands as spikerush (<i>Eleocharis cellulosa</i>) and bulrush (<i>Scirpus californicus</i>) are valuable plants for waterfowl. The improved water quality, and potential for increased coverage of submersed plants, would also benefit waterfowl and the shallow water habitat created would be favorable to the resident mottled ducks and migratory	Noted. Thank you for your comment.

#	Commenter	Comment	Response
		<p>puddle ducks. The proposed constructed islands would benefit freshwater fish as submerged vegetation habitats are enhanced and possible spawning and foraging areas increased. A possible indirect result of the proposed project would be the increase of ecotourism to local communities. The proposed project will increase the quality of recreation in the project and tourists such as recreational anglers, birdwatchers, and wildlife observers may be drawn to the fish and wildlife utilizing the the islands.</p>	
52	FWC	<p>FWC staff recommend considering the effects of other wind directions to supplement the modeled western wind projects shown in Appendix A, figure 4-4.</p>	<p>Wind/wave conditions were modeled from all directions. This project uses the design wave that is the highest possible wind/wave conditions as a function of lake stage.</p>
53	FWC	<p>To further protect against erosion, consider constructing the islands with rounded ends.</p>	<p>Consideration of additional design enhancements will be further evaluated in the project's value engineering workshop.</p>
54	FWC	<p>We recommend the vegetation and tree plantings on the created islands are completed during lower water levels to promote suitable establishment and improve survival rates of the newly planted vegetation. Additionally, stakes should be used when pond apple area planted to keep plants secured upright in the event of a rapid rise in water levels before their roots have established.</p>	<p>Noted. USACE is open to any lessons learned that FWC may have on best practices for plantings in and around Lake Okeechobee.</p>



Figure 1. Example of scow barge and conveyor offloading.

Donofrio, Kristen L CIV USARMY CESAJ (US)

From: Higgins, Jamie <Higgins.Jamie@epa.gov>
Sent: Tuesday, February 27, 2018 1:05 PM
To: Scheler, Kristen L CIV USARMY CESAJ (US)
Cc: Higgins, Jamie; Militscher, Chris
Subject: [Non-DoD Source] Lake Okeechobee Pahokee Restoration Draft EA
Attachments: .Lake O-Pahokee EA-EPA Comments FINAL.pdf

Kristen,
Please find attached EPA's comments on the Lake Okeechobee Pahokee Restoration Draft EA. We would like notification of the Final EA/FONSI upon publication and feel free to contact me should you have questions.
Jamie

National Environmental Policy Act (NEPA) Program Office Resource Conservation Restoration Division Region 4,
Environmental Protection Agency
61 Forsyth Street, NW
Atlanta, GA 30303
404-562-9681

-----Original Message-----

From: Scheler, Kristen L CIV USARMY CESAJ (US) [mailto:Kristen.L.Scheler@usace.army.mil]
Sent: Thursday, February 1, 2018 4:05 PM
To: Scheler, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil>
Subject: For your review: NOA submittal of the draft IFR/EA for the Pahokee Restoration Section 1135 CAP Project in Lake Okeechobee near Pahokee, Palm Beach County, Florida (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Hello.

Pursuant to the National Environmental Policy Act (NEPA) and the US Army Corps of Engineers regulation (33 CFR 230.11), this email constitutes the submittal of the notice of availability (NOA) of the draft Integrated Feasibility Report/Environmental Assessment (IFR/EA) for the Pahokee Restoration Section 1135 Continuing Authorities Program (CAP) project located in Lake Okeechobee near Pahokee, Palm Beach County, Florida. The signed NOA is attached to this email.

As of today, the draft IFR/EA is available for review on the Jacksonville District's environmental planning website, under Palm Beach County. For your convenience, the website link is:

Blocked<http://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/>

Please submit any comments, in writing, to me at the attached letterhead address or via email not later than 30 days from the date of the signed NOA. If you have any questions, please do not hesitate to contact me.

Thank you!

Kristen Scheler
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U.S. Army Corps of Engineers
Jacksonville District (CESAJ-PD-EC)
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 Please consider the environment before printing this email.

CLASSIFICATION: UNCLASSIFIED

**Jacksonville District, US Army Corps of Engineers (USACE)
Draft integrated Feasibility Report and Environmental Assessment (EA)
For the Lake Okeechobee-Pahokee Restoration Project**

**US Environmental Protection Agency (EPA) Comments
February 28, 2018**

Background: The USACE stated purpose of the project is to *Restore historical vegetation and habitat along a portion of the southeastern Lake Okeechobee Shoreline* (page 1-2). Additionally, the USACE states that the deep lake wave action of the southeastern part of the lake near Pahokee creates turbid conditions that inhibits emergent vegetation to root and establish in the littoral zone (page 1-2). To reduce wave action and increase production of emergent vegetation, the USACE and the non-federal sponsor (NFS) Palm Beach County considered various alternatives from creating a high profile island, a low profile island, living shorelines, a high profile littoral shelf and a low profile littoral shelf. The final array of alternatives was Alternative 1-Low island profile, Alternative 2-Low profile shelf, Alternative 3-High island, Alternative 3a-High island profile, Alternative 4-High profile shelf, Alternative 5-Low island profile plus high island profile and Alternative 6 Low island profile plus low island profile shelf. The USACE and Palm Beach County selected Alternative 5, which consisted of construction of two low profile islands (11' elevation) and one high profile island (13' elevation) as the tentatively selected plan.

Water Quality:

- On page 2-5, the USACE discusses the existing condition of water quality in Lake Okeechobee and states that Lake Okeechobee nutrient levels have increased over time. The EPA notes that Lake Okeechobee is on the 303(d) list for impaired water bodies for nutrients, but there is no mention of this impairment within this discussion.
Recommendation: The EPA recommends the USACE discuss the Lake Okeechobee nutrient impairment and inclusion on the 303(d) list. The EPA also recommends water quality issues associated with re-suspension of nutrients due to wave action and the project construction be discussed within the Final EA.
- On page 3-3 and 3-4, the USACE discusses removing silt (S-6) as a project measure and discusses the beneficial outcomes of silt removal; however, removal of silt could also result in re-suspension of sediments and nutrients (especially if the contractor use clamshell dredges (page 5-5)). This could have potential negative outcomes.
Recommendation: The EPA recommends the USACE discuss potential negative impacts associated with removal of silt in the Final EA. The EPA acknowledges that these impacts might be temporary, but potential negative impacts could be discussed and disclosed. Measures to minimize these negative impacts should also be included in the Final EA.

Environmental Justice:

- On page 5-6 in the Socio-Economic Environment section, the EPA notes that there is no discussion regarding the proposed project's potential impacts on Environmental Justice (EJ) communities. Additionally, on page 6-7 in the Environmental Compliance chapter there is an entire section dedicated to EJ. In that section, the USACE states that socioeconomic benefits are discussed in Sections 4.1 and Chapter 5; however, there is no specific discussion regarding the proposed projects positive or negative impacts related to EJ. **Recommendation:** The EPA recommends the USACE specifically discuss potential impacts (positive and negative) to EJ communities within the Chapter 5.5 Socio-Economic Environment section.

Donofrio, Kristen L CIV USARMY CESAJ (US)

From: Reubin Bishop <RBishop@pbcgov.org>
Sent: Friday, March 2, 2018 3:23 PM
To: Donofrio, Kristen L CIV USARMY CESAJ (US)
Cc: Julie Mitchell; Julie Bishop; Michael Stahl R.; Deborah Drum
Subject: [Non-DoD Source] Pahokee Feasibility Study Comments
Attachments: feasibility-comments-signed.pdf

Kristen,

Attached is a scan of Palm Beach County's comment letter. The original will follow via postal mail.

Have a great weekend.

Reubin Bishop,

Sr. Environmental Analyst

Palm Beach County ERM

561-233-2519

rbishop@pbcgov.org

Under Florida law, e-mail addresses are public records. If you do not want your e-mail address released in response to a public records request, do not send electronic mail to this entity. Instead, contact this office by phone or in writing.



**Department of Environmental
Resources Management**

2300 North Jog Road, 4th Floor
West Palm Beach, FL 33411-2743

(561) 233-2400

FAX: (561) 233-2414

www.pbcgov.com/erm



**Palm Beach County
Board of County
Commissioners**

Melissa McKinlay, Mayor

Mack Bernard, Vice Mayor

Hal R. Valeche

Paulette Burdick

Dave Kerner

Steven L. Abrams

Mary Lou Berger

County Administrator

Verdenia C. Baker

*"An Equal Opportunity
Affirmative Action Employer"*

March 2, 2018

Ms. Kristen Scheler
Department of the Army
Jacksonville District Corps of Engineers
701 San Marco Boulevard
Jacksonville, FL 32207-8175

**SUBJECT: PAHOKEE RESTORATION PROJECT
CONTINUING AUTHORITIES PROJECT, SECTION 1135
DRAFT FEASIBILITY REPORT COMMENTS**

Dear Ms. Scheler:

The Palm Beach County Department of Environmental Resources Management (County) has reviewed the Draft Feasibility Report and Environmental Assessment (Report) for the Pahokee Restoration Project (Project) released on February 1. As the non-federal sponsor, the County has three primary concerns regarding the proposed Tentatively Selected Plan (TSP):

- **Potential for Erosion:** The orientation of the islands in the TSP, and lack of adequate protection, could subject the islands to erosion from wind driven waves and storm events. The County recommends positioning the high profile island offshore of the low profile island, placement of additional limestone, and consideration of additional design enhancements to ensure long-term stability and success.
- **Viability of Planted Vegetation:** The design elevations are based on protected wetlands on nearby islands. As the proposed islands are not protected from wind driven waves and storm events, the County recommends increasing the elevation by 1 foot to ensure long-term viability of vegetation, while compensating for a continuing trend of higher lake levels.
- **Effectiveness of Construction:** Due to the difficulty in constructing a silt containment area below the water line, as well as the potential for long-term instability using dredged material, the County recommends that this component be removed from further consideration. We believe that the proposed upland material will function as intended, and that the purchase, transportation and placement of this material will be the most cost-effective method of construction.



Ms. Kristen Scheler
Department of the Army
Jacksonville District Corps of Engineers
Pahokee Restoration Project
Page 2

The County is in support of a project and would like to work with the Corps to address these issues prior to our execution of the Project Partnership Agreement, as suggested by Corps staff during the PDT teleconference on February 27, 2018. For further clarification, we have attached a list of additional comments to support these concerns and a drawing reflecting our design recommendations. Finally, as the local sponsor, the County requests a more active role in the creation of the final plan.

We look forward to creating a successful project in partnership with the Corps. Please feel free to contact me at (561) 233-2400, or Reubin Bishop, Project Manager, at (561) 233-2519 to discuss our comments.

Sincerely,

Deborah Drum, Director
Environmental Resources Management

DD:RB:JM:dab
Enclosures

Pahokee Restoration CAP section 1135 Additional Comments:

Other Agency Review:

Palm Beach County concurs with South Florida Water Management District comment letter dated February 27, 2018.

Engineering Analysis:

- Section 4.1.4 of Appendix A concludes that armor stone is not needed to maintain the 1H:3V upper sand slope of the outboard side of the High Profile Island. It also does not recommend armoring the inboard sand slopes of any of the islands. The report is mute on the north and south sides of the islands, therefore it is assumed that armoring is not included for those slopes. These islands will be subjected to erosive wind driven waves and will require riprap to maintain the indicated 1H:3V and 1H:4V slopes. Failure to protect the sand slopes will result in largescale erosion of the proposed islands. This erosion will result in deflation and ultimately loss of the proposed habitats.
- Section 5.3 analyzes the stability of the proposed containment dike. No consideration is given to the dike relative to hydraulic inflow of dredged materials, nor freeboard, ponding depth, discharge, or dewatering the dredged materials. It is not likely the proposed configuration can be successful for containing and dewatering “silts” nor produce a stable base for habitat over the long term. Additionally, the volume of dredged “silts” do not warrant the costs associated with this proposed methodology. We recommend that island construction should be accomplished entirely through the use of upland materials.
- The design elevations are based on a successful restoration project on Torry Island. The proposed location does not benefit from the storm protection of an expansive wetland and adjacent islands as is the case with Torry Island. Design elevation, island layout, and proposed armoring are not sufficient to protect the planted vegetation during a storm event. Enclosed is a modified design that the County believes will better protect the habitat from potential wave and storm generated impacts. We have also enclosed a comparison of the current design elevations to the 5 year average lake levels.
- Section 4.3.1 estimated 116,000 cubic yards of sand, 46,000 cubic yards of silt, and 2,500 cubic yards of rock for the project. This differs from volume table in Attachment 2 of Appendix A. Please verify fill quantities.

Habitat Unit Calculation:

- In Table 3-5 the incremental cost for alternative 3A is the same as the annual average cost. The incremental cost for alternatives 3 and 5 is significantly lower. Please provide formulas used in these calculations and explain why there is a significant difference between the three aforementioned alternatives.
- The assumption of a lake stage of 12 ft-NGVD29 was used to calculate habitat suitability indices (HSI). This elevation is below the Operational

Pahokee Restoration CAP section 1135 Additional Comments:

Band stated in LORS 2008 for approximately 6 month a year and is not representative of long-term Lake Okeechobee water levels (average water level is approximately 14 ft-NGVD29). Using this elevation in the assumption skews the HSI values towards success.

- The assumption that stone toes will not create habitat to be evaluated in the HSI. Please explain why no habitat value is assigned to the limestone rock. The limestone rock will likely provide the highest habitat value during periods with elevated lake levels.

Adaptive Management:

- Section 14 of Appendix A requires the project to be reconstructed at higher elevations if water levels remain high, which is beyond the concept of adaptive management. The engineering analysis indicates a high probability of having to implement this solution to mitigate for impacts.
- Objective O-2 in table E-1 states that at least 1 acre of habitat will be created however, the management options matrix lists at least 25% cover of planted vegetation (29 acres) is considered successful. Please clarify success criteria.

Design and Implementation (D&I) Phase:

- Responsibilities in D&I as discussed in Report Section 4.3.2 and in Appendix A, Engineering Section 5.4 are not in agreement. Please clarify the D&I responsibilities.
- D&I is budgeted at \$790,000. This includes value engineering, hydro survey, sediment probes, construction access in shallow water, silt source search, silt dewatering methods, and sand placement techniques, however, D&I should also include cultural resources investigation and permitting costs which do not appear elsewhere.
- Responsibilities in D&I should be further expanded to include the following:
 - Project resilience, additional armoring, gradual transition slopes, and other additional design considerations and enhancements to ensure long-term success of the project.
 - A full review of the geotechnical data collected by Palm Beach County during the feasibility study should be completed to assist in confirming the best location for construction of the islands.
 - County supports the general project location identified in the TSP; however, efficient final project design location and configuration is highly dependent on maximizing existing topographic features associated with a localized outcropping of a limestone rock ridge.
 - Design level hydrographic data is required for final siting of primary structural components.

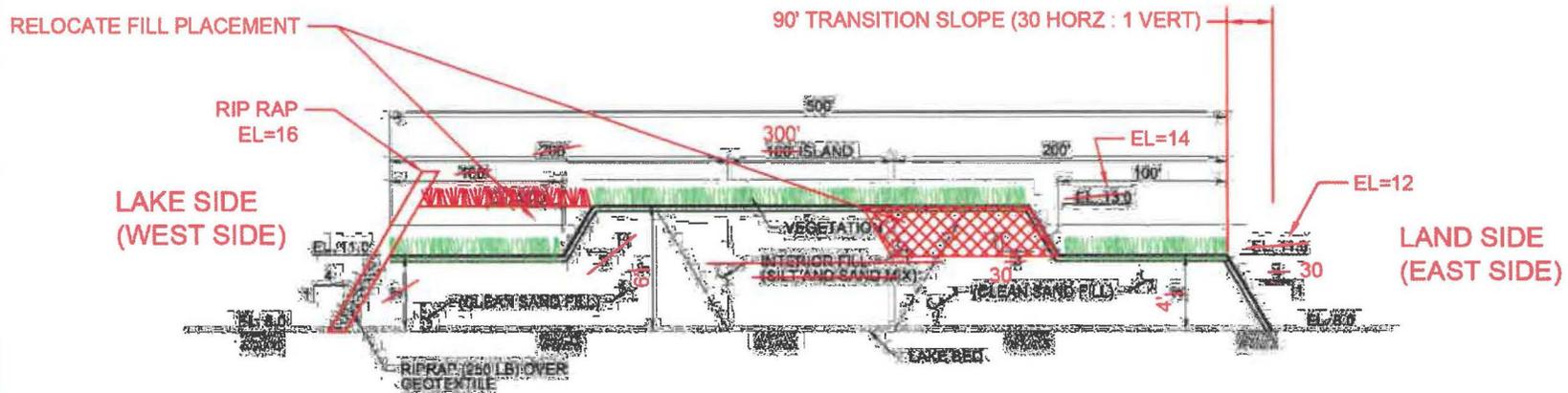
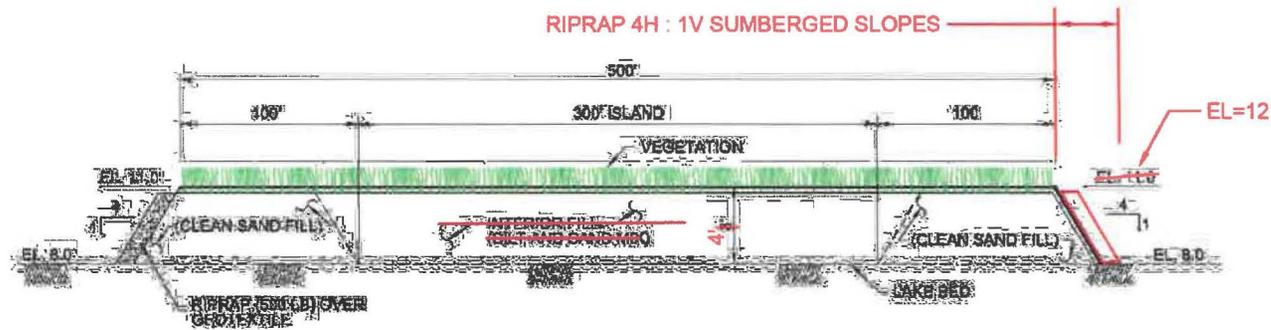
Other Comments:

- The report switches between NAVD88 and NGVD29 datums. This leads to confusion in reading the report. All elevations should be listed in both NAVD88 and NGVD29. Example: 11.2 ft-NAVD88 (12.5 ft-NGVD29).

Pahokee Restoration CAP section 1135 Additional Comments:

- Moving forward there is no equitable division of work. Palm Beach County is expected to contribute only the funds required for local share as well as 100% of any cost overruns with no control during D&I and construction.
- The County is obligated to operate, maintain, repair, rehabilitate, and replace the project at no cost to the Federal Government. Based on concerns with the current design, this project is of considerable financial risk to the County.
- Proposed elevations of islands are not emergent at all times. Per EM 1110-2-5025 (USACE Dredging and Dredged Material Management), new islands should be no smaller than 5 acres and should be emergent at high water levels.
- Lake Okeechobee Regulation Schedule is subject to change. Current LORS is approximately 1 foot lower than previous LORS. The project should be designed to adapt to increased lake levels.
- According to EM 1110-2-5025 (USACE Dredging and Dredged Material Management), an unarmored slope no greater than 3 ft rise per 100 ft is recommended. Please clarify why the design slopes do not agree with USACE guidance.

NOTE: COMMENTS IN RED BY PALM BEACH COUNTY ERM 3/2/2018.



Note: Source for suitable fill material to be determined.

ISLAND (LOW PROFILE) + ISLAND (HIGH PROFILE)

SCALE: N.T.S.

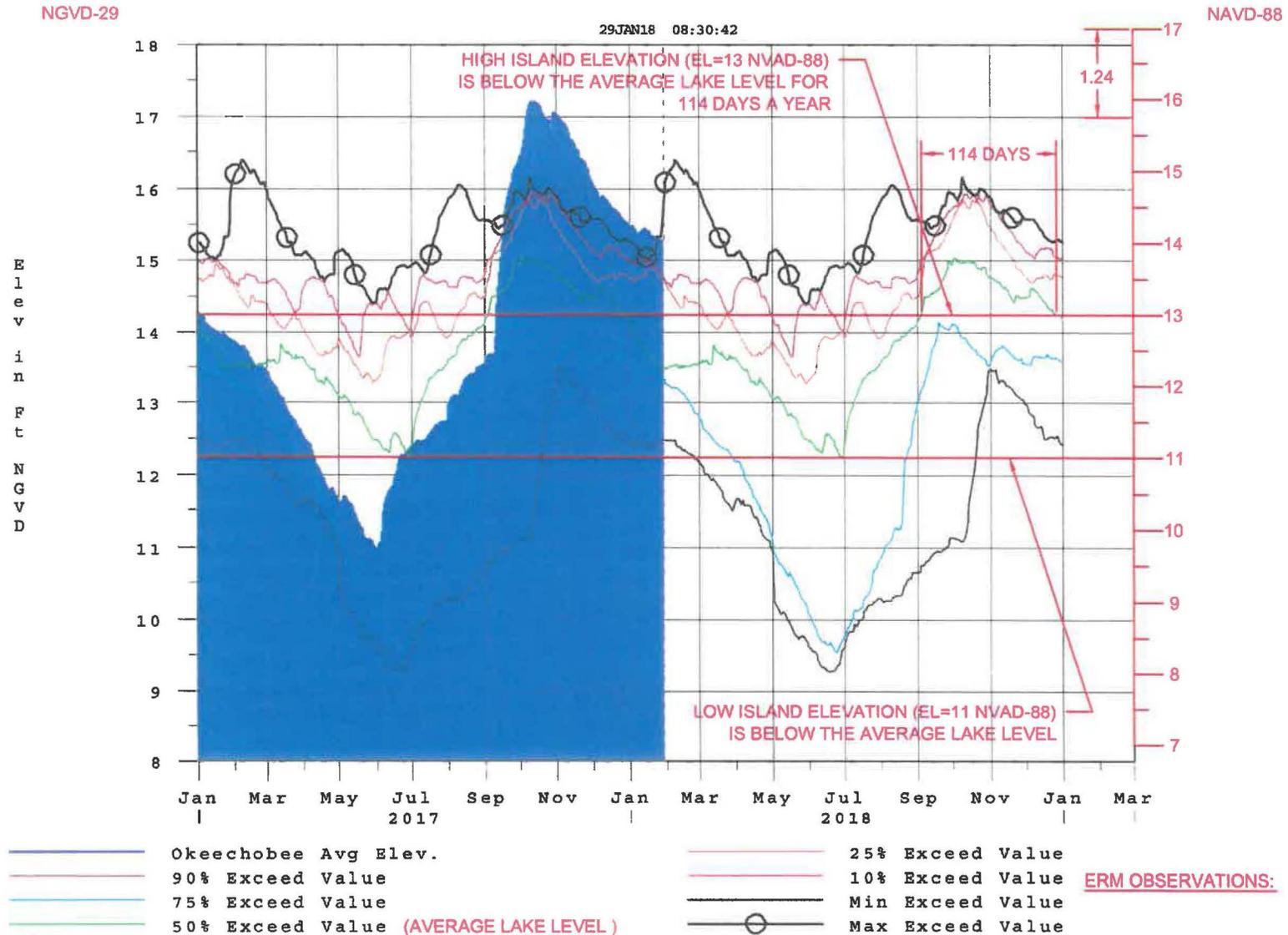
- Low Profile Island = 300 feet x 1500 feet
- High Profile Island = 100 feet x 1000 feet

To reduce project risk and increase project resiliency, Local Sponsor recommends:

1. Moving high profile island lakeward (west) of low profile island.
2. Adding emergent riprap slope protection to lake side of high profile island.
3. Raise average elevation of high profile to 14 ft-NAVD and raise average elevation of low profile island to 12 ft-NAVD.
4. Riprap all submerged 4H : 1V slopes or provide transitional slope component (min. 30H : 1V).
5. If suitable lake bottom material is found within a reasonable distance to justify cost to construct islands with dredged material, island to be constructed with dredged material only. Otherwise; islands to be constructed with upland material only.

ISLAND DESIGN ELEVATIONS COMPARED TO AVERAGE LAKE LEVELS

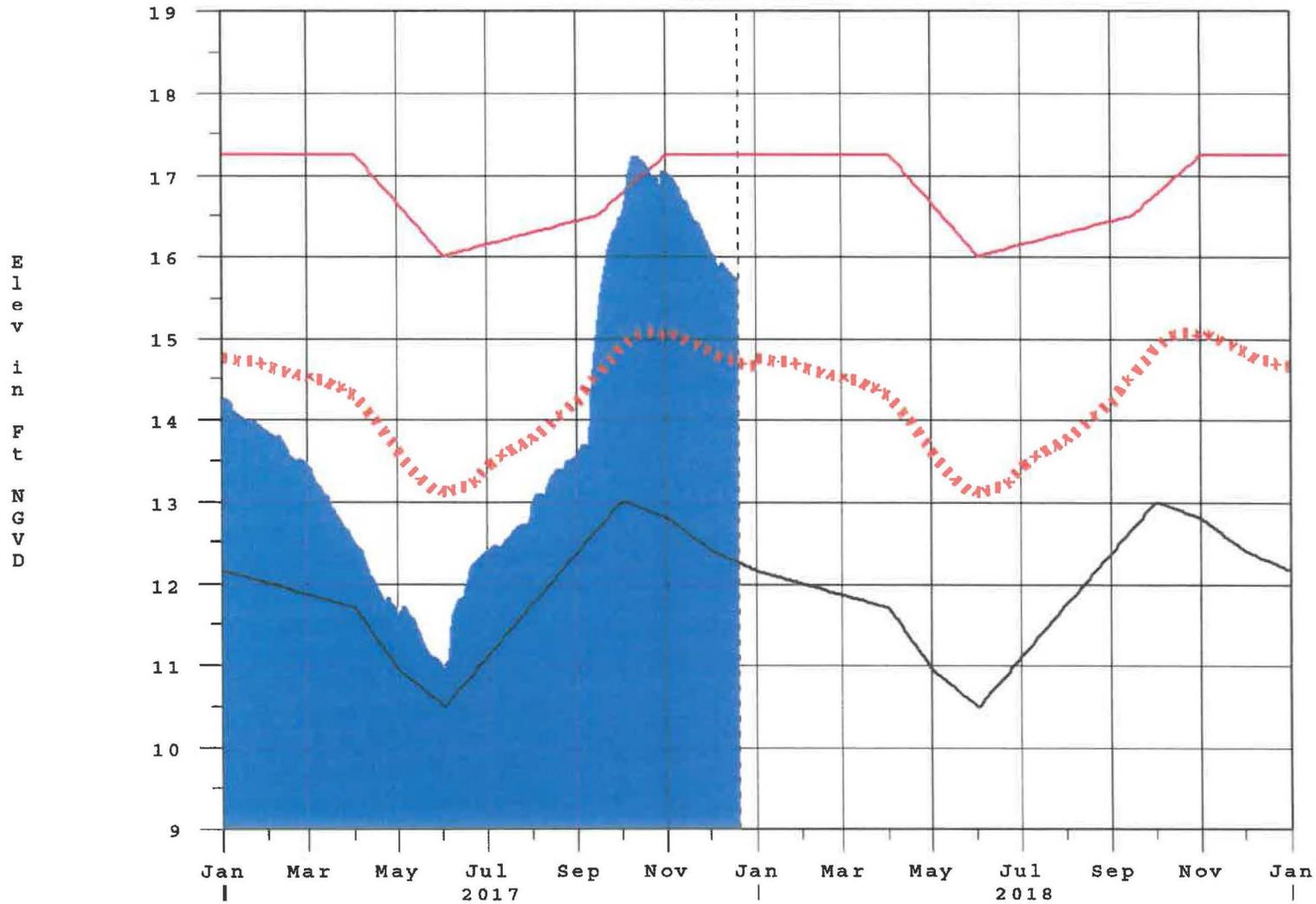
Lake Okeechobee Compared to May 2008-Dec 2016 (LORS) Exceedance Statistics



NOTE: COMMENTS IN RED BY PALM BEACH COUNTY ERM 1/29/2018.

Lake Okeechobee

20DEC17 15:00:33



- High Lake Management
- Okeechobee Avg Elev
- Average Elev [1965-2007]
- Water Shortage Management

From: [Stahl, Chris](#)
To: [Donofrio, Kristen L CIV USARMY CESAJ \(US\)](#)
Cc: [State Clearinghouse](#); [Barfield, Natalie](#); [Trisha Stone](#); "[FWC Conservation Planning Services](#)"
Subject: [Non-DoD Source] State_Clearance_Letter_For_FL201802028249C_Draft Integrated Feasibility Report/Environmental Assessment (IFR/EA) for the Pahokee Restoration Section 1135 CAP Project Located in Lake Okeechobee Near Pahokee, Palm Beach County
Date: Monday, April 2, 2018 3:49:34 PM
Attachments: [03-14-2018 Pahokee CAP IFR and EA Clearinghouse Memo.pdf](#)
[2017-6015B-106-USACE-Pahokee.pdf](#)
[Pahokee Restoration Section 1135 Draft IFR-EA 35497_030218.pdf](#)
[#8249C Pahokee Restoration - SFWMD Comments 2-27-18.pdf](#)

April 2, 2018

Kristen Scheler
US Army Corps of Engineers
P.O. BOX 4970
Jacksonville, Florida 32232

RE: Department of the Army, Jacksonville District Corps of Engineers - Draft Integrated Feasibility Report/Environmental Assessment (IFR/EA) for the Pahokee Restoration Section 1135 Continuing Authorities Program (CAP) Project Located in Lake Okeechobee Near Pahokee, Palm Beach County, Florida
SAI # FL201802028249C

Dear Kristen:

Florida State Clearinghouse staff has reviewed the proposal under the following authorities: Presidential Executive Order 12372; § 403.061(42), Florida Statutes; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

The Florida Department of Environmental Protection, South Florida Water Management District, Florida Department of State-Division of Historical Resources and the Florida Fish and Wildlife Conservation Commission have reviewed the proposed action and independently submitted comments. These have been attached to this letter and are incorporated hereto.

Based on the information submitted and minimal project impacts, the state has no objections to the subject project and, therefore, it is consistent with the Florida Coastal Management Program (FCMP). The state's final concurrence of the project's consistency with the FCMP will be determined during any environmental permitting processes, in accordance with Section 373.428, Florida Statutes.

Thank you for the opportunity to review the proposed plan. If you have any questions or need further assistance, please don't hesitate to contact me at (850) 717-9076.

Sincerely,

Chris Stahl

Chris Stahl, Coordinator
Florida State Clearinghouse
Florida Department of Environmental Protection
2600 Blair Stone Road, M.S. 47
Tallahassee, FL 32399-2400
ph. (850) 717-9076
State.Clearinghouse@dep.state.fl.us





Memorandum

TO: Chris Stahl, Florida State Clearinghouse

THROUGH: Edward C. Smith, Director
Office of Ecosystem Projects

A handwritten signature in blue ink, appearing to read "E. Smith", is written over the printed name and title.

FROM: Chad Kennedy, Stan Ganthier, Tom Behlmer, and Alyssa Freitag
Office of Ecosystem Projects

Jason Andreotta and Monica Sovacool
Florida Department of Environmental Protection, Southeast District

DATE: March 14, 2018

SUBJECT: Department of the Army – District Corps of Engineers – Draft Integrated Feasibility Report and Environmental Assessment Pahokee Restoration Continuing Authorities Project, Section 1135, Palm Beach County, Florida

SAI #: FL201802148258C

Summary:

The U.S. Army Corps of Engineers (USACE) has developed this Draft Integrated Feasibility Report (IFR) and Environmental Assessment (EA) to evaluate the Pahokee Continuing Authorities Project (CAP). The Herbert Hoover Dike (HHD), which surrounds Lake Okeechobee, has altered the historic ecosystem of the shoreline in the project area. Before HHD was constructed, the southeastern shore of Lake Okeechobee contained a gentle slope into deeper waters, resulting in a shallow area along the shoreline. This shallow area provided optimal depth to support littoral zone vegetation, and served as a natural breakwater allowing vegetation to take root. The vegetation provided foraging and breeding habitat for aquatic and terrestrial species. The natural wind and wave break also minimized sediment re-suspension. Construction of HHD resulted in a shoreline with scarce vegetation and a deeper shoreline more susceptible to intense wind and wave energy that is not suitable for the re-establishment of vegetation. As a result, the southeast shoreline adjacent to the City of Pahokee is now characterized by a steep slope into deep water, sparse upland and aquatic vegetation, no littoral zone or animal habitat, and turbid water:

This project seeks to alleviate these issues and will include the construction of two components within Lake Okeechobee: a low-profile island and a high-profile island. The low-profile island will be constructed at an elevation of 11.0 feet (ft) North American Vertical Datum 1988 (NAVD 88). The high-profile island includes construction of a terraced island with a lower elevation of 11.0 ft NAVD 88 and a higher elevation of 13.0 ft. NAVD 88. Both islands will consist of an interior mix of sand and finer silt sediment, surrounded by a sand berm for stability and the outer slopes will be armored with riprap.

The following objectives have been identified for the project:

- Reduce the effects of wind during tropical storms and storm events to shelter a portion of the shoreline in lower Lake Okeechobee;
- Create an area suitable for vegetation, with associated habitat, of at least 1 acre;
- Create habitat for fisheries and birds within 5 years;
- Maintain or improve ecotourism; and
- Improve natural lake bottom conditions in the project or adjacent area within 5 years.

Comments:

The Department is supportive of the Pahokee CAP; and it is anticipated that the project will have positive impacts on water quality in Lake Okeechobee due to nutrient uptake by vegetation, removal of silt from the system to be used as fill, and the reduction of wind and wave energy that can resuspend sediment.

Please note that an Environmental Resource Permit (ERP) will be required for this project and should be acquired from the Department's Southeast District office. The application submittal should include a description of the project that outlines the potential benefits it will provide to the fish and wildlife of Lake Okeechobee. Additionally, as the project is being constructed by Palm Beach County, they should be listed as the applicant and party responsible for the permitted activities.

Similar projects have been permitted in the South Florida region and these projects include a clean sand "cap" on top of any silt to maintain the material at the permitted site. The IFR and EA state that clean sand is proposed in a perimeter dike; the Department recommends capping the interior material with sand or other suitable material. Additionally, please demonstrate that the proposed "random fill," as identified in the IFR, is appropriate material for the proposed planted species to become established. At the time of the permit application submittal, the Department recommends a planting plan that details specific species to be planted at the varying elevations. For example, the EA states that upland pond apple trees will be planted; however, this should be reworded to specify that this obligate wetland species would be planted at areas of higher elevation on these islands than the bulrush and spike rush plantings. A monitoring plan should accompany the project to ensure the project and plantings are successful in providing the intended benefits to Lake Okeechobee.

Specific Comments:

- On page 1-4 in Section 1.4, the scheduled completion dates for HHD Contracts C-10 and C-12, C-2 and C-12A, and C-3 and C-4A should be updated as necessary. For example, the contract for C-3 and C-4A was not completed in February 2018 as stated.

Florida State Clearinghouse: Department of the Army – District Corps of Engineers – Draft Integrated Feasibility Report and Environmental Assessment Pahokee Restoration Continuing Authorities Project, Section 1135, Palm Beach County, Florida
SAI # FL201802148258C
March 14, 2018
Page 3 of 3

- On page 4-2 in Figure 4-1, the profile of the Tentatively Selected Plan (Alternative 5) does not include bedding stone between the riprap and the geotextile. USACE should specify the placement of bedding stone during the Design and Implementation Phase of the project.
- On page 5-12 in Table 5-5, the description of the cumulative effect for water quality should be revised to state “USACE and Palm Beach County are committed...” instead of “USACE and SFWMD are committed...”, because Palm Beach County is the non-federal sponsor.
- In Appendix A, Note 1 in Figure 5-3 states that the perimeter sand slope may need to be flatter than 1V:4H (e.g., 1V:5H, 1V:6H) depending on the behavior of the soft sediment/muck. FDEP appreciates USACE’s focus on the proposed slope of the perimeter berm, which will be a critical factor in the resiliency of the islands and their future maintenance cost.

The Department sincerely appreciates the opportunity to comment and looks forward to continuing our partnership with USACE. Should you have any questions regarding our comments, please contact Natalie Barfield at (850) 245-3197.

Electronic copies to:

Ed Smith
Frank Powell
Jordan Pugh
Kelli Edson
Chad Kennedy
Stan Ganthier
Paul Julian
Alyssa Freitag
Tom Behlmer
Kristyn McClure
Jason Andreotta
Monica Sovacool



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

February 27, 2018

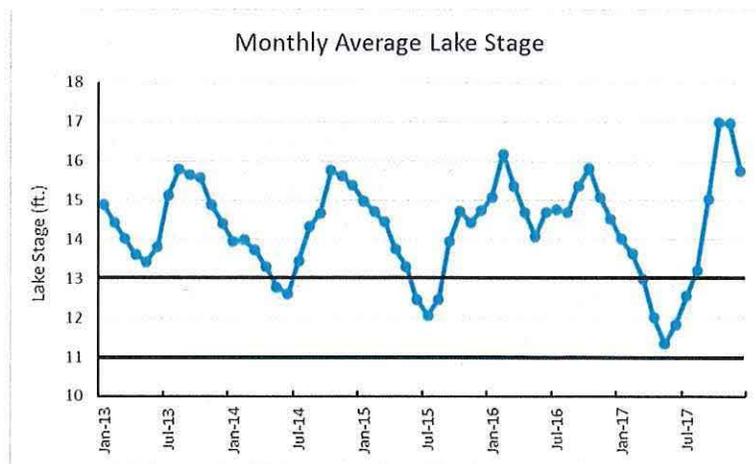
Mr. Christopher Stahl
Office of Intergovernmental Programs
Florida Department of Environmental Protection
2600 Blair Stone Road, Mail Station 47
Tallahassee, Florida 32399-2400
Via Email

**Subject: Project SAI# FL201802028249C
Draft IFR/EA for the Pahokee Restoration Section 1135 CAP Project
Located in Lake Okeechobee Near Pahokee
Palm Beach County**

Dear Mr. Stahl:

The South Florida Water Management District (District) offers the following in response to your request for State Clearinghouse review.

1. From the document text, it is interpreted that the cost of a habitat unit was based on an amortized based on a 2.75 percent bond or note over a 50-year period. Thus, the cost of the 18.48 habitat units is stated as \$22,842 per unit. It may be less misleading to the public if the stated cost for each habitat unit reflected the "real" cost, approximately \$646,407 per unit (\$12.5 million/18.48 units).
2. The concept of constructing a low (11 foot) and high profile (13 foot) island is attractive and potentially beneficial. However, during the 5-year period of January 2013 – December 2017 the monthly average lake stage never fell below 11 feet and rarely was less than 13 feet (see graph below). How can the heavy equipment which is necessary to construct the islands (as described in Section 4.4) be used in areas where the surface lake water is more three feet above final grade?



3. It is unclear how islands constructed mostly of dredged sand and finer silt sediment surrounded by a sand berm can successfully be constructed below the water line in an open area of the lake that is frequently exposed to significant wind and wave energy. Even if riprap is used to armor the lakeward slopes, as proposed in Section 4.2, any sand/silt material above the proposed elevation grades would likely have no protection and would rapidly erode causing the project to fail.
4. Similarly, how will a 3:1 slope (or any engineered slope) connecting the lower elevation portion of the island to the upper elevation be established and maintained when regularly submersed in multiple feet of water (as depicted in Figure 4-1).
5. Establishing new emergent vegetation (bulrush, spikerush, etc.) at the 11-foot elevation and probably the 13-foot elevation (pond apple trees) in exposed open water will be difficult, especially along the lakeward edge of the islands. It appears that the plantings would need to establish a strong anchor system (roots/rhizomes) to survive long-term in a high energy environment. For that to happen, lake stage would need to remain extremely low (possibly less than 12 feet) for an extended period. During the past 10 years, District participation in several large-scale bulrush planting projects in Lake Okeechobee has revealed that none of the bulrush planted in exposed areas survived more than several months. Specifically, one of the planting sites was an interior site inside of Fisheating Bay, which is an area that was much more protected from wind and wave energy compared to the proposed project site.
6. Regarding planting pond apple – the pond apple that was planted on Torry Island in 2005, and mentioned in Section 4.7, was planted in a protected area (see photograph below) on dry ground and was not exposed to wave action.



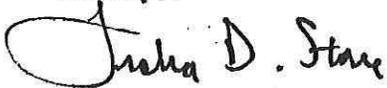
7. The plan states that the islands will serve as a breakwater which would reduce wind and wave activity and result in less resuspension of sediments leading to an improvement in water quality. It appears that these small islands will have a limited effect on water quality in Lake Okeechobee. Although there may be some very localized reductions in suspended sediments, suspended sediments in Lake Okeechobee are easily transported vertically and horizontally (e.g. mid-lake to near-shore). Therefore, turbidity is likely to remain elevated in most areas especially during wind events regardless of the islands small influence.
8. Recreational benefits were calculated using the Unit Day Value method (described in Section 5.5). It may not be possible to accurately measure the project benefits using the limited qualitative and "quantitative" criteria described. It is understood that multiple factors were considered when calculating scores, but some of the calculation was based on a 4 percent increase in county visitation numbers (2007-2016) with 2 percent relating to the Pahokee area. Some percentage of that 2 percent was assumed to result in a visit to the Pahokee marina. If the calculation is understood correctly, that number was somehow used to predict (score) a projected impact that constructing the islands will have on the Pahokee area in the year 2065. The calculation is speculative, unsupportive, and should be removed from the document.
9. Additional design considerations and enhancements are needed before the proposed multiple island construction project near Pahokee can realize long-term success.
10. The project may qualify for an Individual Environmental Resource Permit (ERP) from the State of Florida, solely for environmental restoration or enhancement activities, for construction and operation of the project, in accordance with Rule 62-330.054, Florida Administrative Code (FAC). As part of an ERP application, the following must be provided/demonstrated:
 - A. Reasonable assurance is required to be provided which demonstrates that the project has been designed and will be constructed in a manner to reduce or eliminate wetlands and other surface water resources direct and secondary impacts, in accordance with the Environmental Resource Permit Applicant's Handbook Volume I, Subsection 10.2.1 (AH I, 10.2.1).
 - B. Reasonable assurance is required to be provided which demonstrates that the construction and operation of the project will not cause adverse impacts to the abundance and diversity of fish, wildlife and listed species (e.g. manatees), and will not cause adverse impacts to the habitat of fish, wildlife and listed species, in accordance with AH I, 10.2.2.
 - C. Reasonable assurance is required to be provided which demonstrates that the project will not adversely affect significant historical and archaeological resources, in accordance with AH I, 10.2.3.6.
 - D. Reasonable assurance is required to be provided which demonstrates that the project will not result in short-term or long-term water adverse water quality impacts, in accordance with AH I, 10.2.4.1 and 10.2.4.2.

Mr. Christopher Stahl
Project SAI# FL201802028249C
February 27, 2018
Page 4

11. The project may require authorization for the use of state owned sovereign submerged lands, in accordance with Chapter 18-21, FAC.

Please don't hesitate to contact me if you have any questions or need any additional information.

Sincerely,

A handwritten signature in black ink that reads "Trisha D. Stone". The signature is written in a cursive style with a large, looped initial "T".

Trisha Stone
Lead Environmental Analyst
South Florida Water Management District

Donofrio, Kristen L CIV USARMY CESAJ (US)

From: Aldridge, Jason H. <Jason.Aldridge@dos.myflorida.com>
Sent: Friday, March 2, 2018 2:53 PM
To: Donofrio, Kristen L CIV USARMY CESAJ (US)
Cc: Tiemann, Marc Auguste CIV USARMY CESAJ (US)
Subject: [Non-DoD Source] SHPO comments for Pahokee Draft IFR/EA
Attachments: 2017-6015B-106-USACE-Pahokee.pdf

Good Afternoon,

I've attached our comments for the draft IFR/EA. Please let me know if you have any questions.

Have a good weekend,

Jason Aldridge

Compliance Review Supervisor | Deputy State Historic Preservation Officer | Bureau of Historic Preservation | Division of Historical Resources | Florida Department of State | 500 South Bronough Street | Tallahassee, Florida 32399 | 850.245.6344 | 1.800.847.7278 | Fax: 850.245.6439 | Jason.Aldridge@DOS.MyFlorida.Com
<mailto:Jason.Aldridge@DOS.MyFlorida.Com> | dos.myflorida.com/historical
<Blockedhttp://dos.myflorida.com/historical>

The Department of State is committed to excellence.

Please take our Customer Satisfaction Survey

<Blockedhttp://survey.dos.state.fl.us/index.aspx?email=Jason.Aldridge@dos.myflorida.com> .



FLORIDA DEPARTMENT *of* STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Jacksonville District Corps of Engineers
701 San Marco Boulevard
Jacksonville, Florida 32207-8175

March 2, 2018

RE: DHR Project File No.: 2017-6015, Received by DHR: February 7, 2017
Project: *Draft Integrated Feasibility Report/ Environmental Assessment (IFR/EA) For the Pahoee Restoration Section 1135 Continuing Authorities Program (CAP), Lake Okeechobee, Palm Beach County*

Dr. Ralph:

Thank you for providing our office with an opportunity to review the Draft IFR/EA for this undertaking. The document states that there are few recorded cultural resources within one mile of the project area. Although this is the case, there is limited survey data within or near the project area. The 2011 Boyer Survey (Florida Master Site File No.: 19282) surveyed an area southwest of this project area and may be helpful to consult to determine the appropriate measures necessary to identify cultural resources in the Area of Potential Effect for this undertaking.

As noted in your letter, we will consult further with USACE as the project develops to satisfy the Section 106 review requirements. We look forward to working with USACE to ensure that the project avoids, minimizes, or, if necessary, mitigates potential adverse effects to historic properties.

If you have any questions, please contact me by email at Jason.Aldridge@dos.myflorida.com, or by telephone at 850-245-6344.

Sincerely,

A handwritten signature in blue ink that reads "Jason Aldridge" with "For" written below it.

Timothy A. Parsons, Ph.D.
Director, Division of Historical Resources
and State Historic Preservation Officer



**Florida Fish
and Wildlife
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Commission**

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MyFWC.com

March 2, 2018

Chris Stahl
Florida State Clearinghouse
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, MS 47
Tallahassee, FL 32399-3000
Chris.Stahl@dep.state.fl.us

RE: SAI #FL201802028249C, Department of the Army, Jacksonville District Corps of Engineers - Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA), for the Pahokee Restoration Section 1135 Continuing Authorities Program (CAP) project in Pahokee, Palm Beach County

Dear Mr. Stahl:

Florida Fish and Wildlife Conservation Commission (FWC) staff has reviewed the above-referenced assessment, and provides the following comments in accordance with FWC's authorities under Chapter 379, Florida Statutes; Chapter 68, Florida Administrative Code; and Article 4, Section 9, of the Florida Constitution.

Project Description

The U.S. Army Corps of Engineers (USACE) and Palm Beach County, Florida, acting as the project non-federal sponsor, propose the construction of two islands within Lake Okeechobee. A low profile island constructed at an elevation of 11.0 feet North American Vertical Datum of 1988 (NAVD88), and a high profile island with a lower elevation of 11.0 feet NAVD88 and a higher terraced elevation of 13.0 feet NAVD88, will be constructed of a mix of sand and fine silt sediment, surrounded by a sand berm for stability. The lakeward slope of each island will be armored with riprap for additional protection against erosion. The proposed islands will create approximately 12 acres of pond apple (*Annona glabra*) habitat and 16 acres of emergent vegetation habitat, and reduce the effects of wind to a portion of the shoreline of the Herbert Hoover Dike in southeastern Lake Okeechobee.

Potentially Affected State-Listed Wildlife

FWC staff has reviewed the information provided on the proposed project and has determined that due to the offshore nature of the project, there are no state-listed species likely to be affected. Additionally, there are no known federally endangered fish that use the lake or are within the project area that are likely to be affected.

FWC staff concurs with the threatened, endangered, and protected species no-effect determination in the EA (Section 5.4.3), and the concurrence determination for the West Indian (Florida) manatee (*Trichechus manatus*). Components of construction activity for the proposed project will occur within areas where Florida manatees could be present. FWC staff has determined that no significant impacts to manatees are expected to occur

as long as the Standard Manatee Construction Conditions for In-water Work (2011) are followed for all in-water activity (enclosed).

Comments and Recommendations

The FWC is the lead agency responsible for vegetation and fisheries management within Lake Okeechobee and remains a dedicated partner in maintaining a healthy lake that supports a diversity of wildlife, fisheries, and economies. The proposed project will enhance wildlife habitat in Lake Okeechobee and has the potential to create waterfowl habitat on the proposed islands as spikerush (*Eleocharis cellulosa*) and bulrush (*Scirpus californicus*) are valuable plants for waterfowl. The improved water quality, and potential for increased coverage of submersed plants, would also benefit waterfowl and the shallow water habitat created would be favorable to resident mottled ducks and migratory puddle ducks.

The proposed constructed islands would benefit freshwater fish as submerged vegetation habitats are enhanced and possible spawning and foraging areas increased. Some saltwater fish species use Lake Okeechobee moving through the St. Lucie River at Port Mayaca and the Caloosahatchee River at Moore Haven. Saltwater game fish may also utilize the created habitats as a foraging location. A possible indirect result of the proposed project would be the increase of ecotourism to local communities. The proposed project will increase the quality of recreation in the project and tourists such as recreational anglers, birdwatchers, and wildlife observers may be drawn to the fish and wildlife utilizing the the islands.

FWC staff recommend considering the effects of other wind directions to supplement the modeled western wind projections shown in Appendix A, figure 4-4. Dominant winds on Lake Okeechobee are from an eastern and southeastern direction. Winds with a northerly component, such as northwest, north, or northeast, commonly occur during winter and passing cold fronts. Due to the large fetch on the lake, these northerly winds can also contribute to increased erosion of the lakeward side of the islands. To further protect against erosion, consider constructing the islands with rounded ends.

The FWC has had the most success with vegetation enhancement on the wildlife islands of Lake Okeechobee when the plantings were conducted at the lowest feasible water levels. We recommend the vegetation and tree plantings on the created islands are completed during lower water levels to promote suitable establishment and improve survival rates of the newly planted vegetation. Additionally, stakes should be used when pond apple are planted to keep plants secured upright in the event of a rapid rise in water levels before their roots have established.

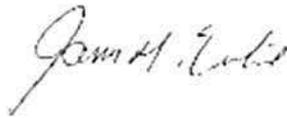
Summary

The FWC appreciates the opportunity to review and comment on the proposed project. Further, we appreciate the willingness of USACE and the state sponsor to maintain open

and cooperative communication with our staff during project design and construction where staff experience and expertise may be beneficial.

We find the proposed project consistent with FWC's authorities under the Coastal Zone Management Act/Florida's Coastal Management Program and staff will continue to cooperate throughout the design and construction phases to ensure maximum benefits for fish and wildlife resources. If you need any further assistance, please do not hesitate to contact our office by email at FWCConservationPlanningServices@MyFWC.com. If you have specific technical questions regarding the content of this letter, please contact Andrea Dominguez by phone at (863) 462-5190 or by email at Andrea.Dominguez@MyFWC.com.

Sincerely,



James Erskine, Everglades Coordinator
Office of Executive Director

jme/ad
ENV 1-3-2
Pahokee Restoration Section 1135 Draft IFR-EA_35497_030118
Enclosure

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK

2011

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

- a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.
- b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.
- c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.
- d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.
- e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida, and to FWC at ImperiledSpecies@myFWC.com
- f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to the email address listed above.