HERBERT HOOVER DIKE MAJOR REHABILITATION
PALM BEACH COUNTY, FLORIDA

ENVIRONMENTAL ASSESSMENT
AND
PROPOSED FINDING OF NO SIGNIFICANT IMPACT

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SUPPLEMENTAL MAJOR REHABILITATION REPORT (MRR)

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Based on the information analyzed and presented in the Environmental Assessment attached hereto, dated March 2015, reflecting pertinent information obtained from agencies having jurisdiction by law and/or special expertise, I conclude that the proposed action would not significantly impact the quality of the human environment and does not require an Environmental Impact Statement. Reasons for this conclusion are, in summary:

a. The proposed action is considered maintenance on an existing Federal project and construction would occur within the Federal right of way except for staging areas at sites currently owned by the sponsor.

b. The goal of the rehabilitation of the Herbert Hoover Dike is to reduce risk to public safety and health. Levee seepage and stability have a direct effect on the capability of the levee to provide the authorized protection. The Flood Control Act of 1948 authorized the U.S. Army Corps of Engineers to operate and maintain the Herbert Hoover Dike levees and Federal culverts.

c. Adverse impacts to protected species are not anticipated. Special measures would be incorporated during project construction to avoid or minimize adverse effects to any listed endangered, threatened, or species of special concern that may be present (see Environmental Compliance and Commitments Section 5). The U.S. Army Corps of Engineers is engaging in informal consultation with the U.S. Fish and Wildlife Service through review of this Environmental Assessment and request for concurrence on species determination herein. If warranted by U.S. Fish and Wildlife Service, the Corps would initiate formal consultation as appropriate. Upon completion of coordination of this Environmental Assessment with U.S. Fish and Wildlife Service, the proposed action would be in compliance with the Endangered Species Act.

d. The U.S. Army Corps of Engineers is coordinating a consistency determination under the Coastal Zone Management Act through the circulation of this Environmental Assessment. The U.S. Army Corps of Engineers has determined that the proposed action is consistent with Florida's Coastal Management Program. The Consistency Determination can be referenced in Appendix A of this report.

e. The proposed action has been coordinated with the Florida State Historic Preservation Officer in accordance with the National Historic Preservation Act. Consultation with the State Historic Preservation Officer and appropriate federally recognized tribes was initiated 10 September 2010 and is ongoing. The Corps has determined the Preferred Alternative would have no effects to historic properties included in, or potentially eligible for inclusion in, the National Register of Historic Places.

f. The project will be in compliance with the Clean Water Act. The Corps will provide information to support issuance of a water quality certificate as designs and specifications are developed and coordinated with the Florida Department of Environmental Protection.

All State water quality requirements would be followed. Refer to Section 1.7, Permits, Licenses, and Entitlements for a list Water Quality Certificates obtained by the Corps.

g. This finding is being coordinated with the public and agencies in accordance with 40 CFR 1501.4(e) and Engineer Regulation ER 200-2-2 (part 11 and Appendix A). The point of contact is Stacie Auvenshine at 904-232-3694 or Stacie.J.Auvenshine@usace.army.mil.

In view of the above and after consideration of public and agency comments received on the project, I have concluded that the proposed action for the rehabilitation of Herbert Hoover Dike would not result in a significant adverse effect on the human environment. This proposed Finding incorporates by reference all discussions and conclusions contained in the Environmental Assessment enclosed herewith.

_____ _____

ALAN M. DODD
Colonel, U.S. Army
District Commander

Date

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1.0 INTRODUCTION AND PROJECT AREA

The Herbert Hoover Dike (HHD) is approximately 143 miles long and was constructed around Lake Okeechobee, a 724-square-mile freshwater lake in south central Florida, for the purposes of flood risk management, navigation, agricultural and municipal water supply, prevention of saltwater intrusion, recreation, and the enhancement of environmental resources. The U.S. Army Corps of Engineers (Corps), Jacksonville District, has operated and maintained HHD for over 75 years, with its highest priority being the continued safety of communities surrounding HHD. The HHD spans the following five counties around the perimeter of Lake Okeechobee: Glades, Hendry, Martin, Okeechobee, and Palm Beach (**Figure 1-1**). In 1993, the Corps established priorities to address structural problems at individual sections of HHD according to the perceived risk of dike failure at that time (USACE, 1993); these sections were classified as Reaches (**Figure 1-2**).

Each reach was assigned a priority rating which corresponded to the assumed severity of potential seepage and stability problems within that Reach. Reach 1 was assigned the highest priority and rehabilitation efforts are nearing completion based on designs from the 2005 Supplemental MRR and EIS and subsequent Environmental Assessments (EA). The current construction of the cutoff wall should be considered successful at reducing the probability of life-loss, and a step forward in reducing the Damn Safety Action Classification (DSAC) rating of the dam. However, during high lake stages (greater than 25 feet), a breach in Reach 3 (the 6.8 mile portion of the dike adjacent to Reach 1 between the Belle Glade and Lake Harbor) would flood much of the same area as a breach in Reach 1. Together this area (Reach 1 and 3) is known as Common Consequence Zone (CCZ) A (**Figure 1-3**), and within the Dam Safety Modification Study, CCZ A was identified as the most at risk section of HHD. Since rehabilitation measures have been undertaken within all reaches within CCZ A with the exception of Reach 3, it is imperative that alternative rehabilitation measures extend through the rest of the CCZ A to avoid economic and environmental damages associated with a breach that would impact stakeholders and resources downstream of CCZ A. A breach would result in flooding to downstream areas, including the cities of Pahokee, Belle Glade, Lake Harbor and South Bay. Potential damages include life loss and human suffering, economic damages including impacts to the economically significant agriculture industry (including sugar cane), environmental damages to the Everglades, and adverse social impacts.

This 2015 Supplemental MRR EA (to the 2000 MRR) is evaluating alternatives for remediation of the dike for the 6.8 miles between Belle Glade and Lake Harbor within CCZ A (**Figure 1-3**). Throughout the rest of this EA, the area of proposed remediation is referred to as CCZ A from Belle Glade to Lake Harbor.

Figure 1-1. **Herbert Hoover Dike Location Map, Herbert Hoover Dike Surrounds Lake Okeechobee**

Figure 1-2. HHD Original Designation of Reaches

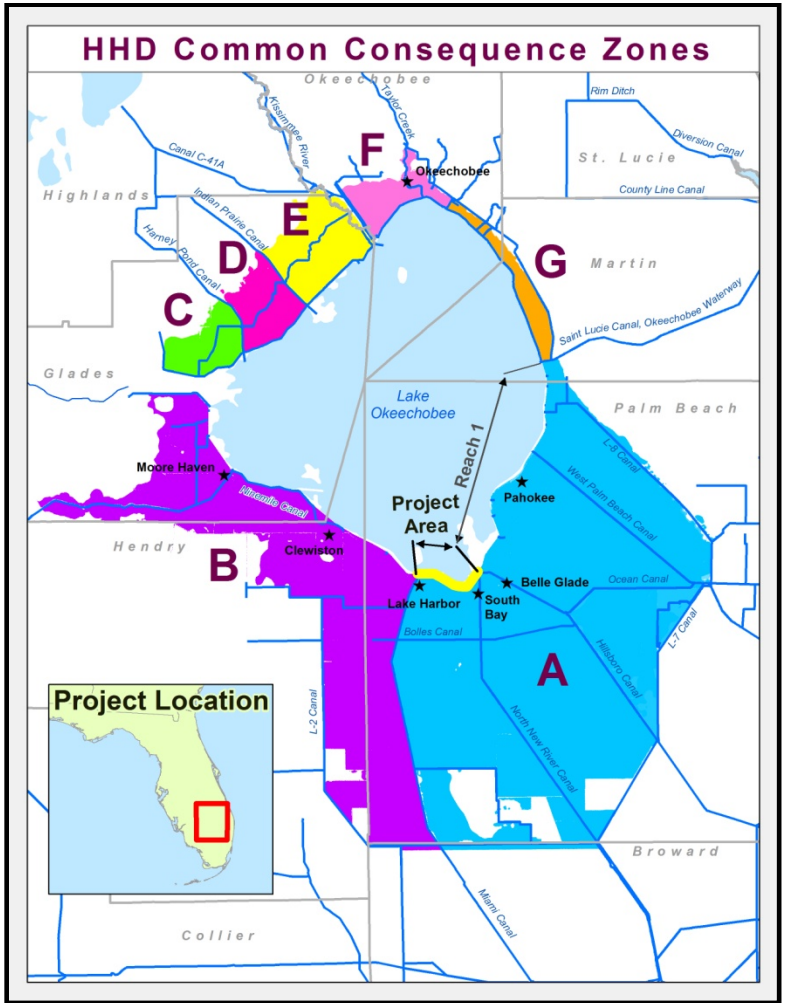

Figure 1-3. HHD Common Consequence Zones and Project Area, CCZ A from Belle Glade to Lake Harbor

1.1 PURPOSE AND NEED

Since the early 1980s, the Corps and independent technical reviewers have studied and documented the potential for catastrophic failure of HHD during high water stages, particularly along CCZ A. The primary causes for concern are seepage and piping. Seepage from Lake Okeechobee occurs when water travels from the lake through the foundation and embankment of the dike. The seepage can carry material (mostly soils and sands) with it, eventually eroding a water flow path through HHD embankment and foundation. This causes a damaging mechanism of internal erosion called piping through the embankment or foundation. Underground seepage and internal erosion are made possible by the permeable nature of the materials of which the dike is constructed, including sand, gravel, shell, and limestone, and by the variable geology comprising the foundation of the dike system.

There are three phases of the piping erosion process: initiation, continuation, and progression. Piping typically initiates at the toe or in the ditch at the toe of HHD embankment (also referred to as the toe ditch). In the continuation phase, the erosion moves up-gradient toward the water source. In the erosion progression phase of piping, the seepage quantity and erosion increase, and soil layers in the embankment or foundation act like a roof that allows the pipe to progress toward the lake. The final stage of the piping process results in an open conduit ("pipe") between the lake and landside toe that can rapidly cause a breach of the embankment.

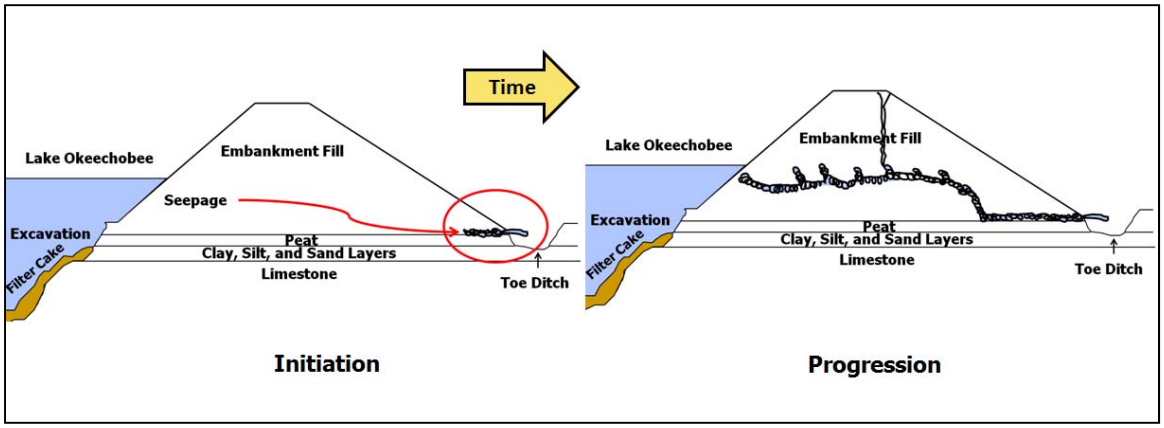

Figure 1-4. Dike Failure Cross-Section Depicting Seepage and Piping.

Symptoms of serious seepage include sand boils—locations of concentrated seepage that resemble groundwater springs on the landside of the dike. Symptoms of initiation of piping would include deposits of sand around sand boils or deltas of sand coming out of the edge of the toe ditch. Piping can create tunnels and cavities, causing instability and sinkholes on the dike. Seepage and piping are the failure modes of greatest concern due to the high potential for their occurrence. Sinkholes, visible pipes in the side wall of the toe ditch or deltas of sand in the ditch as have been observed along HHD are evidence that the piping process has reached the "initiation" and possibly the "progression" stage (**Figure 1-4**).

High lake levels during storms increase the amount of seepage and piping that occurs. Lake Okeechobee water levels are managed by the Corps in accordance with the Lake Okeechobee Regulation Schedule of 2008 (LORS). Water managers may be unable to maintain safe water levels during high water events because the outlet capacity to release lake water is limited. The

outlet capacity (released via the St. Lucie and Caloosahatchee canals) is about one-sixth of the potential inflow (USACE 2007b).

In 2007, the Corps ranked HHD an "Urgent and Compelling (Unsafe)" water control system and "critically near failure or extremely high risk" (USACE 2007a). Failure here means an uncontrolled release of water resulting from a catastrophic breach of some portion of HHD system. This classification and characterization was validated through an external peer review in 2007 (USACE 2007b).

A failure of the dike could result in human suffering, immense property damage, destruction of the natural habitat, and loss of human life. Past efforts at rehabilitating the dike in this area have been piecemeal emergency repairs with limited funding. This project represents an opportunity to avoid a catastrophic failure by implementing an effective, comprehensive rehabilitation solution.

1.2 HISTORY OF HHD

The HHD was constructed in stages around Lake Okeechobee to provide flood risk management to surrounding agricultural areas and communities. The first embankments around Lake Okeechobee were constructed by local interests between 1910 and 1920 along the southern portion of the Lake. The height of these first embankments ranged from five to nine feet and were largely composed of muck excavated from adjacent borrow canals.

During the 1930s, a Federal interest to improve and lengthen the dike for flood risk management was initiated after a hurricane storm surge in 1926 and 1928 overtopped the original embankment and caused over 2,600 deaths. The Rivers and Harbors Act, approved July 3, 1930, authorized the construction of 67.8 miles of embankment along the south shore of Lake Okeechobee and 15.7 miles of embankment along Lake Okeechobee's north shore. The Corps constructed these reaches between 1932 and 1938, and the typical crest height of these embankments ranged from about 31 to 34 feet National Atlantic Vertical Datum 88 (NAVD88).

A major hurricane in 1947 prompted the need for additional flood risk management in Florida. In response, Congress passed the Flood Control Act of 1948 authorizing the first phase of a comprehensive plan for flood risk management and other water control benefits called the Central and Southern Florida (C&SF) Project. As part of the C&SF Project in the early 1960s, HHD was extended to encircle Lake Okeechobee and raised to its present height (ranging from about 31 to 45 feet NAVD88). Major culvert modifications, for water supply and flood risk management, were then accomplished in the 1970s.

In recent years, HHD has experienced a high quantity of seepage through its embankment and foundation. Embankment and foundation erosion from these seepage forces has required emergency remediation along portions of the southeastern perimeter of the dike. The embankment and foundation are vulnerable to seepage and erosion due to the sandy nature of the materials used to construct the embankment, poor construction techniques by today's standards, and variable geology comprising the foundation of HHD. The Corps, Jacksonville District, began reporting areas of vulnerability at HHD in the mid-1980s. The primary compilation of information and documentation of the condition of the dike was prepared in HHD *Major Rehabilitation Evaluation Report (MRR)* (USACE 2000). While the MRR analyzed the

entire dike system to determine whether rehabilitation measures related to seepage and stability problems were warranted, it provided more detailed, site-specific information for the engineering analysis of Reach 1. The report recommended that while detailed plans and specifications to rehabilitate Reach 1 were being prepared, an MRR for reaches 2 and 3 should be initiated as a first step in addressing severe seepage and stability problems.

Upon receiving approval for the 2000 MRR from the Corps South Atlantic Division and a signed Record of Decision (ROD) in 2005, a plan for rehabilitating HHD in Reach 1 was developed, and construction began in December 2005. However, the plan for Reach 1 was developed before Hurricane Katrina's devastating impact on embankments in New Orleans in August 2005. Even though construction had begun, it was concluded by the Corps that the lessons learned in Katrina's aftermath should be used to further ensure that the robustness of HHD was sufficient to protect lakeside communities. Construction was halted, and Independent Technical Review (ITR) panels convened in 2006 and 2007 to further evaluate the rehabilitation design.

In 2006, the Corps prepared a Draft MRR and accompanying Supplemental Environmental Impact Statement (EIS) for HHD, Reaches 2 and 3. The MRR design concept was based on 2006 ITR recommendations and included a cutoff wall in the center of the dike and a seepage berm along the landside toe that would incorporate lands outside of the existing HHD right of way. The plan was to be constructed in two phases, with the 2006 Draft Supplemental EIS addressing only Phase 1. In this phase, the Corps would construct those elements of the recommended plan that could be implemented within the existing Federal right of way (a cutoff wall throughout Reach 1 and a partial seepage berm along a portion of the northern end of Reach 1). In Phase 2, the seepage berm would be expanded to its full design extent outside of the existing right of way, and relief features would be added to the toe of the dike, where needed. This phase was to be assessed in a future National Environmental Policy Act (NEPA) document. The Draft Supplemental EIS for Reaches 2 and 3 was coordinated with the public in December 2006.

However, as plans progressed for this design concept, technical evaluations called for additional geotechnical analyses and engineering, risk, and dam safety criteria to be developed and applied to rehabilitation designs. To meet these criteria, one of the designs considered along sections of Reaches 1, 2, and 3 where the ground surface is underlain by a layer of organic materials (peat, organic clays, and silts), the seepage berm could extend beyond 400 feet landside of the toe to meet all applicable safety criteria. Constructing a seepage berm of this magnitude would have significant impacts on residential and commercial property, transportation networks, and would incur exorbitant real estate and construction costs. Therefore, the Corps, Jacksonville District dismissed the full seepage berm/partial cutoff wall recommended design combination from further consideration. The 2006 Draft Supplemental EIS for the MRR, Reaches 2 and 3, was halted to allow the project team to develop and analyze other rehabilitation designs that would meet all safety and engineering criteria while avoiding significant impacts to the greatest extent possible. This also provided an opportunity to review the performance of the Reach 1 cutoff wall constructed as part of the 2006 Draft Supplemental EIS.

1.3 PROJECT AUTHORITY

The HHD is a component of the C&SF Project for Flood Control and Other Purposes, and was constructed based on multiple authorizations and numerous associated construction contracts.

Authorizations include the Rivers and Harbors Acts of 1930 and 1935, and Flood Control Acts of 1948, 1954, 1958, and 1968.

The Rivers and Harbors Act of 1930 authorized the construction of embankments and other features, for protection from storm surge-induced flooding, along the north and south shores of Lake Okeechobee. Components authorized included:

- Improvements to the Caloosahatchee River and Canal from Lake Okeechobee to the Gulf of Mexico, to provide 2,500 cubic feet per second (cfs) capacity outlet from Lake Okeechobee, and 6-foot minimum water depth navigation channel.
- Improvements to Taylor Creek to provide a 6-foot minimum water depth channel from Okeechobee City to Lake Okeechobee.
- An embankment to elevation 31 feet, Lake Okeechobee datum, which is 1.4 feet below National Geodetic Vertical Datum (NGVD), and a channel 6-foot deep following, in general, the south shore of Lake Okeechobee from Fisheating Creek to the St. Lucie Canal.
- An embankment to elevation 31 feet, Lake Okeechobee datum, on the north shore of the lake from the Kissimmee River to Nubbin Slough.
- Protection works in the St. Lucie Canal for erosion control.

The Rivers and Harbors Act of 1935 authorized the Corps construction of 22 drainage structures in the embankments and that the United States would be responsible for operation and maintenance of the embankments and drainage structures.

The Flood Control Act of 1948 created the C&SF Project and included authorization for Phase 1 of the C&SF Project that included raising the existing embankments and construction of additional embankments along the northeast and northwest shores. Additional provisions included agricultural and municipal water supply, additional flood control, the preservation of fish and wildlife, regional groundwater control, salinity control, and navigation. Components included:

- Construction of embankments, channels, and control works for Lake Okeechobee.
- Protection and construction of major drainage of the Everglades agricultural area.
- Conservation of water for control of regional groundwater supplies.
- Protection of east coast urban areas from overflow from the Everglades.
- Flood and water control for salinity control in the existing east coast urban areas.
- Construction of main outlets for the water conservation areas.

The Flood Control Act of 1948 also required the United States to operate and maintain the embankments, channels, locks, and control works of the St. Lucie Canal, Lake Okeechobee, and Caloosahatchee River and the main spillways of the conservation areas.

The Flood Control Act of 1954 authorized the remainder of the C&SF Project. These elements included:

- Additional flood control, water conservation, and navigation projects in the Upper St. Johns and Kissimmee River Watershed Basins.

- An increase in the outlet capacity of the Caloosahatchee River from Lake Okeechobee.
- Construction of the remaining embankments for the Everglades Agricultural and Water Conservation Areas.
- Construction of the remaining salinity barrier in south Dade County.

The Flood Control Act of 1958 modified the comprehensive plan to provide that the second phase of the project authorized by the Flood Control Act of 1954, non-Federal interests be required to contribute 27.5 percent of actual construction costs, to provide the necessary lands and relocations, to bear the cost of maintenance and operation of all works except those having to do with the regulation of Lake Okeechobee, and to hold and save the Federal Government free from damages resulting from project construction and operation.

The Flood Control Act of 1960 authorized the name of all embankments around the shore of Lake Okeechobee to be "Herbert Hoover Dike", in honor of the former President and his role in implementing embankment construction.

The Flood Control Act of 1968 further authorized construction projects around the Lake. Some of the components included:

- Construction of an interrelated system of canals, embankments, pump stations, and other structures necessary to supply irrigation water, provide flood protection to St. Lucie and Martin Counties, and to maintain optimum water-control levels.
- Provisions to meet the long-term needs of urban and agricultural water users.
- Conservation and conveyance of additional water supply for the Everglades National Park (recreation and allied purposes) to include:

    1. Facilities for pumping excess water from east coast areas into storage component of Lake Okeechobee and water conservation areas.
    2. Construction of interrelated canals, embankments, pump stations, and control structures for conveyance and distribution of water to demand areas.
    3. Deepening the navigation channel across Lake Okeechobee.
    4. Construction of recreation facilities.
    5. Raising Lake Okeechobee water levels 4 feet in regulation stage.
    6. Deletion of deepening of the St. Lucie Canal.
    7. Construction of a small craft locks at the Buttonwood Canal.

The Flood Control Act of 1968 authorized the raising of the Herbert Hoover Dike embankments by an additional four feet as described in House Document 369, Ninetieth Congress, 1968. House Document 369 used the criteria set forth in the Design Memoranda and the 1959 General Design Memorandum to determine the revised design embankment heights for the Herbert Hoover Dike.

Other Relevant Authorities Related to Dam and Embankment Safety include:

- National Dam Safety Inspection Act of 1972, Public Law 92-367
- Water Resources Development Act of 1986, Title XII, National Dam Act of 1986, Public Law 99-662

- Water Resources Development Act of 1992, Public Law 102-580
- Water Resources Development Act of 1996, Public Law 102-303
- Dam Safety and Security Act of 2002, Public Law 107-310
- Dam Safety Act of 2006, Public Law 109-460
- Water Resources Development Act of 2007, Title IX National Embankment Safety Program, Public Law 110- 114

1.4 LAKE OKEECHOBEE REGULATION SCHEDULES

Regulation of Lake Okeechobee from the early 1900s up through the authorization of the C&SF project in 1948 attempted to maintain the Lake at water levels between elevation 11.26 to 14.26 feet, NAVD88. The 1948 C&SF Project authorization did not specify what lake regulation schedule should be adopted. As agricultural development south of the Lake and population growth along Florida's southeast coast burgeoned in the 1950s and 1960s, an increased reliance and draw on the Lake for water supply encouraged water managers and decision makers to attempt to store more water in Lake Okeechobee by raising the lake regulation schedule. Incorporating additional hurricane studies and the effects of wind setup/wave run-up, design and construction of the full-height HHD in the 1960s also influenced the decision to increase the water levels in Lake Okeechobee with a revised lake regulation schedule. In 1974, the regulation schedule was increased with operating ranges between 13.2 to 14.7 feet, NAVD88 and then again in 1978, with operating ranges between 14.2 to 16.2 feet, NAVD88. The RUN25 and Water Supply and Environmental (WSE) lake regulation schedules were implemented in 1994 and 2000, respectively, with WSE formally incorporating forecast information such as tributary inflows and climate outlooks into the lake management process. The top of the flood storage pool varied between 15.7 feet, NAVD88 up to 17.2 feet, NAVD88 for both the RUN25 and WSE lake regulation schedules.

The current regulation schedule implemented in April, 2008 is called the Lake Okeechobee Regulation Schedule (LORS). Lake regulation schedules influence the stage-duration on the Lake which has the greatest effect on antecedent lake stages prior to episodic flood events. One purpose of LORS implementation was as an interim HHD risk-reduction measure by attempting to maintain lower lake levels to protect the embankment. LORS attempts to limit maximum stages on Lake Okeechobee to elevation 15.95 feet, NAVD88 as opposed to previous schedules which limited maximum stages to 17.2 feet, NAVD88.

1.5 AGENCY GOAL AND OBJECTIVE

The objective of this EA is to assess the environmental effects of rehabilitating HHD embankment in Reach 3.

1.6 HHD ENVIRONMENTAL AND RELATED DOCUMENTS

Since 1999, numerous engineering designs and interim risk reduction measures have been proposed for rehabilitating HHD in Reaches 1, 2, and 3. Each one has been accompanied by an EA or an EIS. Table 1-1 provides a summary of all NEPA documents that have been prepared for HHD.. Each of the actions described in the NEPA documents have independent utility.

Table 1-1. Previous NEPA Documents for HHD Rehabilitation

Type	Project	Title	Recommended Action	Decision
Draft EIS	Reach 1	Draft EIS for the Major Rehabilitation Report, HHD, Reach 1 (USACE, 2000)	Installation of a seepage berm with relief trench along the landward toe of the embankment.	Approved in 2000 contingent on economic revisions, ROD signed in 2005
Final EIS	Reach 1	Final EIS for the HHD Major Rehabilitation Report, Reach 1 (USACE, 2005)	Installation of a seepage cutoff wall on the landward side of the dike slope and a relief trench and relief berm at the toe of the dike, all within the current right of way.	Record of Decision signed on September 23, 2005
Draft EIS	Reaches 2 and 3	Draft EIS for the Major Rehabilitation Report, Phase 1, HHD Reaches 2 and 3 (USACE, 2006)	Installation of a partial cutoff wall at crest of dike and construction of a seepage berm within existing right of way	Cancelled by Notice in Federal Register (78 FR 8119) February 5, 2013
EA	Reaches 1, 2, and 3	EA of Modified Design in Reach 1 and Priority Toe Ditch Repairs in Reaches 1, 2, and 3 (USACE, 2007c)	(1) Installation of a cutoff wall at crest of dike, a partial seepage berm within existing right of way, and a drainage swale at toe of berm. (2) Backfill toe ditch for immediate repairs in the most critical areas. This document only assessed impacts within the existing right of way. A future NEPA document would assess impacts of the full seepage berm, which would extend outside of the existing right of way.	Finding of No Significant Impact, January 12, 2007
EA	Reach 1 and Sub-reach 1A	EA of Reach 1 Seepage Berm and Reach 1A Test Cutoff Wall (USACE, 2007e)	Installation of a demonstration cutoff wall at the crest of the dike in Reach 1A and a partial seepage berm within the existing right of way. A future NEPA document would assess impacts of the full seepage berm.	Finding of No Significant Impact, May 3, 2007
EA	Reach 1 and Sub-reaches 1B, C, and D	EA of Reach 1 Cutoff Wall with Addendum (Quarry) (USACE, 2008a)	Installation of a cutoff wall at crest of dike in Reach 1B, C, & D.	Finding of No Significant Impact, February 11, 2008
EA	Reaches 1 and 2	EA for Partial Reach 1 and 2 Ditch Backfill and Culvert 14 Removal (USACE, 2008b)	In Reach 1, assesses the impacts of removing Culvert 14 and filling the toe ditch in Focus Areas 1 and 6. In Reach 2, assesses impacts of filling in 9.5 acres of toe ditch.	Finding of No Significant Impact, August 28, 2008

Type	Project	Title	Recommended Action	Decision
Draft Supplement EIS	Reach 1A	Draft Supplemental EIS for the Major Rehabilitation Project, HHD Reach 1A (USACE, 2010)	Installation of a seepage berm, drainage swale, and relief wells outside of the existing right of way. Removal of Culvert 11 and replacement of Culvert 16.	Cancelled by Notice in Federal Register (78 FR 8118) February 5, 2013
EA	HHD Federal Culverts	EA for HHD Culvert Replacement and Removal	Replacement of 28 Federal culverts and removal of 4 Federal culverts.	Finding of No Significant Impact, May 13, 2011
EA	HHD Pilot Test	EA for HHD Alternative Rehabilitation Plan Pilot Test	To perform a pilot test to determine constructability and efficacy of alternative seepage collection systems and comparison to cutoff wall currently installed in Reach 1.	Finding of No Significant Impact, February 7, 2012

1.6.1 STATUS OF THE DAM SAFETY MODIFICATION STUDY

Beginning in 2011, the Corps has focused study efforts on completing a comprehensive evaluation of the entire HHD system, known as a Dam Safety Modification Study (DSMS). While the 2000 MRR was a comprehensive look at the integrity of HHD, the engineering support information available was mostly limited to the area of Reach 1, and a decision was made to begin construction on that element as expeditiously as possible. In conjunction with modifications to Reach 1, the Corps would be completing supplement MRRs (the latest was in 2005) on the remainder of the embankment, culverts, and structures. Construction of the remediation work identified for Reach 1 is almost complete along with continued progress on remediation of culverts. As a result, the Jacksonville District was unable to communicate the overall level of risk, the holistic scope of repairs and the resulting total project cost. The DSMS and associated Report is the mechanism for providing this information.

The DSMS effort has focused on updating hydrology, geology, geotechnical investigations, risk assessments, and consequence evaluations for the entire HHD to more comprehensively identify an overall risk picture, scope, and cost for remediating the entire HHD. Similar to any complex engineering system, this effort has experienced technical challenges that have led to delays in determining a risk assessment with a high level of accuracy. These delays have postponed continued embankment remediation until at least 2019, which would result in a stall in construction of almost 5 years. The 2015 Supplemental MRR with this associated EA is the opportunity to identify an area of the dike that is not dependent upon further technical investigations. The 2015 Supplemental MRR is focused on an area of the dike (Reaches 1 and 3) that all technical analysis supports the same conclusions, would provide benefits to life safety and economic and environmental resources, and would lead to expedited construction in 2017, therefore providing risk reduction measures to the community and environment.

1.7 RELATED PROJECTS

Comprehensive Everglades Restoration Plan (CERP), April 1999

The $10.9 billion CERP takes a watershed approach that builds upon and works with other state and Federal efforts to revitalize the wetlands, lakes, bays, and estuaries of south Florida. Considered the largest environmental restoration program in history, CERP is largely based upon a series of projects that will address four major characteristics of freshwater flow: quantity, quality, timing, and distribution.

The complex, multi-year undertaking has two distinct levels of activity:

- Program-level coordination fosters productive working relationships and understanding among the various Federal, state, local, tribal, and stakeholder partners involved in CERP implementation. In addition, other key activities that span the life of CERP include ongoing efforts such as data collection, computer modeling, studying the response of the natural environment to CERP activities, addressing recreational opportunities, and science, outreach, and economic issues.

- Project-level activities are the land acquisition, planning, designing, and constructing of more than 50 individual projects.

Once fully implemented, CERP would allow water deliveries and overland flow to follow patterns that are more natural throughout the south Florida ecosystem. The CERP reservoirs would store excess water from Lake Okeechobee, receive flood control releases that would otherwise go to the estuaries, and collect stormwater runoff from developed areas. The stored water would then improve high and low water levels in Lake Okeechobee; help meet environmental targets in the estuaries, Everglades, and other natural areas; and supplement urban and agricultural water supply. The integrity of HHD will affect future lake levels and Lake Okeechobee's ability to store water for Everglades restoration.

Final Supplemental EIS on Lake Okeechobee Regulation Schedule (LORS), Lake Okeechobee, Florida, 2008

The LORS was approved by the Corps on April 28, 2008. This regulation schedule represents the best balance of project goals, including improving the environmental health of certain major ecosystems while providing for public health and safety. High lake stages approved under the previous schedule, called WSE schedule, threatened the integrity of HHD in its current condition. To avoid stressing HHD when lake stages are high, large volumes of lake water have been released to Lake Okeechobee's two major outlets, the St. Lucie and Caloosahatchee Estuaries, adversely affecting these ecosystems. Extended periods of high water levels in Lake Okeechobee have also resulted in significant losses of valuable habitat in Lake Okeechobee's littoral zone and marsh communities, including habitat for the endangered Everglade snail kite (*Rostrhamus sociabilis mirabilis*). As compared with WSE, 2008 LORS allows for quick response and operational flexibility to changing lake conditions and tributary inflows. The schedule improves the rates of flow to the coastal estuaries by allowing low rates of flow to begin earlier as the lake rises, which in turn helps reduce the need for higher flows later in the year. The LORS also improves the environmental health of Lake Okeechobee by reducing the frequency and duration of high lake elevations that affect Lake Okeechobee's shore zones and HHD stability.

Central Everglades Planning Project (CEPP), 2013

The purpose of CEPP is to assess Federal and non-Federal interest in implementing components of CERP, which was authorized as a framework for restoring the south Florida ecosystem while providing for other water related needs of the region in the 2000 Water Resources Development Act (WRDA). Since CERP was approved, three projects were authorized in the 2007 WRDA and proceeded into construction (Indian River Lagoon-South, Picayune Strand, and Site 1 Impoundment) and a fourth project, Melaleuca and Other Exotic Plants Biological Controls, was implemented under the programmatic authority in WRDA 2000. Under the WRRDA 2014, additional civil works projects were authorized including C-43, C-111 Spreader Canal, and Broward County Water Preserve Area. Despite this progress, ecological conditions and functions within the central portion of the Everglades ridge and slough community continue to decline due to lack of sufficient quantities, timing and distribution of freshwater flow into the central Everglades. Planning goals for CERP projects include enhancing ecological values and enhancing economic values and social well-being. Both goals were considered during the formulation of CEPP alternative plans, and project-specific objectives and constraints were established to evaluate the plans. In general, ecosystem restoration objectives focused on providing additional water to the Everglades by capturing freshwater discharges from Lake Okeechobee to the St. Lucie and Caloosahatchee Estuaries. Timing of deliveries and distribution of flows to the Everglades and improvements to water supply for municipal, agricultural, and Tribal use were also evaluated.

Kissimmee River Restoration and Headwaters Revitalization (in progress)

Acquisition of more than 100,000 acres of land needed for Kissimmee River Restoration and Headwaters Revitalization is complete. Three phases of the Kissimmee River Restoration Project have been completed. The remaining phases are scheduled to be complete in 2019. Once restoration construction is complete, 40 square miles of Kissimmee River and floodplain ecosystem will be restored including almost 63,000 acres of wetlands (38,000 acres of riverine floodplain and 25,000 acres of lake littoral zone) and 40 miles of historic river channel. The restoration of the Kissimmee River and implementation of a headwater regulation schedule will allow additional water to be stored in the Kissimmee Basin, thereby reducing flows into Lake Okeechobee.

1.8 PERMITS, LICENSES, AND ENTITLEMENTS

The proposed HHD repairs are subject to Section 401 of the Clean Water Act and would require Water Quality Certification (WQC) from the Florida Department of Environmental Protection (FDEP). This WQC would be obtained when more specific designs are completed. As part of applying for and obtaining the WQC, FDEP would likely require the Corps to demonstrate that the water quality requirements of the Lake Okeechobee Protection Act (LOPA) are met. The proposed work also requires a Coastal Zone Management Act consistency evaluation (Appendix A). A Section 402 National Pollutant Discharge Elimination System (NPDES) permit is required for construction activities disturbing more than five acres of land. These permits would be acquired prior to construction. Drainage connections and utilities would be coordinated with the Florida Department of Transportation (FDOT), as appropriate.

1.9 DECISION TO BE MADE

The alternatives analyzed in this EA are to determine which alternative would be recommended to implement rehabilitation measures within CCZ A.

2.0 ALTERNATIVES

2.1 DESCRIPTION OF ALTERNATIVES

The ongoing DSMS identified CCZ A as the most at risk section of the dike. Rehabilitation measures have been undertaken from Belle Glade to Port Mayaca, with the exception of 6.8 miles between Belle Glade and Lake Harbor. It is imperative that alternative rehabilitation measures extend throughout the entire CCZ A to avoid economic and environmental damages associated with a breach that would impact stakeholders and resources downstream of CCZ A. The Alternatives developed for this EA include alternatives developed as part of the HHD DSMS. This section summarizes the alternatives for rehabilitating HHD that have been developed through the DSMS for CCZ A between Belle Glade and Lake Harbor. The concepts and lessons learned in the development of rehabilitation designs for Reach 1 (the first of HHD reaches to receive comprehensive evaluation) have been used to develop alternative designs for the remainder of HHD rehabilitation.

2.1.1 ALTERATIVE 1: NO ACTION ALTERNATIVE

Evaluation of the No Action Alternative is a requirement of NEPA regulations. The No Action Alternative assumes that aside from routine operation and maintenance, no additional actions would be taken to rehabilitate the dike. However, the continued replacement and removal of the Federal culverts as outlined in the 2011 Culvert Replacement and Removal EA would continue. The 2008 LORS is an interim risk reduction measure and would remain in place under the No Action Alternative. The genesis of the 2008 LORS began in response to environmental damages suffered in the St. Lucie and Caloosahatchee estuaries as the result of large and prolonged freshwater releases from Lake Okeechobee during the epic 2004 Hurricane Season. After Hurricane Katrina, dam safety concerns for HHD and attempting to manage water levels lower in Lake Okeechobee became an additional objective of LORS. The 2008 LORS is therefore intended to contain the lake stage within a band that best satisfies the C&SF Project flood damage reduction, water supply, navigation, and environmental objectives, without permitting a lake stage that could cause dam failure. Through many years of previous studies and dam safety classifications, with no action, a breach in the dike is likely to occur.

2.1.2 ALTERNATIVE 2: CUTOFF WALL

This alternative includes construction of a cut off wall within two locations within the embankment: centerline and on the upstream face of the dike (**Figure 2-1**). The following generalized cross sections present the proposed wall locations. The cutoff wall depicted on the upstream slope includes use of an impervious liner to prevent through seepage between the top of the wall and extreme reservoir elevations.

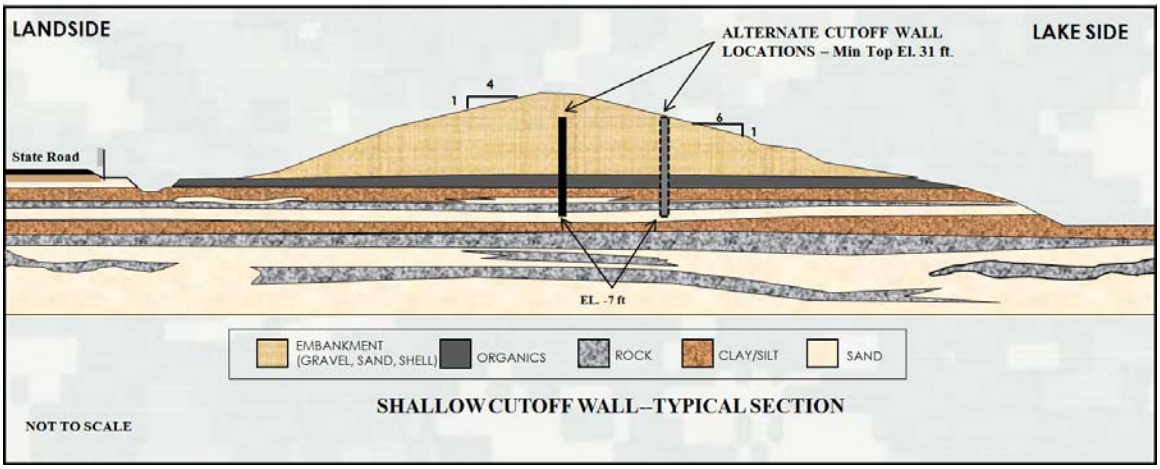

Figure 2-1. Seepage Cutoff Wall, Crest of HHD

The centerline cutoff wall was recommended in the 2006 EIS for Reaches 2 and 3, the DSMS, and now for this Supplemental MRR.

Cutoff walls of varying depths were evaluated within Consequence Zone A and are included as Alternatives 2A and Alternative 2B with consideration to local geologic conditions, estimated seepage exit gradients, and adjacent features such as ground surface elevations and ditch or canal invert elevations. The presence of downstream features such as the shallow toe ditches influence the depth of cutoff wall needed to reduce risk to within tolerable levels, as these features create a geometry that allows horizontal piping to occur, which requires significantly lower gradients as compared to vertical erosion.

Alternative 2a: Shallow Cutoff Wall

The shallow cutoff alternative would extend from near the crest of the embankment to an elevation of approximately -7 feet to -25 feet NAVD88 (**Figure 2-1**). This type of wall is designed to penetrate only the top layers of limestone in the foundation. This measure does not tie into a confining layer, but achieves risk reduction by increasing the seepage path length, routing flow through less erodible limestone layers in the foundation, and interrupting the horizontal failure path through the embankment and shallow foundation. This measure requires more vertically orientated internal erosion path and significantly increases the gradient required to move and sustain movement of soil. This measure provides sufficient risk reduction; however, it must be noted that unfiltered seepage would likely still discharge in the toe ditch during high reservoirs.

The shallow cutoff wall consists of Soil Cement Bentonite and uses specialty construction methods capable of maintaining trench stability through the loose embankment fill while still capable of cutting the underling limestone. Other material types such as soil bentonite and open trench construction would be considered during the construction phase should shallow cutoff wall be the selected risk reduction measure for these areas.

Alternative 2b: Deep Cutoff Wall

The deep cutoff alternative would extend from near the crest of the embankment to an elevation of approximately -40 feet NAVD88 (**Figure 2-2**). This cutoff wall would be comprised of the same materials as the shallow cutoff wall and is designed to penetrate all of the shallow

limestone strata in the foundation (this type of cutoff wall is what is currently under construction in CCZ A between Belle Glade and Port Mayaca).

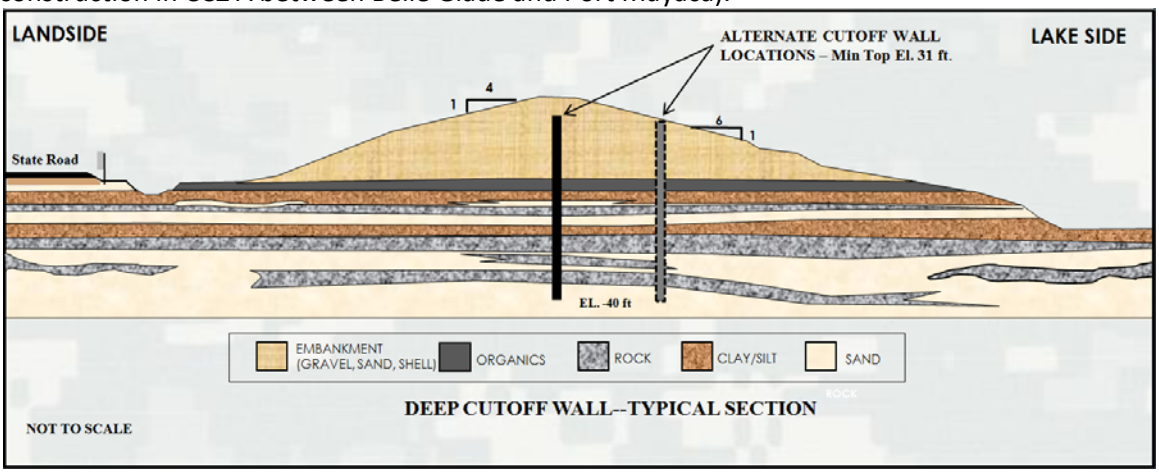

Figure 2-2. Deep cutoff wall

2.1.3 ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

Internal drainage systems of varying designs and configurations were also evaluated for Consequence Zone A. The purpose of the internal drainage system is to intercept seepage waters moving through the embankment and foundation and safely discharge this water into the adjacent toe ditch through a designed drain. The drains allow this seepage to be discharged without building up pressures in the embankment that lead to erosion of the embankment fill. Additionally, the outer layers of the drain are designed to a specific gradation that filters the existing embankment fill and foundation sands allowing water to move through the system while retaining the surrounding soil. The proposed internal drainage systems are defined as variations of chimney, blanket, and trench drains, where the intent of the chimney is to drain seepage from the embankment and the blanket and trench are intended to drain foundation pressures. Note that the majority of the seepage discharged into the toe ditch naturally seeps into the system already in an unfiltered state. However, during elevated lake stages, some additional seepage from the foundation could daylight into the toe ditch in areas where the surficial peat and organic silt layers are not already breached by the toe ditches. An Articulated Concrete Block (ACB) is also proposed to line the ditch. A closed cell ACB would still allow for dissipation of seepage in the open areas between blocks but would limit excavation depth during cleaning and prevent excessive vegetation growth. Regular herbicide treatment of the ditch would still be required.

The primary internal drainage system designs are described below:

Chimney, blanket and trench drains – a system that incorporates a chimney to intercept through embankment seepage, a trench to intercept and drain through foundation seepage, and a continuous discharge blanket that discharges to a downstream seepage conveyance system (**Figure 2-3**).

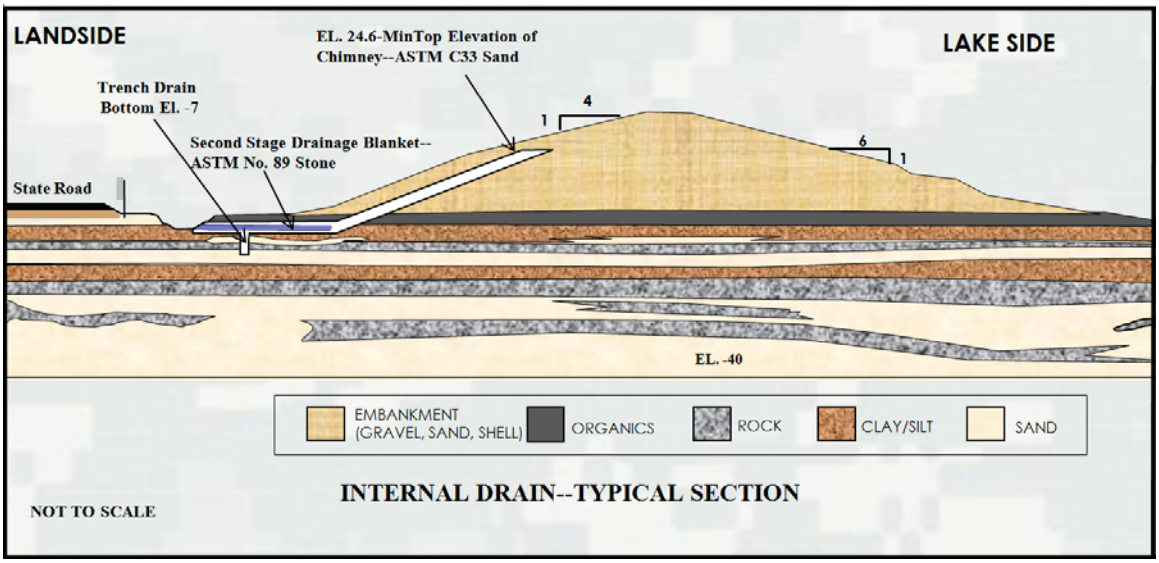

Figure 2-3. Chimney, Blanket, and Trench Drain

Chimney, blanket and toe ditch lining – a system that incorporates a chimney and blanket with continuous discharge through a blanket drain into the seepage conveyance system; however, this measure eliminates the trench feature in the foundation and utilizes an inverted filter at the seepage exit location (**Figure 2-4**).

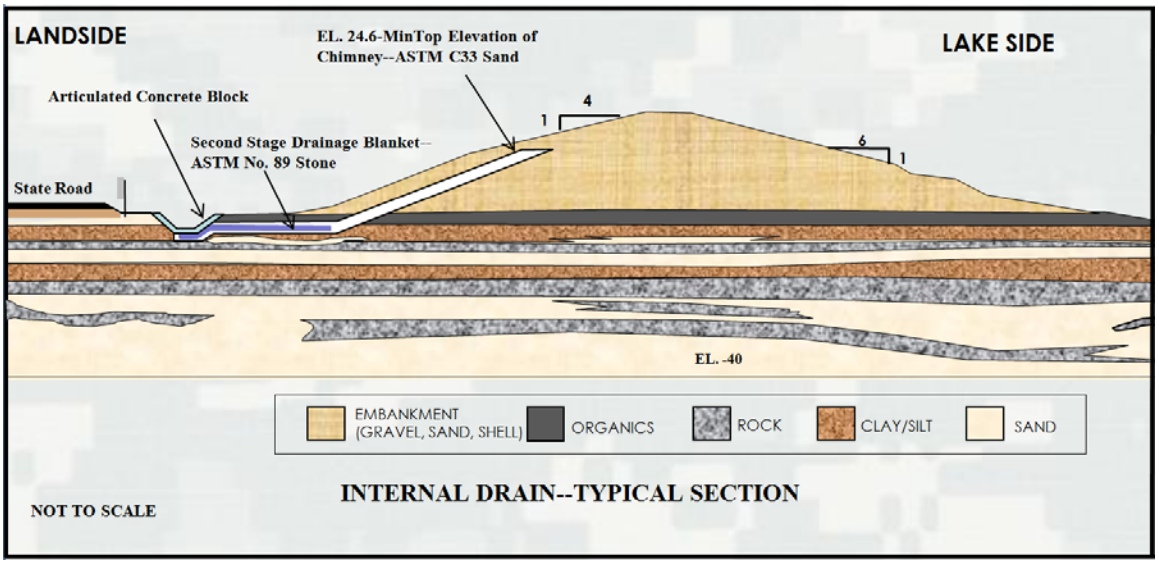

Figure 2-4. Chimney, Blanket, and Toe Ditch Lining

2.1.4 ALTERNATIVE 4: PROPERTY ACQUISITION AND RELOCATION

Property acquisition and relocation was considered as an alternative to remove the threat of flooding to homes within CCZ A. Acquisition of residential properties requires relocation of the population that would experiences 6 foot water depths in 12 hours for single family residence, or more than 2 feet in 12 hours for a mobile home. To ensure that future entities do not move within the inundation area, a no-development easement area would need to be acquired from the existing landowners.

2.2 ISSUES AND BASIS FOR CHOICE

This action is for immediate maintenance and risk reduction actions for CCZ A that were identified in the DSMS as the highest priority for repair that would be utilized in the rehabilitation of the dike system. The Alternatives identified in this document are for only for rehabilitation of CCZ A between Belle Glade and Lake Harbor; the HHD DSMS and associated NEPA will systematically address rehabilitation measures and an array of alternatives needed for the entire HHD.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED

The Corps developed and analyzed a number of system and design alternatives to provide the authorized level of protection against a failure in the dike. As stated previously, plan formulation for the rehabilitation of HHD has been ongoing for many years and summaries can be found in the 2006 Draft Supplemental EIS for Reaches 2 and 3 and the 2010 Draft Supplemental EIS for Reach 1A. A variety of alternatives have been considered over the years to include those within this EA as well as several others that were eliminated (see Table 1-1 for a list of previous documents. These documents can be provided upon request.)

The deep cutoff wall was eliminated from further consideration because it was more expensive and less economically viable than the shallow cutoff wall. The shallower depth cutoff wall still provides an acceptable level of risk reduction against life loss and environmental damages south of Lake Okeechobee.

Alternative 4, Acquisition and Relocation is not an economically viable option. It also does not provide flood safety for surrounding communities and the environment south of Lake Okeechobee.

2.4 PREFERRED ALTERNATIVE

The Preferred Alternative is Alternative 2a, Shallow Cutoff Wall. Constructing a shallow cutoff wall would increase stability of the embankment as well as adequately accommodate for economic and environmental damages if a breach were to occur. The No Action Alternative does not address the imminent need for public safety according to current dam safety standards.

3.0 AFFECTED ENVIRONMENT (EXISTING CONDITIONS)

The affected environment section describes the existing environmental resources of HHD that would be affected if any of the alternatives were implemented. This section describes only those environmental resources that are relevant to the decision to be made, meaning rehabilitation of the remainder of CCZ A. Therefore, it does not describe the entire existing environment, but only those environmental resources that would affect or be affected by the alternatives if they were implemented. This section, in conjunction with the description of the No Action Alternative forms the baseline conditions for determining potential environmental impacts of the proposed action and reasonable alternatives. Further, the existing condition captures the risk associated with HHD project as it stands today. The risk also takes into account that if a failure were to occur as it stands today that local and Federal government would intervene and begin flood fighting.

3.1 GEOLOGY

The following sections describe the basic geological characteristics of HHD embankment and foundation within HHD alignment of CCZ A. Generalized cross sections of this geology are presented in the risk reduction figures in Section 2 (**Figure 1-4**).

3.1.1 EMBANKMENT

Herbert Hoover Dike was built in two phases. The first phase was completed in the 1930s and was constructed by hydraulic dredge and fill techniques. The embankment was raised and widened in the 1960s/1970s using dragline excavation and placement methods. No systematic compaction efforts were performed in either construction phase nor were there any gradation or soil classification controls. The embankment was constructed with materials excavated from a continuous borrow trench that parallels the lakeside toe of the embankment (its location ranging from immediately adjacent to the lakeside toe to approximately 300 feet upstream of the toe). The embankment is therefore a heterogeneous blend of the soils and limestone found in the foundation of the dike with various concentrations of sands, silts/clays, peat, cobbles and boulders throughout.

The higher elevations of the embankment (constructed with dragline) generally consists of a heterogeneous mixture of loose to medium dense, sandy to gravelly, silty and clayey sands with shell and a significant percentage of limestone and sandstone gravel, cobbles, and occasional boulders. The gravel, cobbles, and boulders are found in varying percentages and distributions, Concentrations of over 60% occur in pockets in the embankment. The lower elevations of the embankment (constructed hydraulically) generally contain more fine grained soils including soft sandy clays and silts mixed with organic silts and peats.

The embankment in Consequence Zone A was constructed using similar construction methods and as such is very similar throughout. Similar geology can be found in the adjacent borrow trench. There are subtle transitional differences within Consequence Zone A that have been observed and can be related to the excavated foundation materials. Limestone cobble and boulder concentrations are highly variable and would reflect the amount of foundation rock present at a given location.

3.2 LAND USE

The primary land use in the Lake Okeechobee region is agriculture, however there are also residential properties. Major agricultural activities in the area include sugarcane plantations, ornamental plant nurseries and citrus groves.

The Farmland Protection Policy Act of 1981 was enacted to minimize the extent that Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) is responsible for designating prime or unique farmland protected by the Act. In early 2010, NRCS designated certain high-value crops in Florida, such as sugarcane, ornamental plant nurseries, and citrus groves, as "unique," thereby protecting these farmlands under the Act. Unique farmland protected by the Act exists in close proximity to HHD in CCZ A.

3.3 HYDROLOGY & HYDRAULICS

Surface Water

Inflow to Lake Okeechobee for drainage purposes and outflow for agricultural water supply and other purposes, such as releases made under LORS 2008, are made through a series of Federal, state, and local drainage district culverts that penetrate HHD. The majority of inflow enters Lake Okeechobee through several major canals and control structures. In general, excess runoff from the drainage basins are gravity fed to the canals and structures on the north, east and west shores of Lake Okeechobee, as well as pumped to the canals and structures on the south shore of Lake Okeechobee. The Lake Okeechobee drainage area, including Lake Okeechobee, is approximately 5,600 square miles. The Standard Project Flood was selected as the inflow design flood (IDF) for HHD Project. The Standard Project Flood is equivalent to a stage of 24.7 feet NAVD88.

Inflow enters from the north, east and west of Lake Okeechobee through the following watersheds: Kissimmee River, Taylor Creek-Nubbin Slough, Fisheating Creek, Nicodemus Slough and Lake Istokpoga. Inflow enters from the south of Lake Okeechobee through mostly state and local water control districts in the watershed designated as the 'South Shore'. These basin discharges are generally pumped back into Lake Okeechobee through HHD culverts, with the exception of Culverts S-2 and S-3, which pump directly into Lake Okeechobee. In general, HHD culverts along the south shore have surface water management permits for drainage to Lake Okeechobee and water supply from Lake Okeechobee for agricultural irritation purposes.

The largest outlets of Lake Okeechobee include the St. Lucie (C-44) and the Caloosahatchee Rivers (C-43). Four major agricultural canals (West Palm Beach, Hillsboro, North New River, and Miami) drain to the south into Stormwater Treatment Areas, and then sequentially through the three Water Conservation Areas (WCAs). **Figure 3-1** shows the major Lake Okeechobee hydrologic features including the contributing watersheds to the north, east, and west; and the local water control districts along the south shore of Lake Okeechobee.

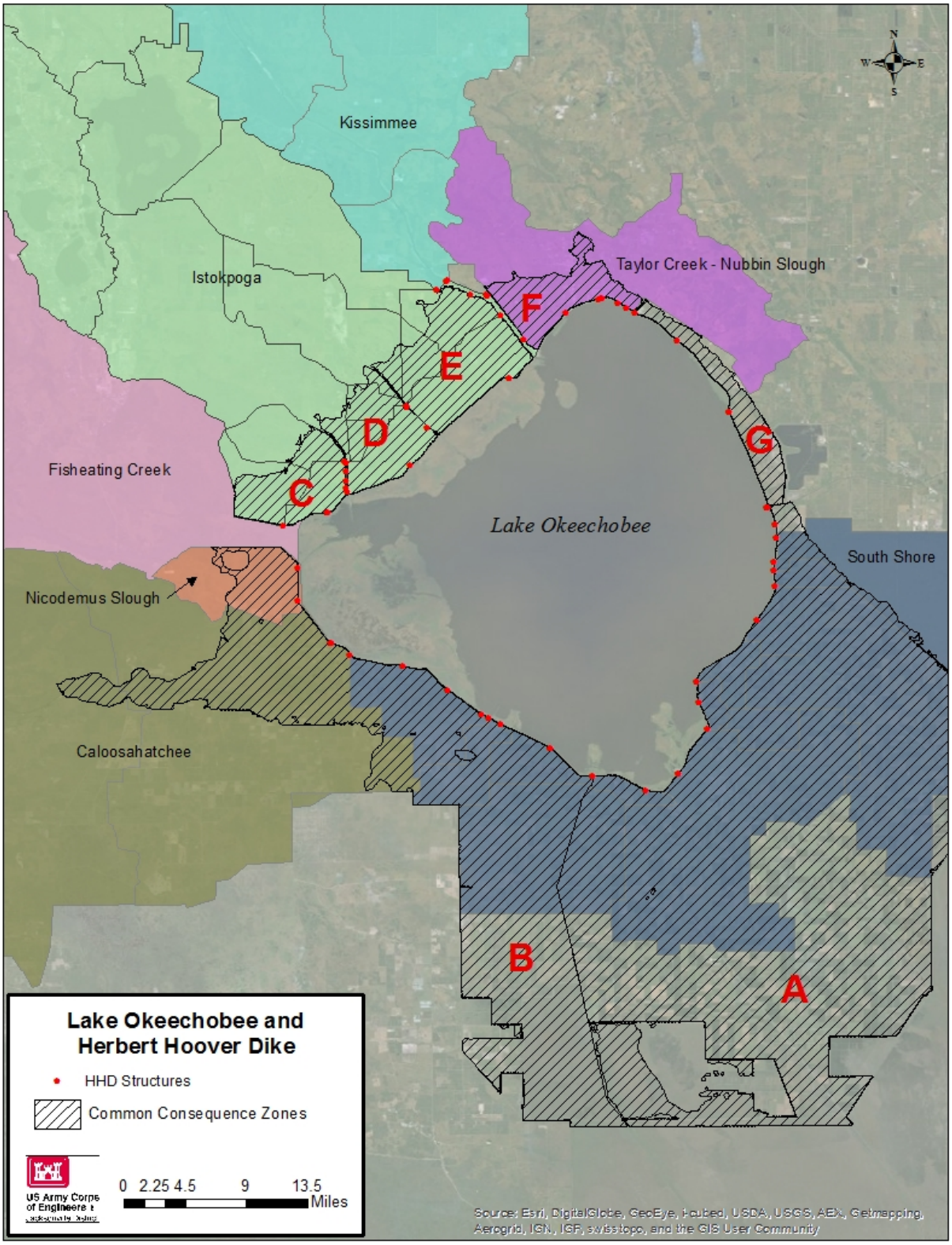

Figure 3-1. Basin Location Map

Kissimmee River

The Kissimmee River drainage basin encompasses about 2,260 square miles and extends from Orlando southward to Lake Okeechobee at the mouth of the Kissimmee River (C-38). The basin is the largest source of surface water flow to Lake Okeechobee with the inflow from C-38 controlled at SFWMD structure S-65E (**Figure 3-3**).

Taylor Creek – Nubbin Slough

The Taylor Creek – Nubbin Slough drainage area bordering the north and northeast shores of Lake Okeechobee encompasses about 309 square miles and extends from the Kissimmee River (C-38) to the St. Lucie River (C-44). All inflow from this watershed is controlled. There are five HHD culverts in the basin: C-6, C-7 (abandoned), C-8, C-9 (abandoned), and Taylor Creek Culvert (abandoned). The C-7, C-9 and Taylor Creek culverts are not in use and considered abandoned in place.

Fisheating Creek

Fisheating Creek is located principally in the western portions of Highlands and Glades counties, with the western boundary extending into the easterly edges of Hardee, DeSoto, and Charlotte counties. The drainage area is adjacent to the Peace Creek Basin on the west and northwest, the Lake Istokpoga-Indian Prairie and Harney Pond Canal areas on the north and northeast, and Nicodemus Slough on the south. Fisheating Creek drains an L-shaped area of about 550 square miles. From the headwaters near Lake Josephine, the creek discharges uncontrolled and flows south for 32 miles, then east for 23 miles to discharge into Lake Okeechobee.

Nicodemus Slough

The Nicodemus Slough drainage basin borders the southwest shore of Lake Okeechobee extending from Fisheating Creek to Culvert 5A just north of the Caloosahatchee River watershed. The area encompasses about 39 square miles and normally drains to Lake Okeechobee. When lake levels are abnormally high, it is necessary to drain some of Nicodemus Slough south to the Caloosahatchee River through structures C-5 and C-5A. There are two HHD culverts in the basin: C-5 and C-5A.

Istokpoga

The Istokpoga drainage basin borders the northwest shore of Lake Okeechobee from Kissimmee River (C-38) to Fisheating Creek (FC) and encompasses about 1,070 square miles. Embankments isolate the two main canals, Indian Prairie (IP) Canal (C-40) and Harney Pond (HP) Canal (C-41) from the watershed. There are three culverts that discharge into Indian Prairie Canal: IP-1, IP-2, and IP-3, as well as the S-72 gated spillway; and six culverts discharge into Harney Pond Canal: HP-1, HP-2, HP-3, HP-5, HP-6, and HP-7, as well as the S-71 gated spillway. The FC-1 culvert discharges into the L-50 borrow.

South Shore

The South Shore of Lake Okeechobee extends from Moore Haven at the Caloosahatchee River to Port Mayaca at the St. Lucie River. There are 13 HHD culverts in the basin: 1, 1A, 2, 3, 4A, 10, 10A, 11, 12, 12A, 13, 14 (to be removed) and 16. The drainage areas associated with these 13 culverts are local water control districts mostly contained within the Everglades Agricultural Area (EAA).The EAA is divided into seven drainage basins and is comprised of a network of canals, structures, and embankments that divide the area to provide for the removal of excess water to Lake Okeechobee and the WCAs to the south. The local drainage districts, also referred to as '298 Districts', have private pump stations that discharge to Lake Okeechobee or the EAA canals. **Figure 3-2** provides a map of the 298 Districts.

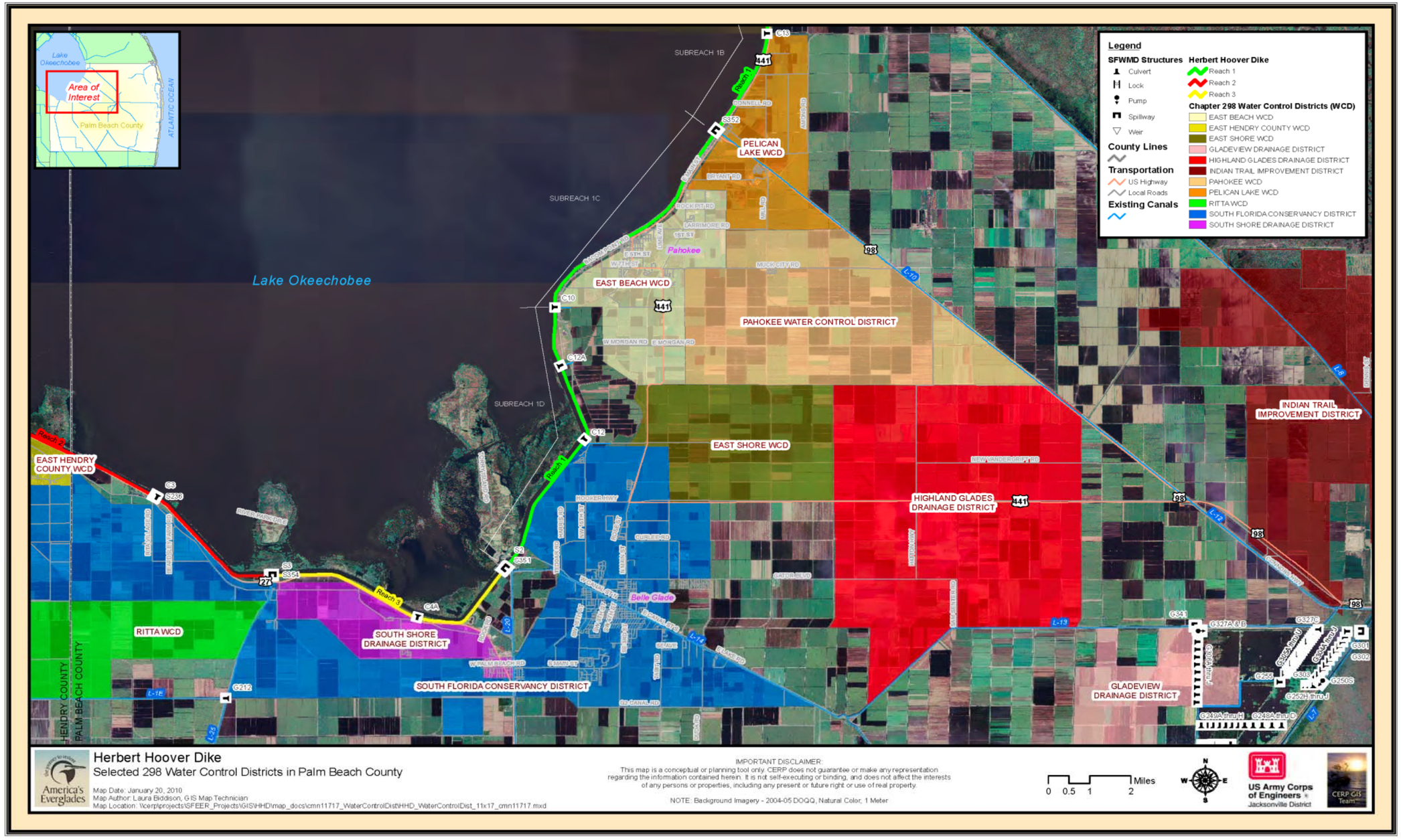

Figure 3-2. 298 Water Control Districts

Surface Water Use

The SFWMD manages the water use permitting process within its boundaries under authority of Chapter 373, State Statutes, 40E-20 Florida Administration Code (F.A.C.). A water use permit allows a user to withdraw a specified amount of water from the ground, a canal, a lake, or a river. The water can be used for public water supply, industrial processes, or irrigation.

There are 298 Water Control Districts (originated through Florida State Statute 298), which maintain and operate a secondary canal systems in the EAA (England et al., 2013 (a); **Figure 3-2**). The water use in the EAA is assured by maintaining water levels in these canals. The Water Control Districts maintain water levels approximately 1 to 2 feet below ground surface for most of the year. During the planting and harvesting seasons, water levels are lowered further to facilitate operations. During dry periods, increased water use and high evapotranspiration can result in undesirably low water levels in Lake Okeechobee. To reduce adverse ecological effects from low lake levels, SFWMD has developed a water supply management plan that requires various actions to be taken according to the severity of the dry conditions. The basis of this plan is an allocation scheme that parcels out Lake water based on estimated water use for the remainder of the dry season.

Groundwater

The groundwater resources in the Lake Okeechobee area include the surficial unconfined aquifer system (SAS) and the Floridan Aquifer System (FAS) separated by the Intermediate Confining Units (Radin et al. 2005). Groundwater recharge in the area occurs primarily from precipitation. Pumping of the surficial aquifer for agricultural and potable water needs occurs around the entire perimeter of the Lake though it is most predominant in the northern boundaries. Through CCZ A between Belle Glade and Lake Harbor, surficial aquifer groundwater tends to move from the lakeside to the landside (England et al. 2013 (b)) since adjacent land elevations and groundwater levels are generally lower than the lake levels.

The typical depth to the surficial groundwater table in the Lake Okeechobee area is about three feet below ground surface. In Palm Beach, Glades, and Hendry counties, the SAS may extend to 200 feet below ground surface in CCZ A between Belle Glade and Lake Harbor. The surficial groundwater aquifer in the vicinity of the eastern and southern portions of HHD extends from the land surface (8.7 feet NAVD88) to a depth of -180 feet below land elevation. The upper portion of this aquifer is potable to a depth of approximately -50 feet below land elevation though this elevation varies. Some residents and agricultural operations adjacent to the eastern and southern portions of Lake Okeechobee use shallow wells as a source of drinking and irrigation water. The groundwater below elevation -50 feet is not considered potable due to the high salinity of the underlying trapped connate water (i.e., ancient saline water).

The SAS can be further divided into different hydro-geologic units that include undifferentiated fill, peat/silt, inter-bedded zones, highly permeable limestone layers, sand and semi-confining units (England et al. 2013 (a)). Pumping tests and other aquifer performance tests have been conducted along HHD alignment to estimate values of key hydro-geologic parameters that characterize the transmissivity and storativity of groundwater within the SAS. These tests show that the transmissivity of groundwater in the SAS generally increases moving from north (CCZ C, D, E, F, and G) to south (CCZ A) and can be partially explained by the increased percentage of limestone within the SAS moving southward.

Groundwater levels surrounding HHD are rarely static and often fluctuate with changes in lake levels, recent rain events, agricultural pumping and operation of water control structures and canals. Typically, toe ditch water levels adjacent to HHD are reflective of the local groundwater levels. In contrast, the water levels in the C&SF Project canals are managed by SFWMD and water levels in those canals do not necessarily represent local groundwater levels. Within the EAA, due to land subsidence and the presence of embankments bounding the C&SF Project canals, water levels in these canals can often be several feet higher than the groundwater levels being managed in the adjoining EAA farms.

Compared to the pre-historic condition, the groundwater hydrologic system in the area (particularly along the southern portions of CCZ A) has been changed due to the construction of HHD, the construction/operation of public and private drainage systems and agricultural practices. The completion of HHD and the primary drainage canal system of the C&SF Project allowed agricultural operations to flourish in the peat-deposited lands downstream of CCZ A, to the point that this region became known as the EAA. Water levels in the 298 Water Control Districts with the EAA are artificially maintained approximately 1 to 2 feet below the ground surface during the majority of the year and further lowered during the planting and harvesting seasons to facilitate operations. Other entities (lessees) of the EAA have similar practices. These systems operate under surface water and groundwater use permits issued by SFWMD. Ultimately, the altered distribution of flows, peat loss and land subsidence and decline of groundwater tables has caused an increase in the groundwater gradients across HHD (England et al. 2013 (b)).

Groundwater Use

Lake Okeechobee provides potable water and recharges the surficial aquifer. The unconfined SAS is the principal source of groundwater for the basin's potable, agricultural and industrial uses. The confined FAS aquifer has higher levels of dissolved solids such as sodium, thus it is not suitable for potable water except in some areas of Okeechobee and Glades Counties with the higher quality FAS water. Only eight water supply wells are known to tap into the Upper Floridan aquifer in the basin.

There are approximately 300 surficial aquifer system groundwater pumping wells permitted within the general vicinity of the south, southwest and southeastern portions of Lake Okeechobee. These wells, in addition to unpermitted wells in the area, are used for household, agricultural, industrial consumption and de-watering activities. Some of these wells are located within 2,500 feet of HHD. The majority of the wells have pump capacities below 1 million gallons per day. In the area south of HHD, groundwater is used primarily for irrigation, livestock and landscaping. In addition, there are several groundwater wells that are used for industrial and public water supply. For instance, the City of Moore Haven uses a surficial aquifer wellfield located within one mile of HHD for its potable water supply.

Water Control Structures: Culverts

The HHD has numerous culvert structures that provide flood protection to residents of Palm Beach, Okeechobee, Highlands, Broward, Hendry, Glades and Martin counties. Lake Okeechobee and HHD are integral components of both the C&SF Project and CERP which aim to provide flood protection, navigation, agricultural and municipal water supply, prevention of saltwater intrusion, recreation, enhancement of environmental resources and ecosystem restoration.

The current HHD system is composed of 28 operational culvert structures, designated as either 'primary' or 'secondary' culverts (**Figure 3-3**). Primary culverts were mainly constructed along the southern and eastern portions of Lake Okeechobee with a few located near the City of Okeechobee on the northern end of Lake Okeechobee. Secondary culverts, located along the northern side of Lake Okeechobee, were constructed as feeder canals and rivers flowing into Lake Okeechobee.

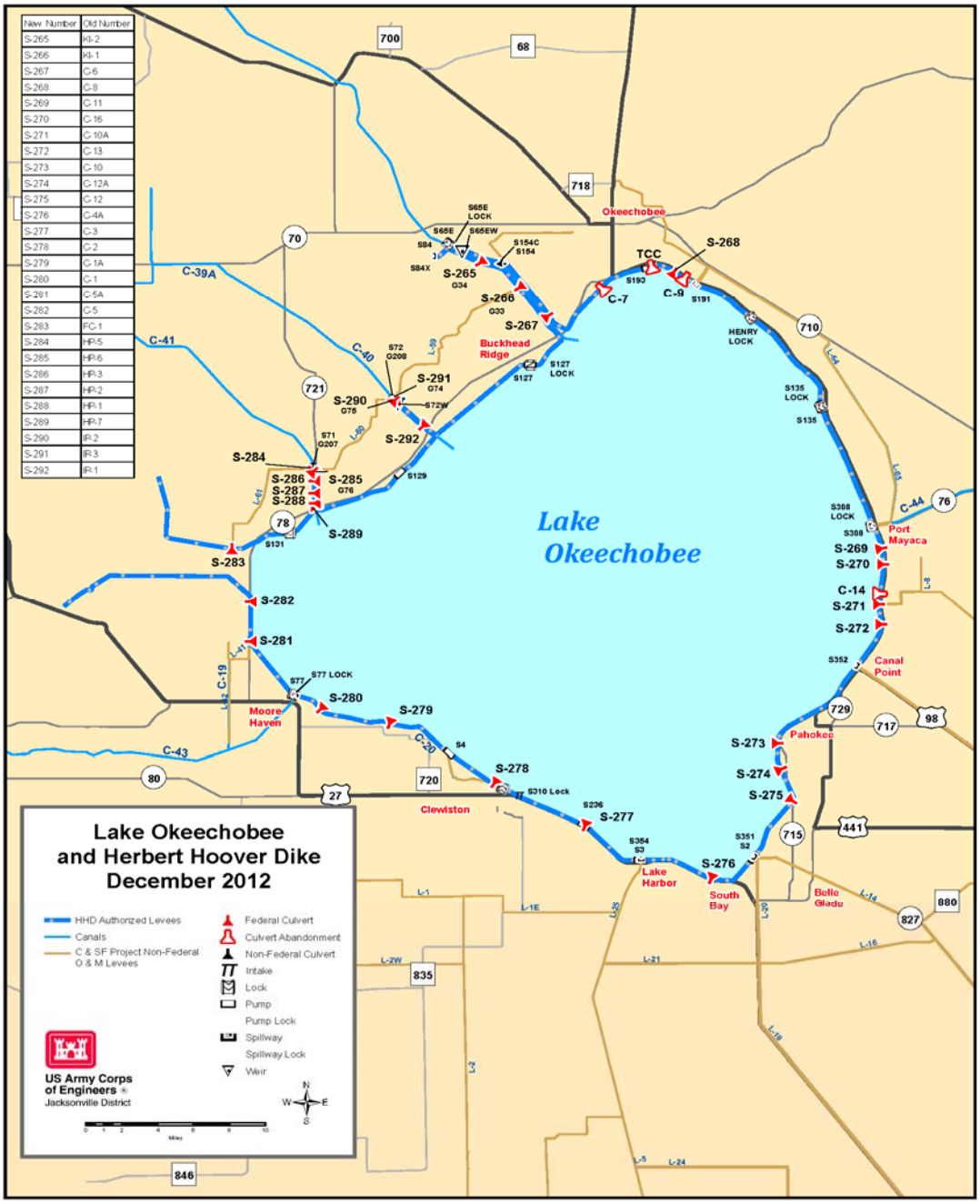

Figure 3-3. Structure Location Map

3.4 WATER QUALITY

Surface Water

Lake Okeechobee is a multipurpose reservoir providing drinking water for urban areas, irrigation water for agricultural lands, recharge for aquifers, freshwater for the Everglades, habitat for fish and waterfowl, flood control, navigation and many recreational opportunities. Lake Okeechobee has been designated by the FDEP as a Class I water body (drinking water supply). The surface water in HHD toe ditch and nearby canals meets most Class III water quality standards (recreation and maintenance of healthy fish and wildlife populations). However, the water in Lake Okeechobee and canals has elevated concentrations of nutrients (primarily phosphorus and nitrogen). The Clean Water Act requires states to classify their surface waters according to designated uses and to develop water quality standards. If water bodies are not meeting the standards, states are required to develop Total Maximum Daily loads (TMDLs). The TMDLs establish the maximum amount of a pollutant that a water body can assimilate without causing an exceedance of water quality standards. Nutrient loads within the Lake Okeechobee Basin are regulated under the Lake Okeechobee Protection Act (LOPA). Cooperating state agencies developed the Lake Okeechobee Protection Plan (LOPP) to outline strategies to reduce phosphorus loading to the Lake and to meet the total phosphorus TMDL of 140 metric tons by 2015. The LOPP specifies the implementation of Best Management Practices, Basin Management Action Plans (BMAPs), which allocate discharge reductions to the various stakeholders within the watershed or river basin, and construction of large regional facilities to capture phosphorus. The BMAPs contain a schedule for subsequent phases of phosphorus load reduction consistent with the TMDLs. The FDEP has a five-year cycle for setting and updating TMDLs and BMAPs. A reduction in Lake Okeechobee phosphorus is desired, in part, to reduce the occurrence of blue-green algal blooms in the Lake and to reduce adverse effects of phosphorus on downstream systems, including the Caloosahatchee River Basin and the St. Lucie River Basin. During high lake stages conditions, large volumes of water are released from Lake Okeechobee and sent to the Caloosahatchee and St. Lucie Estuaries. These large flow events are sometimes harmful to the downstream estuaries (USACE 2007d).

Groundwater

Groundwater quality varies throughout the five counties surrounding Lake Okeechobee, depending on geographic location and the subsurface aquifer characteristics. The surficial groundwater aquifer surrounding Palm Beach County, the vicinity of the eastern and southern portions of HHD, extends from the land surface (8.7 feet NAVD88) to a depth of -180 feet. In the vicinity of HHD, the upper portion of this aquifer is potable to a depth of approximately -50 feet below land elevation. Rural houses and agricultural operations adjacent to the eastern and southern portions of Lake Okeechobee use shallow wells as a source of drinking and irrigation water. The groundwater below elevation -50 feet is not considered potable due to its high salt content.

The quality of the groundwater in the lower portion of SAS is compromised by the presence of remnant connate seawater, which has a high salt content and renders much of this water unsuitable for most potable and agricultural uses. The cities of Belle Glade, Pahokee and South Bay historically drew their potable water supply from Lake Okeechobee because of the poor quality of SAS and the underlying FAS in this part of Florida. Agricultural water demand in this area is generally met by water delivered through an extensive surface water canal network. Despite the poor water quality of the surficial aquifer, there are water supply wells that

primarily use the water for irrigation, though some of the shallower wells may be used as a source of potable water.

The Corps and the U.S. Geological Survey have been monitoring groundwater quality in the vicinity of HHD Embankment in CCZ A and B since 2011. Some of this monitoring occurred prior to the cutoff wall installation in Reach 1 which was completed in 2013. **Figure 3-4** shows a monitoring well at Reach 1A (PB-1815). The cutoff wall at this location is placed to a depth that is 30 feet or more above the elevation of the interface between fresh groundwater and saline connate groundwater. The PB-1815 monitoring well shows that the cutoff wall has not had a significant effect on groundwater quality. This is likely because the cutoff wall does not eliminate all of the freshwater groundwater flow that is transported from the lake side of the embankment landward. **Figure 3-5** shows the observed change in the saline/freshwater interface depth that appears to have occurred subsequent to the installation of the cutoff wall in Reach 1D in the vicinity of monitoring well PB-1819 which is located approximately 80 ft landward of the levee crest. At this location, this observed change does not appear to have affected any adjacent water user. Based on the data available to date, it appears that the cutoff wall has caused the chloride interface depth to decrease by about 10 feet. Monitoring continues at this location. There are no monitoring wells placed in the 500 to 1,000 feet downstream range from the embankment so at present the Corps cannot determine the maximum distance from the embankment that changes to groundwater saline interface depth change. In the vicinity of Reach 1B, there is some recent evidence of increased chloride concentrations in surface water drainage/supply canals that are located within approximately 500 feet of HHD embankment. It is possible that installation of the cutoff wall in this location may be one of the causes of the observed increase in surface water chloride concentrations; however, the hydrogeology and surface water management practices in this area associated with two nearby rock mining operations and ongoing farming may be responsible for the changed water quality conditions.

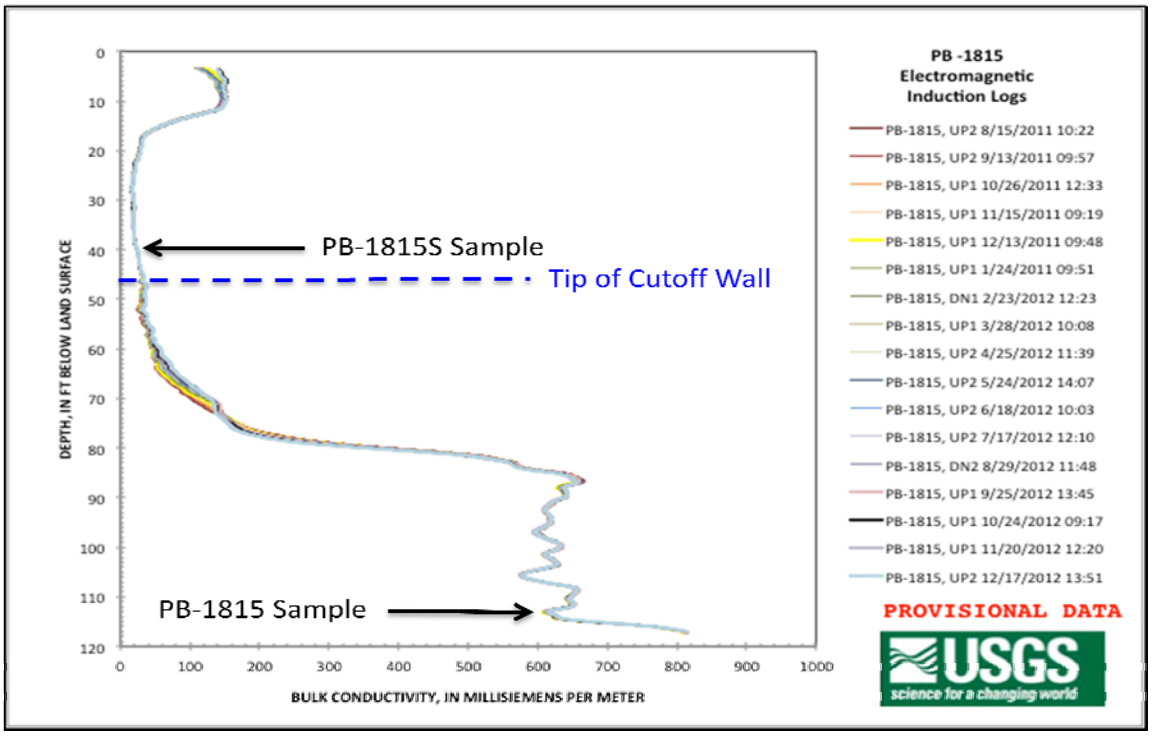

Figure 3-4. Bulk Conductivity at PB-1815 Well (Reach 1A).

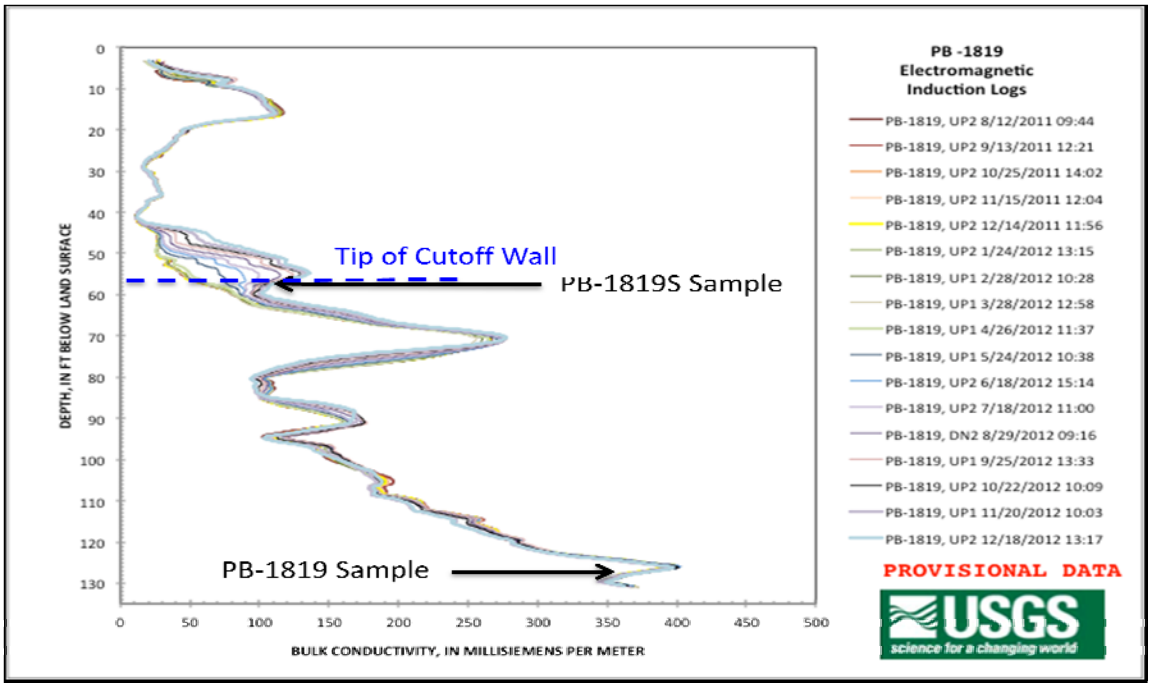

Figure 3-5. Bulk Conductivity at PB-1819 Well (Reach 1D)

3.5 VEGETATION

The vegetation within the Lake Okeechobee region has been greatly altered during the last century. Historically, the natural vegetation was a mix of freshwater marshes, hardwood swamps, cypress swamps and pine flatwoods. Although some of these natural areas still exist,

the introduction of controlled drainage for agriculture and land development has resulted in a significantly different set of cover types.

Landward of HHD, sugarcane plantations, improved pasture, row crops and urban lands now prevail. The HHD itself is covered with mixed grasses and some shrubs and trees that are mowed on a regular basis. Exotic invasive plants including melaleuca (*Melaleuca quinquenervia*), Australian pine (*Casuarina* sp.) and Brazilian pepper (*Schinus terebinthifolius)* are found throughout the area. Wetland vegetation can be found in the toe ditch of HHD though this vegetation is mowed during regular maintenance activities to allow inspection of the toe of HHD embankment. In the toe ditch and the network of canals, exotic and nuisance vegetation exists, including species such as water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), hydrilla (*Hydrilla verticillata*), bamboo (*Arundinaria* sp.), and cattail (*Typha* sp.).

The major cover types lakeward of HHD include open water and freshwater marshes. CCZ A contains mostly open water. A 98,000-acre (154-square-mile) littoral zone is found along Lake Okeechobee's western edge and on the islands in its southern shore (Kraemer Island, Torry Island and Ritta Island, which together encompass approximately 4,000 acres). The littoral zone supports more than 50 species of emergent, submerged and floating-leaf plants. Emergent vegetation within the littoral zone is dominated by cattail, spike rush (*Eleocharis* sp.) and the nuisance exotic torpedo grass (*Panicum repens*). Submerged vegetation, such as tape grass (*Vallisneria americana*), is abundant within the photic zone of Lake Okeechobee.

3.6 WETLANDS

Wetlands in the Lake Okeechobee region, though greatly reduced in area and quality through human impact, still exist as valuable ecosystems both landward and lakeward of HHD. Lake Okeechobee hydraulically feeds wetlands beyond the dike, providing freshwater for the Everglades to the south and for WCAs in Palm Beach and Broward Counties. Low quality wetlands also occur in the toe ditches around HHD. Typical vegetation in the toe ditch wetlands includes baby bluestem (*Andropogon* spp.), rush fuirena (*Fuirena scirpoidea*), bald cypress (*Taxodium distichum*), begger's tick (*Torilis arvensis*), matchhead (*Phyla* sp.), alligator weed (*Alternanthera philoxeroides*), Brazilian pepper, common reed (*Phragmities austalis*), common hackberry (*Celtis occidentalis*), elderberry (*Sambucus nigra* subsp. *canadensis*), smartweed (*Polygonum* sp.), southern willow (*Salix caroliniana*), cabbage palm (*Sabal palmetto*), sweetscent (*Pluchea odorata*), day flower (*Commelina* sp.), pennywort (*Hydrocotyle* sp.), Australian pine, water hyacinth, cattail and water lettuce. Although wetlands present on the landward side of HHD (toe ditch) may not be considered high quality ecosystems, they host small fishes and invertebrates and provide usable foraging habitat for wading birds, alligators and turtles. High quality wetland habitat can be found in the extensive littoral zone covering the western side of Lake Okeechobee. This habitat (littoral zone) is outside of the proposed project footprint.

3.7 THREATENED AND ENDANGERED SPECIES

The U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and State of Florida have designated certain species of reptiles, birds, mammals, gastropods, and plants and lichens in Palm Beach County as threatened or endangered (**Table 3-1**). Several of these listed species have been observed within the vicinity of HHD.

Table 3-1. Federal and State Listed Plant and Animal Species Palm Beach County, Florida

Scientific Name	Common Name	Federal Status	State Status	Effect Determination
Amphibians				
Rana capito	Gopher frog	Not listed	S*	No Effect
Reptiles				
Caretta caretta	Loggerhead sea turtle	Threatened	Threatened	No Effect
Chelonia mydas	Green sea turtle	Endangered	Endangered	No Effect
Crocodylus acutus	American crocodile	Threatened	Endangered	No Effect
Drymarchon couperi	Eastern indigo snake	Threatened	Threatened	No Effect
Eumeces egregius lividus	Bluetail mole skink	Threatened	Threatened	No Effect
Gopherus polyphemus	Gopher tortoise	Not listed	Threatened	No Effect
Pituophis melanoleucus mugitus	Florida pine snake	Not listed	S	No Effect
Birds				
Ammodramus savannarum floridanus	Florida grasshopper sparrow	Endangered	Endangered	No Effect
Aphelocoma coerulescens	Florida scrub jay	Threatened	Threatened	No Effect
Aramus guarauna	Limpkin	Not listed	S	No Effect
Athene cunicularia	Burrowing owl	Not listed	S	No Effect
Calidris canutus rufus	Red knot-migrant	Candidate	Candidate	No Effect
Campephilus principalis	Ivory-billed woodpecker	Endangered (Historic)	Endangered	No Effect
Charadrius melodus	Piping plover	Threatened	Threatened	No Effect
Egretta caerulea	Little blue heron	Not listed	S	No Effect
Egretta thula	Snowy egret	Not listed	S	No Effect
Egretta tricolor	Tricolored heron	Not listed	S	No Effect
Eudocimus albus	White ibis	Not listed	S	No Effect
Falco sparverius paulus	Southeastern American kestrel	Not listed	Threatened	No Effect
Grus Americana	Whooping crane	Endangered	S	No Effect
Grus canadensis pratensis	Florida sandhill crane	Not listed	Threatened	No Effect
Haematopus palliates	American oystercatcher	Not listed	S	No Effect
Mycteria americana	Wood stork	Threatened	Endangered	MANLAA
Pandion haliaetus	Osprey	Not listed	S	No Effect
Pelecanus occidentalis	Brown pelican	Not listed	S	No Effect
Picoides borealis	Red-cockaded woodpecker	Endangered	S	No Effect
Platalea ajaja	Roseate spoonbill	Not listed	S	No Effect

Scientific Name	Common Name	Federal Status	State Status	Effect Determination
Polyborus plancus audubonii	Audubon's crested caracara	Threatened	Not listed	MANLAA
Rostrhamus sociabilis plumbeus	Snail kite	Endangered	Endangered	MANLAA
Rychops niger	Black skimmer	Not listed	S	No Effect
Sterna antillarum	Least tern	Threatened	Threatened	No Effect
Invertebrates				
Anaea troglodyte floridalis	Florida's leafwing butterfly	Candidate (historical)	Not listed	No Effect
Strymon acis bartrami	Bartram's hairstreak butterfly	Candidate (1974)	Not listed	No Effect
Mammals				
Eumops floridanus	Florida bonneted bat	Endangered	Threatened	No Effect
Podomys floridanus	Florida mouse	Not listed	S	No Effect
Puma concolor coryi	Florida panther	Endangered	Endangered	MANLAA
Sciurus niger shermani	Sherman's fox squirrel	Not Listed	S	No Effect
Trichechus manatus	Manatee	Endangered	Endangered	MANLAA
Ursus americanus floridanus	Florida black bear	Not Listed	Threatened	No Effect
Gastropods (Snails and Allies)				
Orthalicus reses reses	Stock Island tree snail	Threatened	Endangered	No Effect
Plants and Lichens				
Acrostichum aureum	Golden leather fern	Not Listed	Threatened	No Effect
Argusia gnaphalodes	Sea lavender	Not Listed	Endangered	No Effect
Asimina tetramera	Four-petal pawpaw	Endangered	Endangered	No Effect
Calopogon multiflorus	Many-flowered grasspink	Not Listed	Endangered	No Effect
Chamaesyce cumulicola	Sand-dune spurge	Not Listed	Endangered	No Effect
Cladonia perforata	Perforate reindeer lichen	Endangered	Endangered	No Effect
Coccothrinax argentata	Silver palm	Not Listed	Threatened	No Effect
Cucurbita okeechobeensis	Okeechobee gourd	Endangered	Endangered	MANLAA
Dalea carthagenensis floridana	Florida prairie cover	Candidate (1918)	Endangered	No Effect
Dicerandra immaculate	Lakela's mint	Endangered	Endangered	No Effect
Glandularia maritima	Coastal vervain	Not Listed	Endangered	No Effect
Halophila johnsonii	Johnson's seagrass	Threatened	Threatened	No Effect
Hypericum edisonianum	Edison's ascyrum	Not Listed	Endangered	No Effect
Jacquemontia reclinata	Beach jacquemontia	Endangered	Endangered	No Effect

Scientific Name	Common Name	Federal Status	State Status	Effect Determination
Lantana depressa var. *floridana*	Atlantic Coast Florida lantana	Not Listed	Endangered	No Effect
Lantana depressa var.*sanibelensis*	Gulf Coast Florida lantana	Not Listed	Endangered	No Effect
Lechea cernua	Nodding pinweed	Not Listed	Threatened	No Effect
Lechea divaricata	Pine pinweed	Not Listed	Endangered	No Effect
Liatrus ohlingerae	Scrub blazing star	Endangered	Endangered	No Effect
Linum carteri var. *smallii*	Carter's large-flowered flax	Not Listed	Endangered	No Effect
Nemastylis floridana	Celestial lily	Not Listed	Endangered	No Effect
Okenia hypogaea	Burrowing four-o'clock	Not Listed	Endangered	No Effect
Ophioglossum palmatum	Hand fern	Not Listed	Endangered	No Effect
Panicum abscissum	Cutthroat grass	Not Listed	Endangered	No Effect
Paronchia chartacea	Papery whitlow-wort	Threatened	Endangered	No Effect
Polygala lewtonii	Lewton’s polygala	Endangered	Endangered	No Effect
Polygala smallii	Tiny polygala	Endangered	Endangered	No Effect
Pteris bahamensis	Bahama brake	Not Listed	Threatened	No Effect
Pteroglassaspis ecristata	Giant orchid	Not Listed	Threatened	No Effect
Sacoila lanceolata var. *paludicola*	Fakahatchee ladies' tresses	Not Listed	Threatened	No Effect
Schizaea pennula	Ray fern	Not Listed	Endangered	No Effect
Tephrosia angustissima var. *cutissii*	Coastal hoary-pea	Not Listed	Endangered	No Effect
Thelypteris serrata	Toothed maiden fern	Not Listed	Endangered	No Effect
Tillandsia flexuosa	Banded wild-pine	Not Listed	Threatened	No Effect
Tolumnia bahamensis	Dancing-lady orchid	Not Listed	Endangered	No Effect
Warea carteri	Carter’s mustard	Endangered	Endangered	No Effect
Critical Habitat				
Rostrahamus sociabilis plumbeus	Everglade snail kite	Endangered	Endangered	No Effect
Trichechus manatus	West Indian manatee	Endangered	Endangered	No Effect
Chelonia mydas	Green sea turtle	Endangered	Endangered	No Effect
Halophila johnsonii	Johnson’s seagrass	Threatened	Threatened	No Effect

*S=species of special concern, MANLAA = May Affect, Not Likely to Adversely Affect

Species discussed below are expected to occur within the study area. Other species listed in (Table 3-1. Federal and State Listed Plant and Animal **Species** Palm Beach County, Florida) are not expected to be present directly within the project area (CCZ A between Belle Glade and Lake Harbor).

3.7.1 FEDERALLY LISTED SPECIES EXPECTED TO OCCUR WITHIN THE STUDY AREA

Audubon's Crested Caracara: The threatened caracara is a unique raptor scavenger in the family Falconidae that reaches the northern limit of its geographic range in the southern United States. In Florida, this raptor occurs as an isolated population in the south-central region of the state. Changes in land use patterns throughout central Florida have resulted in this population becoming a subject of concern. This raptor has been documented to occur almost exclusively on privately owned cattle ranches in the south-central part of the state.

Currently, much of the caracara population is found on improved or semi-improved pastures on private cattle ranches (Layne 1996; Hipes *et al*. 2000). Available evidence suggests that the most serious threat to Florida's caracara population is loss or degradation of nesting and feeding habitat. Such loss is most commonly due to conversion of pasture and other grassland habitats and wetlands to citrus, sugar cane, other agriculture, and urban development.

Adult caracaras exhibit high site- and mate-fidelity; therefore, extensive loss of habitat within the home range, particularly of the nesting site itself, may cause the pair to abandon that home range, or at least the nesting site (Morrison 2001). Egg laying has been documented as early as September and as late as June; peak activity occurs from late December through February (Morrison 2001). Clutch size is 2-3 eggs, with an incubation period of 32-33 days (Layne 1996). Double brooding can occur if a nest is lost early in the season. Fledging occurs at 8 weeks. Young are dependent on parents for at least 2 months post-fledging, and may remain in the natal territory for up to 10 months. Most young in Florida leave natal territory after 4-6 months and form groups of up to 30 individuals.

The caracara is an opportunistic feeder, taking prey items such as insects, small reptiles, amphibians, and small mammals. Eggs and carrion are also included in the diet of caracaras. Foraging for food takes place in early morning and late afternoon. Caracaras often walk through pastures searching for prey items, particularly after disturbance such as mowing or plowing. Caracaras have also been observed feeding in recently burned areas. Hunting takes place from conspicuous perches or while in flight. Once prey is sighted, the caracara flies to the ground and walks up to prey item (Morrison 1996; Morrison 2001). The caracara is known to occur in the vicinity of HHD and Fisheating Creek (USFWS 2001). Caracara nests around Lake Okeechobee are shown in **Figure 3-6**.

Figure 3-6. Caracara nests and observations (from 1992-2014) around Lake Okeechobee

Eastern Indigo Snake: The threatened Eastern indigo snake is the largest native non-venomous snake in North America. It is an isolated subspecies occurring in southeastern Georgia and throughout peninsular Florida. The Eastern indigo snake prefers drier habitats, but may be found in a variety of habitats from xeric sandhills, to cabbage palm hammocks, to hydric

hardwood hammocks (Schaefer and Junkin 1990). The Eastern indigo snake needs relatively large areas of undeveloped land to maintain their population. In warm months, the Eastern indigo snake uses a variety of natural areas and has a large home range (Moler 1992; USFWS 1999). The Eastern indigo snake occupies larger home ranges in the summer than the winter. Information on snakes in Florida indicates adult males have home ranges as high as 224 hectares in the summer (Moler 1985). Because it is such a wide-ranging species, the Eastern indigo snake is especially vulnerable to habitat fragmentation that makes travel between suitable habitats difficult. The main reason for its decline is habitat loss due to development. Further, as habitats become fragmented by roads, the Eastern indigo snake becomes increasingly vulnerable to highway mortality as they travel through their large territories (Schaefer and Junkin 1990).

In south Florida, the Eastern indigo snake is thought to be widely distributed. Given their preference for upland habitats, the Eastern indigo snake is not commonly found in great numbers in wetland complexes, though they have been found in pinelands, tropical hardwood hammocks, and mangrove forests in extreme south Florida (Duellman and Schwartz 1958; Steiner *et al*. 1983). Within the range of the gopher tortoise, tortoise burrows are favorite refugia for indigo snakes. They are known to use burrows made by cotton rats and land crabs, hollows at bases of trees and stumps, ground litter, trash piles and rock piles lining banks of canals (USFWS 2007) and pipes or culverts.

Sexual maturity appears to occur around 3-4 years of age (Hallam *et al*. 1998). In North Florida, breeding occurs November to April with females laying 4-12 eggs in May-June (Moler 1992). Most hatching of eggs occurs August-September, with yearling activity peaking in April-May (USFWS 1999). Limited data on reproduction in south Florida indicate the breeding season is extended; breeding occurs from June-January, egg deposition is April to July, and hatchlings are born through early fall (USFWS 1999).

The Eastern indigo snake is known to occur in the vicinity of HHD (USFWS 2001) but have not been observed on the embankment during construction activities in CCZ A (cutoff wall) and culvert replacements.

Everglade Snail Kite: The snail kite is listed as an endangered species by both USFWS and the State of Florida. Although previously located in freshwater marshes over a considerable area of peninsular Florida, the range of the snail kite is now limited to several impoundments on the headwaters of the St. John's River, Kissimmee Chain of Lakes, southwest side of Lake Okeechobee, the eastern and southern portions of WCA-1, -2A and -3, the southern portion of WCA-2B, the western edge of WCA-3B, and the northern portion of Everglades National Park (USFWS 1996).

The snail kite inhabits relatively open freshwater marshes that support adequate populations of apple snail (*Pomacea* sp.), upon which this bird feeds almost exclusively. Favorable areas consist of extensive shallow, open water such as sloughs and flats, vegetated by sawgrass (*Cladium jamaicense*) and spike rush. The areas are often interspersed with tree islands or small groups of scattered shrubs and trees that serve as perching and nesting sites. The water level must be sufficiently stable to prevent loss of the food supply through drying out of the surface.

The snail kite is threatened primarily by habitat loss and destruction. Widespread drainage has permanently lowered the water table in some areas. This drainage permitted development in

areas that were once kite habitat. In addition to loss of habitat through drainage, large areas of marsh are heavily infested with water hyacinth that inhibits the snail kite's ability to see its prey (USFWS 1996).

Based on the description in the Federal Register (1977), snail kite critical habitat in Lake Okeechobee is located in the western parts of Glades and Hendry Counties, extending along the western shore to the east of the dike system and the undiked high ground at Fisheating Creek, and from the Hurricane Gate at Clewiston northward to the mouth of the Kissimmee River, including all the spike rush flats of Moonshine Bay, Monkey Box, and Observation Shoal, but excluding the open water north and west of the northern tip of Observation Shoal north of Monkey Box and east of Fisheating Bay. Critical habitat for the snail kite includes the southwest and western shore of Lake Okeechobee from Clewiston to the Kissimmee River, excluding deep open water (USFWS 1996). Critical Habitat does not exist within CCZ A (**Figure 3-7**).

Figure 3-7. Snail Kite Critical Habitat

Okeechobee Gourd: The endangered Okeechobee gourd is a climbing annual or perennial vine possessing heart to kidney-shaped leaf blades. The cream-colored flowers are bell-shaped and the light green gourd is globular or slightly oblong.

The Okeechobee gourd was locally common in the extensive pond apple forest that once grew south of Lake Okeechobee (Small 1922). Historically, the Okeechobee gourd was found on the southern shore of Lake Okeechobee in Palm Beach County and in the Everglades. Currently this species is limited to two disjunct populations, one along the St. Johns River in Volusia, Seminole and Lake Counties in northern Florida and a second around the shoreline of Lake Okeechobee in south Florida (USFWS 1999). The conversion of the pond apple forested swamps and marshes for agricultural purposes as well as water-level regulation within Lake Okeechobee have been the principal causes of the reduction in both range and number of the Okeechobee gourd.

West Indian Manatee: The West Indian manatee is a large, plant-eating aquatic mammal that can be found in the shallow coastal waters, rivers, and springs of Florida. The West Indian (Florida) manatee, *Trichechus manatus*, was listed as endangered throughout its range for both the Florida and Antillean subspecies (*T. manatus latirostris* and *T. manatus manatus*) in 1967 (32 FR 4061) and received Federal protection with the passage of the Endangered Species Act (ESA) in 1973. Because the manatee was designated as an endangered species prior to enactment of ESA, there was no formal listing package identifying threats to the species, as required by section 4(a)(1) of the Act.

Manatees can be found throughout the southeastern United States; however, within this region, they are at the northern limit of their range (Lefebvre *et al*. 2000). Because they are a subtropical species with little tolerance for cold, they remain near warm water sites in peninsular Florida during the winter. During periods of intense cold, manatees will remain at these sites and will tend to congregate in warm springs and outfall canals associated with electric generation facilities (Florida Power and Light 1989). During warm interludes, manatees move throughout the coastal waters, estuaries, bays, and rivers of both coasts of Florida and are usually found in small groups. During warmer months, manatees may disperse great distances. Manatees have been sighted as far north as Massachusetts and as far west as Texas and in all states in between (Rathbun *et al*. 1983; Fertl *et al*. 2005). Warm weather sightings are most common in Florida and coastal Georgia. They will once again return to warmer waters when the water temperature is too cold (Hartman 1979; Stith *et al*. 2006). Manatees live in freshwater, brackish, and marine habitats, and can move freely between salinity extremes. It can be found in both clear and muddy water. Water depths of at least three to seven feet (one to two meters) are preferred and flats and shallows are avoided unless adjacent to deeper water. The West Indian manatee is known to inhabit Lake Okeechobee (USFWS, 2001)

Over the past centuries, the principal sources of Florida manatee mortality have been opportunistic hunting by man and deaths associated with unusually cold winters. As of February 2015, the Florida Fish and Wildlife Conservation Commission (FWC) reported 54 Florida manatee deaths. Today, poaching is rare, but high mortality rates from human-related sources threaten the future of the species. The largest single mortality factor is collision with boats and barges. Manatees also are killed in flood gates and canal locks, by entanglement or ingestion of fishing gear, and through loss of habitat and pollution (Florida Power and Light 1989).

Wood Stork: The wood stork is a large, white, long-legged wading bird that relies upon shallow, freshwater wetlands for foraging. Black primary and secondary feathers, a black tail and a blackish, featherless neck distinguish the wood stork from other wading birds species. This species was federally listed as endangered under the ESA on February 28, 1984; however, its

status was upgraded to threatened in July 2014. No critical habitat has been designated for the wood stork.

In the United States, wood storks were historically known to nest in all coastal states from Texas to South Carolina (Wayne 1910; Bent 1926; Howell 1932; Oberholser 1938; Dusi and Dusi 1968; Cone and Hall 1970; Oberholser and Kincaid 1974). Dahl (1990) estimates these states lost about 38 million acres, or 45.6 percent, of their historic wetlands between the 1780s and the 1980s. However, it is important to note wetlands and wetland losses are not evenly distributed in the landscape. Hefner *et al*. (1994) estimated 55 percent of the 2.3 million acres of the wetlands lost in the southeastern United States between the mid-1970s and mid-1980s were located in the Gulf-Atlantic coastal flats. These wetlands were strongly preferred by wood storks as nesting habitat. Currently, wood stork nesting is known to occur in Florida, Georgia, South Carolina, and North Carolina from March to late May. However, in south Florida, wood storks lay eggs as early as October and fledge in February or March. Breeding colonies of wood storks are currently documented in all southern Florida counties except for Okeechobee County. Known nesting colonies are shown in **Figure 3-8**.

The wood stork population in the southeastern United States appears to be increasing. Preliminary population totals indicate that the wood stork population has reached its highest level since it was listed in 1984. Wood stork nesting was first documented in North Carolina in 2005 and wood storks have continued to nest in this state. This suggests that the northward expansion of wood stork nesting may be continuing.

The primary cause of the wood stork population decline in the United States is loss of wetland habitats or loss of wetland function resulting in reduced prey availability. Almost any shallow wetland depression where fish become concentrated, either through local reproduction or receding water levels, may be used as feeding habitat by the wood stork during some portion of the year; but only a small portion of the available wetlands support foraging conditions (high prey density and favorable vegetation structure) that wood storks need to maintain growing nestlings. Browder *et al*. (1976) and Browder (1978) documented the distribution and the total acreage of wetland types occurring south of Lake Okeechobee, Florida, for the period 1900 through 1973. They combined their data for habitat types known to be important foraging habitat for wood storks (cypress domes and strands, wet prairies, scrub cypress, freshwater marshes and sloughs, and saw grass marshes) and found these habitat types have been reduced by 35 percent since 1900.

Wood storks forage primarily within freshwater marsh and wet prairie vegetation types, but can be found in a wide variety of wetland types, as long as prey are available and the water is shallow and open enough to hunt successfully (Ogden *et al*. 1978; Browder 1984; Coulter 1987; Gawlik *et al*. 2004; Herring and Gawlik 2007). Calm water, about 5 to 25 centimeters in depth, and free of dense aquatic vegetation is ideal, however, wood storks have been observed foraging in ponds up to 40 centimeters in depth (Coulter and Bryan 1993; Gawlik 2002). Typical foraging sites include freshwater marshes, ponds, hardwood and cypress swamps, narrow tidal creeks or shallow tidal pools, and artificial wetlands such as stock ponds, shallow, seasonally flooded roadside or agricultural ditches, and managed impoundments (Coulter *et al*. 1999; Coulter and Bryan 1993; Herring and Gawlik 2007). During nesting, these areas must also be sufficiently close to the colony to allow wood storks to efficiently deliver prey to nestlings.

The wood stork is known to occasionally feed in the toe ditch wetlands of HHD. However, the principal habitat in the area for the wood stork is within the littoral zone of Lake Okeechobee (USFWS 2001).

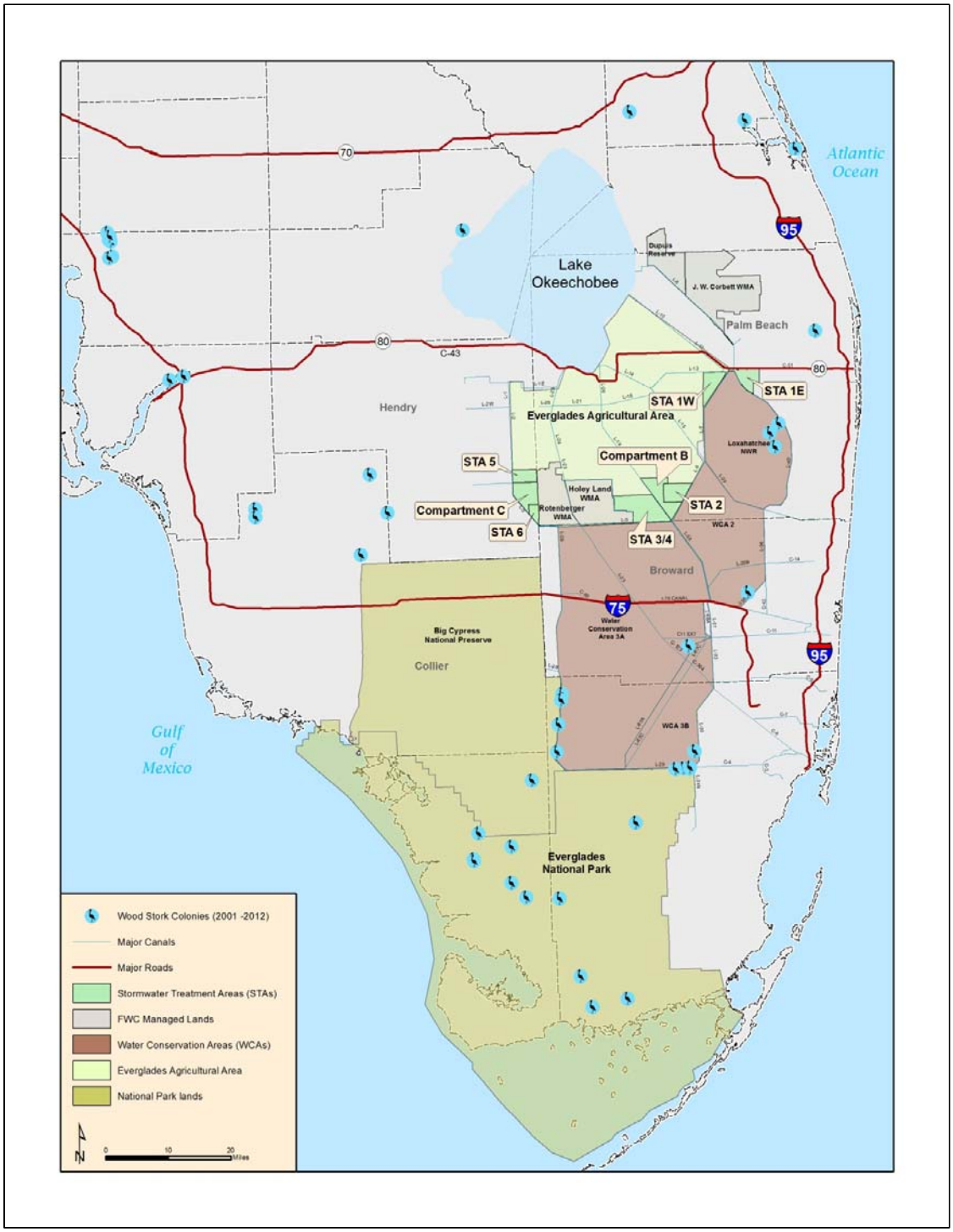

Figure 3-8. Wood stork colonies near HHD and Lake Okeechobee

Florida Panther: The endangered Florida panther, also known as cougar, mountain lion, and puma, was once the most widely distributed mammal (other than humans) in North and South

America, but it is now virtually exterminated in the eastern United States. Habitat loss has driven the subspecies known as the Florida panther into a small area, where the few remaining animals are highly inbred, causing such genetic flaws as heart defects and sterility. Recently, closely-related panthers from Texas were released in Florida and are successfully breeding with the Florida panthers. Increased genetic variation and protection of habitat may save the subspecies.

One of 30 cougar subspecies, the Florida panther is tawny brown on the back and pale gray underneath, with white flecks on the head, neck and shoulder. Preferred habitat consists of cypress swamps, pine and hardwood hammock forests. The main diet of the Florida panther consists of white-tailed deer, sometimes wild hog, rabbit, raccoon, armadillo and birds. Present population estimations range from 80 to 100 individuals. Florida panthers are solitary, territorial, and often travel at night. Males weigh up to 130 pounds and have a home range of up to 400 square miles; females reach 70 pounds with a range of 50 to 100 square miles. Florida panther primary, secondary, and dispersal zones are shown in **Figure 3-9**. Female panthers reach sexual maturity at about three years of age. Mating season is December through February; gestation lasts about 90 days and females bear two to six kittens, juveniles stay with their mother for about two years and females do not mate again until their young have dispersed. The main survival threats to the Florida panther include habitat loss due to human development and population growth, collision with vehicles, parasites, feline distemper, feline alicivirus (an upper respiratory infection), and other diseases (USFWS 1999).

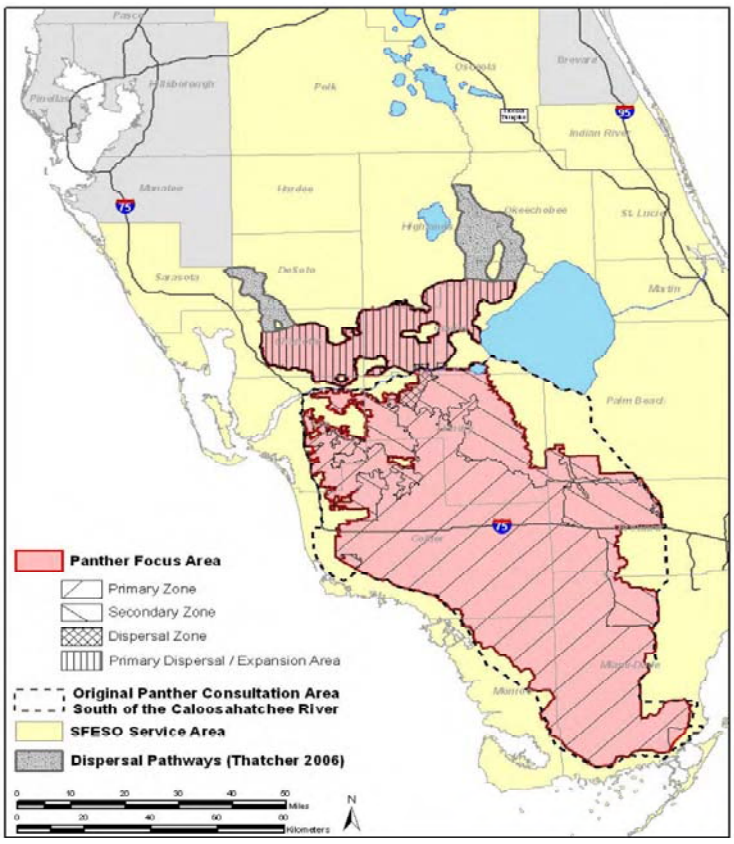

Figure 3-9. Florida panther zones in South Florida

Florida Bonneted Bat:
The Florida bonneted bat is Florida's largest bat, weighing approximately 1.1 to 2.0 ounces, with a 19 to 21 inch wingspan and a body length of 5.1 to 6.5 inches. The species has dark brown fur and large broad ears that join together and slant forward over the eyes. Relatively little is known regarding the ecology and habitat requirements of this species (FWS 2009). In general, bats will forage over ponds, streams and wetlands and require roosting habitat for daytime roosting, protection from predators and rearing of young (Marks and Marks 2008). Florida bonneted bats roost in tree cavities, rocky outcrops and dead palm fronds. In residential communities, the bats roost in Spanish tile roofs, but have also been found in attics, rock or brick chimneys and fireplaces of old buildings (NatureServe 2009). Colonies are small, with the largest reported as just a few dozen individuals. The bat is a nocturnal insectivore and relies upon echolocation to navigate and detect prey. Females give birth to a single pup from June through September (Scott 2004); however limited data suggests that a female may undergo a second birthing season possibly in January or February (FWS 2009).

The Florida bonneted bat is Florida's only endemic bat and is listed by FWC as a state listed endangered species and is a candidate species for Federal listing under the ESA. The range of this species is limited to southern Florida, although this species was encountered in 2008 in two locations within the Kissimmee River Wildlife Management Area north of Lake Okeechobee. Records indicate that it was once common in the 1950s and early 1960s near Coral Gables and Miami (Belwood 1992). The Florida bonneted bat has only been documented in 12 locations within Florida, including areas within Coral Gables, Homestead, Naples, Everglades City and North Fort Myers. Seven of the locations are under public ownership with the Florida bonneted bat found in discrete and specific areas within BCNP, Fakahatchee Strand Preserve State Park, Kissimmee River Wildlife Management Area, Babcock Ranch and Fred C. Babcock and Cecil M. Webb Wildlife Management Area (FWS 2009). Loss of suitable habitat is believed to be the primary cause of population declines. Other perceived threats include pesticide and herbicide use, which decrease populations of insects, the bats primary prey.

3.7.2 STATE LISTED SPECIES EXPECTED TO OCCUR WITHIN THE STUDY AREA

State listed species likely to use HHD for foraging and nesting include the gopher tortoise and burrowing owl. In addition, other state listed species known to occur in and around Lake Okeechobee include many wading bird species (see **Table 3-1**). Similar to the wood stork, state listed wading bird species are known to occasionally feed in the toe ditch wetlands of HHD. However, the principal habitat in the area for these wading birds is within the littoral zone of Lake Okeechobee (USFWS 2001).

Gopher tortoise:
The gopher tortoise, an upland dwelling reptile, is currently listed as a candidate species in the Eastern U.S. by the USFWS (USFWS 2013). The gopher tortoise shell can be from 5.9 to 14.6 inches long, is dark-brown to grayish-black terrestrial turtle, has large hind feet, and shovel-like forefeet (Ernest & Barbour, 1972). In Florida, individuals from coastal areas are generally darker than more central populations. Gopher tortoises excavate deep burrows that provide shelter from weather extremes and refuge from predation (Diemer, 1989). The gopher tortoise commonly occupies habitats with a well-drained sandy substrate, ample herbaceous vegetation for food, and sunlit areas for nesting (Landers, 1980; Landers, Garner, & McRae, 1980; Diemer, 1989). Diemer (1992) found that gopher tortoise activity increased in April, peaked in July, and remained high through October. Many vertebrate and invertebrates species are known to seek

refuge in gopher tortoise burrows, including protected species like the Eastern indigo snake (Franz, 1986; Jackson & Milstrey, 1989; Lips, 1991; Witz, Wilson, & Palmer, 1991).

Burrowing Owl:
The Florida burrowing owl occurs throughout the state although its distribution is considered local and spotty. The presence of burrowing owls is primarily dependent upon habitat. Humans have created new habitat for burrowing owls by clearing forests and draining wetlands. Burrowing owls inhabit open native prairies and cleared areas that offer short groundcover including pastures, agricultural fields, golf courses, airports, and vacant lots in residential areas. Historically, the burrowing owl occupied the prairies of central Florida. Recently, these populations have decreased because of disappearing habitat while populations in south Florida coastal areas have increased due to modification of habitat by humans.

Burrowing owls live as single breeding pairs or in loose colonies consisting of two or more families. Burrowing owls use burrows year-round; for roosting during the winter and for raising young during the breeding season (Feb - July). Florida's owls typically dig their own burrows but will use gopher tortoise or armadillo burrows. Burrows extend 4 to 8 feet underground and are lined with materials such as grass clippings, feathers, paper, and manure (www.myfwc.com 2014).

3.8 NOISE

Along HHD there are a number of existing sources currently contributing to the overall ambient noise level. The more predominant of these sources include: vehicular traffic on U.S. 27 and other local roadways, boat traffic along the rim canal, small industry (i.e., produce processing and distribution), urban activities in Moore Haven, Clewiston, Pahokee, Okeechobee, and Belle Glade, agricultural equipment (tractors, trucks, etc.) and pumping stations.

Rural areas typically have noise levels of 35-55 decibels. Sound levels along transportation arteries are typically in the range of 70 decibels. According to the FDOT State Environmental Management's Office, no known ambient noise monitoring has been conducted in the project area; consequently, no quantitative data on noise levels within the project area are available for analysis.

3.9 AIR QUALITY

The U.S. Environmental Protection Agency's (EPA) AirData database contains measurements of air pollutant concentrations for the entire United States. The measurements include both criteria air pollutants and hazardous air pollutants and are compared against the National Ambient Air Quality Standards (NAAQS) specified by the EPA. The AirData database was queried for air quality data between 2002 and 2006 (newest comparison information available) within the project area. The data show that Palm Beach County is currently in attainment for all six criteria air pollutants. The AirData database also provides annual summaries of Air Quality Index (AQI) values for counties or metropolitan areas. The AQI is an approximate indicator of overall air quality, because it takes into account all of the criteria air pollutants measured within a geographic area. The AQI summary values include both qualitative measures (i.e., days of the year having "good" air quality) and descriptive statistics (i.e., median AQI value). The AQI for Palm Beach County, the most developed portion of the study area indicates that air quality is generally good, with no periods when air quality is classified as unhealthy for sensitive groups.

Of the six criteria air pollutants, ozone and particulate matter of 2.5 millimeters or less are most likely to occur within this county. However, the air quality is within NAAQS limits for these parameters.

3.10 TRANSPORTATION AND UTILITIES

Transportation

U.S. Highways 27, 78, and 98 are major Federal roadways within the project area. There are numerous state highways and local roadways as well, many of which are at the toe of HHD landside embankment.

In 2000, the Governor's Hurricane Evacuation Task Force identified six limited access routes with a potential "need to reverse" to enhance regional evacuations. Though not a designated evacuation route, U.S. 27 would undoubtedly be used for hurricane evacuation if necessary, as it is the only east-west corridor in the area, however, traffic would likely be maintained in both directions. The use of U.S. 27 for hurricane evacuation requires that the highway's traffic flow not be impeded during the hurricane season.

In addition, the Okeechobee Water Way (OWW) provides economically important commerce between the eastern and western coasts of Florida. The waterway connects the Atlantic Intracoastal Waterway to the Gulf Intracoastal Waterway and is a congressionally authorized project, with depths and operations required for efficient navigation on the system. The authorized C&SF Project depths for Lake Okeechobee navigation are based on the lake being at water levels of elevation 12.56, feet, elevation 11.26 ft., NAVD88 or higher.

Utilities

As part of field surveys completed by the Corps staff since 2006, records were made of overhead utility and transmission lines in a portion of the project area. These surveys were completed in CCZ A between Belle Glade and Port Mayaca due to the recent cutoff wall construction as well as in the areas immediately adjacent to the culvert replacement projects as part of Planning, Engineering, and Design (PED). Additional surveys would be undertaken during PED for the DSMS in preparation for construction efforts.

3.11 SOCIOECONOMICS

Economic Activities In and Around Lake Okeechobee

The primary economic activity throughout the study area is agriculture. The EAA located directly south of Lake Okeechobee consists of more than 700,000 acres of productive agricultural land, the vast majority of which is under active sugarcane cultivation. In addition to sugarcane, crops grown near Lake Okeechobee include citrus and winter vegetables. Some pasture lands for livestock are also located near Lake Okeechobee.

A second major economic activity is recreation. Lake Okeechobee and its associated waterways, shoreline and the Lake Okeechobee Scenic Trail (LOST) on top of the dike provide a wide variety of water-based recreation activities for local residents and tourists, including fishing, boating, picnicking, sightseeing, camping, swimming, birding, hunting, biking, horse-back-riding, roller

blading, air boating and hiking. Recreation facilities associated with Lake Okeechobee include: 37 picnic sites, 309 individual camp sites, 4 playgrounds, 1 public swimming area, 1 marina with 41 boat slips, 29 boat ramps, 12 general recreation areas, and hundreds of acres open to hunting. Annual visitation based on a five-year average (2006-2010), amounts to 5,616,000 recreation visits per year. Data for specific recreation activities in these years were obtained from the Institute for Water Resources (IWR) "Lakes Gateway" website. According to the IWR 2010 *Lake Level Report*, it is estimated that visitors to Lake Okeechobee spend approximately $172 million per year, directly supporting more than 1,800 local jobs.

Additionally, Lake Okeechobee supports an active commercial and recreational fishing industry. This includes several different types of commercial fishing operations and landside support activities, such as marinas and wholesale and retail distribution facilities. There are commercial fisheries on Lake Okeechobee that harvest American alligator. Alligators are harvested from Lake Okeechobee to supplement the stock in alligator farming operations. Recreational fishing tournaments are held on the Lake multiple times a year.

The depth of Lake Okeechobee also makes commercial navigation on the Lake possible. There are two navigation routes in Lake Okeechobee, including Route 1 through the center of the Lake and Route 2 along the south shore of the Lake. Only Route 1 is fully maintained by the Corps at its authorized depth for commercial navigation. Petroleum products, including distillate fuel oil, residual fuel oil, and liquid natural gas, comprise the majority of tonnage shipped. Other commercial navigation includes fleets of day/dinner cruise vessels that operate from Pahokee during the tourist season. As stated in Section 3.10 above, the OWW allows passage of boats between the Atlantic Ocean and the Gulf of Mexico through Lake Okeechobee.

Other than agriculture, recreation, tourism, commercial fishing, and navigation, secondary economic activities include: services (banking, insurance, etc.) healthcare, education, and government activities. Examples of the above include: the Lakeside Medical Center, the Belle Glade Elementary School, Lake Shore Middle School, Glades Central High School, and the West Palm Beach County Technical Education Center.

Demographics

The majority of the study area is rural and agricultural. However, there are a number of towns located in close proximity to HHD (see **Figure 3-10** and **Table 3-2**). In most of these communities, homes, business and public buildings can be found within 100 feet of the dike. The largest of the communities is Belle Glade, located near the Hillsboro Canal with a population of more than 17,000 people.

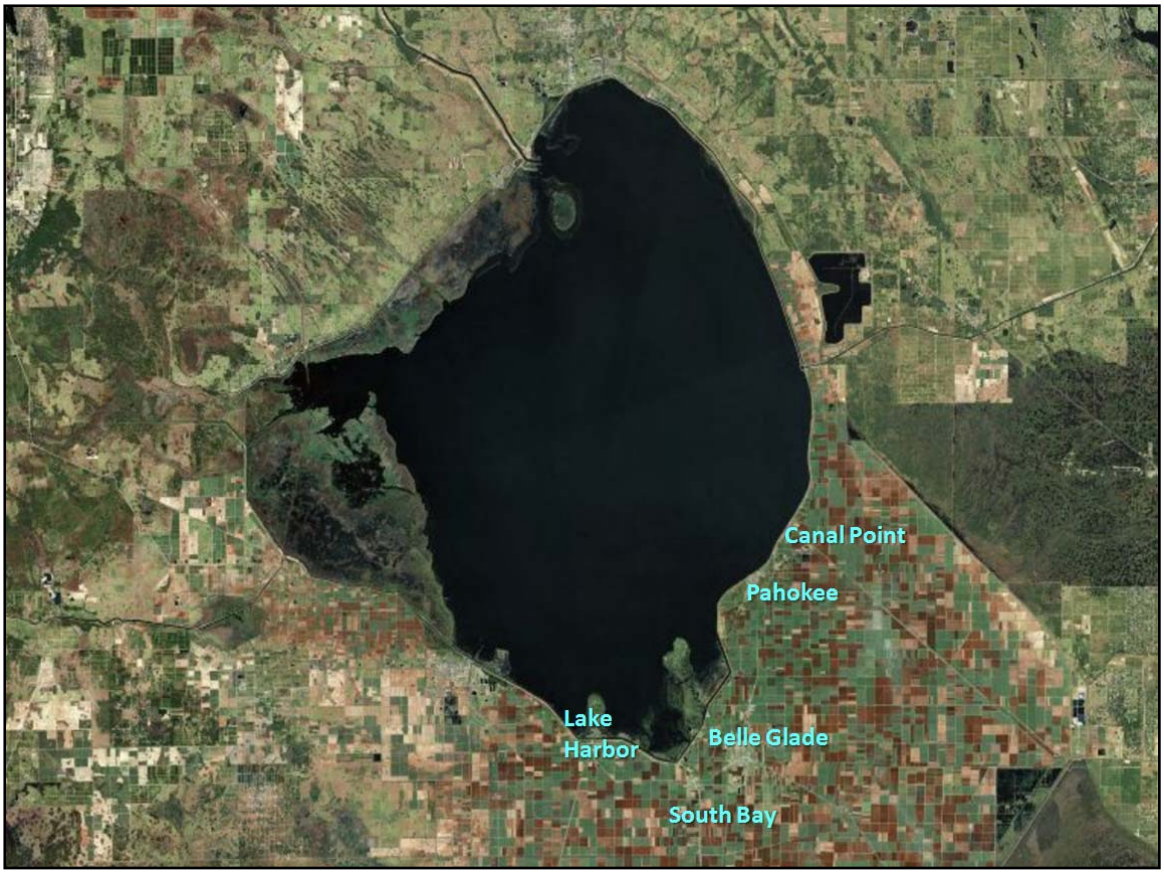

Figure 3-10. Major cities in study area considered in demographics study

Table 3-2. Major Population Centers Subject to Flooding in Palm Beach County*

City / Town	County	2010 Population
Pahokee	Palm Beach	5,649
Belle Glade	Palm Beach	17,467
South Bay	Palm Beach	4,876

*Please note: Population estimates in this table do not include very small towns (Canal Point and Lake Harbor) in the inundation zone or population at risk in unincorporated areas of Palm Beach county.

In general, these are diverse, relatively low income communities. Pahokee, Belle Glade, and South Bay all have median household incomes that are significantly less than the state average. They also have a relatively high proportion of households below the poverty line (**Table 3-3**). Palm Beach County has an above average median income, but the communities in the county near HHD (Pahokee, Belle Glade, and South Bay) have socioeconomic characteristics much more similar to Hendry and Glades counties.

Table 3-3. Economic characteristics of counties adjacent to Lake Okeechobee

	Median Household Income	Persons below poverty line
State of Florida	$46,956	16.3%
Pahokee	$27,353	29.2%
Belle Glade	$30,727	36.3%

South Bay	$26,944	36.7%

3.12 PUBLIC SAFETY

The HHD system is paramount to public safety. With six times more inflow capacity to the Lake versus outflow capacity, the dike provides flood risk management not only to towns immediately adjacent to the dike, but to a vast area south of the Lake. Due to signs of dike instability during high water stages in the Lake after 2004 and 2005 hurricanes in South Florida, the SFWMD contracted for an expert review panel of the stability and safety of HHD. Particular emphasis was placed on the structural stability of the dike with regard to seepage and water pressures within the embankment and erosion and potential overtopping concerns during large storm events. The technical review concluded that the current condition of HHD poses a grave and imminent danger to the people and the environment of South Florida (BCI 2006). Throughout the life of HHD and the recent Dam Safety Modification Study, the Corps has also conducted many modeling studies to determine the risk to the public if a breach were to occur.

The term "dike failure" implies a catastrophic breaching of some portion of HHD system. This situation would result in widespread flooding, as waters from Lake Okeechobee pass through the breach and onto adjacent lands. In the event of a total breach, significant effects to human life, agriculture, property, soils, vegetation, water resources, wildlife and habitat would result.

3.13 REAL ESTATE

The geographic area for the project is located in southern Florida encircling Lake Okeechobee. The lands encircling Lake Okeechobee known as HHD are approximately 143 miles of real estate that cross several counties in the State of Florida. The Federal government has approximately 83.6 miles of real estate interests to support construction and the operation and maintenance for HHD. The SFWMD has approximately 60.4 miles of real estate interests that can be certified to the Federal Government to support construction, operation and maintenance for HHD. Currently, there are a number of public roads providing access to HHD. Within the existing right of way around HHD there are sufficient lands to allow for staging areas for construction purposes. Lands adjoining HHD's real estate interest area are owned by the State of Florida, the SFWMD, local government, or private land owners.

3.14 HAZARDOUS, TOXIC AND RADIOACTIVE WASTES

Hazardous, toxic, and radioactive waste (HTRW) surveys have been conducted as part of EAs and EISs prepared as part of the prior HHD rehabilitation efforts. In December 2007, a HTRW survey of HHD was conducted using aerial imagery and a contaminated site and petroleum storage site database compiled by the FDEP. A visual survey was conducted to verify the findings of the desktop survey. The survey was updated in August 2009 for the Reach 1A Supplemental EIS (USACE 2010) and in February 2010 for L-D1 and L-D2 and January 2014 for additional embankments and remaining Federal right of way. The purpose of the additional surveys was to preliminarily identify potential contamination sites within 500 feet of HHD in remaining reach areas. The results of these surveys show that agricultural and rural residential development has resulted in the HTRW contamination in areas adjacent to HHD. A subsequent survey conducted as part of this EIS found 27 locations where petroleum has been stored or released within 100 ft of the embankment right of way. **Table 3-4** is a list of these sites by location, ownership, and status. Five of these sites have been closed and the storage tank or release has been removed.

Twelve of the petroleum storage sites are operational and require ongoing monitoring for releases. Seven sites have been closed and required no clean up action. Two sites require clean up actions. The S-12A and S-127 structures have contamination present such that clean up is required. As of August 2014, there is no plan to remediate the S-127 site. At the S-12A structure in CCZ A (portion with already constructed cutoff wall), the FDEP spill database shows that a release of approximately 4,000 gallons of diesel occurred in 1991. The Corps and FDEP are coordinating remediation actions to minimize disruption of construction during the replacement of the S-12A structure which would begin in early 2015.

Table 3-4. List of Petroleum Storage Facilities within 100 ft of HHD Right of way (Listed in clockwise order from Port Mayaca)

Site Name	Reach	Operator	Status
S-308 (Port Mayaca Lock)	1	Corps	Ongoing Monitoring
Pahokee Camp Ground	1	City of Pahokee	Ongoing Monitoring
S-12	1	East Shore W. Control District	Cleanup Completed
S-12A	1	New Hope Sugar Company	Cleanup Underway
Torry Island	1	SFWMD	Cleanup not required
S-2 Pump Station	1	SFWMD	Cleanup Completed
Maintenance Shop	3	South Bay	Cleanup not required
South Shore Pump Station	3	South Shore Drainage District	Ongoing Monitoring

3.15 RECREATIONAL RESOURCES

A variety of recreational resources are enjoyed year-round on Lake Okeechobee. Each year, more than six million people visit Lake Okeechobee and the OWW. The OWW allows transit between the Gulf of Mexico and the Atlantic Ocean using the Caloosahatchee River (west coast) through Lake Okeechobee and reaching the Atlantic Ocean through the St. Lucie River. Recreational resources in the project area include LOST, fishing and boating opportunities, campgrounds, hunting, and park areas.

Lake Okeechobee Scenic Trail

The LOST circles the entire lake on top of the dike. The LOST is located on lands held in fee simple title by the State of Florida. This is a mostly double-track and/or paved trail that offers recreation opportunities for hiking, biking, horseback riding, and fishing around the lake. Pedestrians and mountain bikers are able to access the trail from many locations in towns adjacent to HHD. Informational signs along the roadways direct recreational users to the LOST access points as well as wildlife viewing locations. Equestrians are able to access the trail from various locations in the project area as well.

Fishing and Boating

Lake Okeechobee offers a wide-range of fishing opportunities. There are more than 60 species of fish in the lake, the most sought-after game fish being largemouth bass, catfish, and black crappie. Fishing tournaments are regularly held throughout the year. Boats can access the lake through navigation locks and boat ramps. In CCZ A and B, public boat ramps are available for use at the Moore Haven Lock and Dam, Alvin Ward Park, Lake Observation Point (Bare Beach),

the Clewiston Recreation Area, and the South Bay Boat Ramp. Additional fishing and boating resource in the area includes Uncle Joe's Fish Camp at Liberty Point, which dates back to the 1940s.

3.16 AESTHETIC RESOURCES

There are many public access points to view Lake Okeechobee from the elevated vantage point of the length of HHD crest. In addition, the LOST runs atop HHD around the entire Lake, totaling approximately 110 miles.

The HHD crest affords panoramic views of the flat agricultural (mostly sugarcane) fields and rim canal to the south, southwest, and southeast of CCZ A from Belle Glade to Lake Harbor.

Rita Island dominates the landscape when looking northward from the dike in Lake Harbor. Also in this area is John Stretch Park, which is located adjacent to the south side of the dike near the Miami Canal. This park includes a pond, picnic areas, restrooms, a large grassy field, an outdoor basketball court and a boat ramp. There are several parks adjacent to HHD. These parks include resources such as ponds, picnic areas, restrooms, grassy fields, boat ramps, and other amenities.

3.17 CULTURAL RESOURCES

The earliest widely accepted date of occupation by aboriginal inhabitants of Florida dates from around 12,000 years ago. This earliest cultural period, called the Paleo-Indian period, lasted until about 7500 B.C. Few Paleo-Indian archeological sites are recorded in Florida, and none are identified by the Florida Master Site Files (FMSF) near HHD. During the Archaic period (ca. 7500 B.C.-ca. 500 B.C.), a wider range of resources was exploited and may have led to a more sedentary existence. Few Archaic period archeological sites are recorded in south Florida. Known sites are clustered along the Atlantic and Gulf coasts and inland waterways. No Archaic period sites are located near the dike, as recorded in the Florida Master Site File (FMSF). In the Okeechobee Basin, the Belle Glades culture sequence (ca. 500 B.C.- A.D. 1500) follows the Archaic. Black earth middens, low sand mounds and circular and linear earthworks are Belle Glade site types located near HHD, as recorded in the FMSF.

During the early historic period, beginning with the first Spanish colonial period (1513 - 1763), the Calusa, a native Tribe, inhabited southern Florida. Their population was decimated by European-introduced diseases, warfare, enslavement, and migration out of Florida. The Miccosukee and the Seminole migrated into Florida in the 18th and 19th centuries from Georgia and Alabama. Throughout the mid-1800s, the U.S. relentlessly pursued a policy of Indian removal in Florida, and the Seminole, resisting removal, eventually established themselves in the Everglades, Big Cypress Swamp, and the Ten Thousand Islands. Several important battles of the Seminole Wars occurred around Lake Okeechobee including the largest and bloodiest battle of the Second Seminole War, the Battle of Okeechobee on Christmas Day in 1837. The Okeechobee Battlefield site is located at the north end of Lake Okeechobee and is a National Historic Landmark site. Other Seminole battle and habitation sites, predominantly on tree islands, are located near HHD.

American settlement around Lake Okeechobee began in earnest in the late 19th century when efforts to drain and reclaim the Everglades began. Agriculture began in the Everglades, south of Lake Okeechobee after drainage projects of the 1906-1927 era. By 1921, there were 16

settlements on or near Lake Okeechobee, with a total estimated population of 2,000. By the 1940's, a number of homes had been built in this area forming historic districts potentially eligible for listing on the National Register of Historic Places.

A review of the FMSF lists both prehistoric and historic archeological sites located in the near vicinity of HHD. Prehistoric Native American sites consist of middens, mounds and earthworks. Historic sites include buildings, shipwrecks, canoes, cemeteries, and an early 19th century Fort McRae. An historic dugout canoe and artifacts associated with early military exploration of the Everglades was discovered in the lake near the entrance of the St. Lucie River. Early 20th century homes and historic districts have been recorded along the shoreline of Lake Okeechobee. The HHD, including various locks, dams, buildings and hurricane gates associated with it, is eligible for listing on the National Register and is recorded by the FMSF in each county surrounding Lake Okeechobee (HN179, GL421, PB2028, OB244).

Consultation with the State Historic Preservation Office and other interested parties was initiated September 1, 2010. Consultation with the State Historic Preservation Office and other interested parties would continue through completion of the project.

3.18 TRIBAL RESOURCES

No portion of the proposed project in CCZ A from Belle Glade to Lake Harbor exists within or adjacent to any Native American properties.

4.0 ENVIRONMENTAL EFFECTS

This assessment of environmental effects evaluates the anticipated environmental effects within CCZ A from Belle Glade to Lake Harbor of the alternative actions described in Section 2.0. The following includes anticipated changes to the existing environment including direct, indirect, and cumulative effects. The effects described in this section are based on the assumption that all real estate required to implement these alternatives have been acquired or use is permitted via formal land agreements and that LORS 2008 is in place.

4.1 GEOLOGY

No impact to the geology of CCZ A is expected to occur from either the Preferred Alternative or the No Action Alternative. The geology of HHD would remain as documented within Section 3.1.

4.1.1 SOILS

4.1.1.1 NO ACTION ALTERNATIVE

The soils in the Lake Okeechobee region and comprising HHD would remain as documented in Section 3.2. Subsidence of adjacent agricultural lands is expected to continue as a result of oxidation of soils.

4.1.1.2 ALTERNATIVES 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

The cutoff wall or internal drainage system would temporarily disturb soils within the construction footprint, but would not have a long term affect on soils in the area.

4.2 LAND USE

4.2.1 NO ACTION ALTERNATIVE

For the past 100 years, the primary economic activity in this area has been agriculture. In all likelihood this would continue to be the case for the foreseeable future. As discussed previously, ecosystem restoration projects are projected to be completed in areas south of the HHD project area which would preclude additional development and/or agricultural practices. The type of event that would spur dramatic change in land use would be, for example, the discovery of major mineral or natural gas reserves. Such an event is not expected to occur in south Florida.

One major constraint to future development in the No Action Alternative is the Federal Emergency Management Agency (FEMA) flood insurance program. Currently, this Federal program offers flood insurance to the communities near Lake Okeechobee. However, without rehabilitation of HHD, flood insurance rates are expected to increase significantly in the future. Development and population growth pressures in South Florida will be offset by the increased cost of developing and maintaining property in the areas near HHD. For all of the above reasons, major changes in land use are not expected in the No Action Alternative. The area is expected to remain rural and agricultural in the foreseeable future.

4.2.2 ALTERNATIVE 2A: CUTOFF WALL

The cutoff wall could have an indirect effect on land use in the area because current seepage of groundwater availability may be reduced. In general, the agricultural operators in the vicinity of the HHD levee are artificially draining the soils to remove excess seepage water that can flood

the root zone and reduce productivity. When seepage is not sufficient for the needs of the crops, supplemental water is provided via the drainage/water supply canals and ditches. The installation of a cutoff wall may reduce excess seepage during some periods which may improve cultivation conditions by reducing excessive root zone moisture. During periods when in sufficient seepage is available, agricultural operators can use surface water supplies to supplement. Thus, a cutoff wall may permanently alter seepage flows but this would moderately impact current land use since other water sources are available.

4.2.3 ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

This alternative would not affect existing land use in the area because it would occur adjacent to the embankment within the toe ditch, thus not affecting land use in the surrounding areas.

4.3 HYDROLOGY & HYDRAULICS

4.3.1 NO ACTION ALTERNATIVE

The hydrology and hydraulics of the Lake Okeechobee watershed as described in Section 3.4 of the report will remain essentially unchanged. However, there are a few notable exceptions. Land use (**Figure 4-1**) for the northern part of the watershed (i.e., Kissimmee Upper Basin) will become increasingly developed as the Orlando-Kissimmee urban epicenter continues to sprawl. Land use in the southern part of the watershed will remain primarily as undeveloped and conservation lands. Existing population centers in the southern part of the watershed and along the perimeter of Lake Okeechobee are predicted to expand outward such that development along the entire rim of the lake will be nearly continuous.

Figure 4-1. Florida Land Use (2005 and Projected 2060)

Increased development can often lead to increased surface water runoff due to natural pervious areas being converted to impervious surfaces (i.e., parking lots, roadways, roofs). However, increased regulation of stormwater by permitting agencies has tempered the potential for increased surface water runoff by requiring new developments and infrastructure projects to both detain a certain volume of runoff on their property and to ensure that post-project peak discharge rates do not exceed pre-project discharge rates. As long as these regulations are

adhered to and enforced, there would be no measureable changes to hydrology within CCZ A with the No Action Alternative.

4.3.2 ALTERNATIVE 2A: CUTOFF WALL

Based on the results of previous groundwater flow modeling and ongoing groundwater quality monitoring since installation of the cutoff wall north of Zone A, the cutoff wall has been effective in preventing seepage through the embankment, which will change the groundwater flow quantity and path below the toe of the cutoff wall. Results of the calibrated flow model indicate that the cutoff wall has an effect on reducing groundwater flow in the highly permeable geologic zone beneath the dike and increasing flow in the underlying surficial aquifers, particularly within 1,000 feet landward of the HHD. The effects on the quantity of groundwater flow were increased during the unlikely and unrealistic scenario of a high lake stage coupled with high landside groundwater pumping for water supply. The effect of the cutoff wall on changes to groundwater flow are predicted to be less during the more likely critical scenario of a low lake stage coupled with high groundwater pumping (i.e., during a drought condition). Also, agricultural interests in the landside areas are more likely to use surface water from adjacent project canals that are supplied by releases from Lake Okeechobee - this is an economical source of irrigation water compared to the pumping costs necessary to extract groundwater.

Results of the calibrated transport models indicate that the cutoff wall does appear to have a potential impact on the connate water in the vicinity of the HHD in cases where the downward tip of the cutoff wall extends close to or into the layer of connate water. The models indicate that areas along the eastern portions of HHD are more susceptible to salinity migration than those in the south and west (i.e., including Zone A) since the trapped connate water in the reach between Belle Glade and Port Mayaca is encountered at shallower depths and at higher salinity concentrations than the connate water seen in areas to the south. Long-term 50-year transport simulations indicate that the extent of this impact is highly variable and is affected by lake stage, EAA water levels, proximity to canals and other hydro-geologic factors. However, these same simulations suggest that the potential for salinity movement beneath Zone A will be essentially mitigated if the shallow cut-off wall configuration is selected.

The USACE and the U.S. Geological Survey have been monitoring groundwater quality in the near vicinity of the HHD from Port Mayaca, southward through Canal Point, Pahokee, Belle Glade and westward to near Clewiston since 2011. Since no cutoff wall has been installed in Zone A, the groundwater wells in those areas have been providing baseline data that could eventually be used in an impacts analysis when a wall of other seepage management measure is installed in the future. Monitoring will continue at the existing well locations (groundwater wells PB-1821 and PB-1822) in Zone A, with a new well proposed north of South Bay near the juncture of US27 / HHD and additional monitoring wells are proposed at other locations between Port Mayaca and Clewiston farther from the dike to determine if salinity effects are migrating landward.

4.3.3 ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

There would be minor impacts to surface water quantity due to the system's ability to collect additional internal seepage and transfer it to the interior toe ditch as increased surface water flow. Conveyance improvements to the interior toe ditches would mitigate for any potential stage increases, therefore no negative long term effects are expected.

4.4 WATER QUALITY

4.4.1 SURFACE WATER QUALITY

4.4.1.1 NO ACTION ALTERNATIVE

Regardless of the condition of the dike, the highly eutrophic condition of Lake Okeechobee is expected to persist for the foreseeable future due to past and future nutrient loading. If a breach in the dike were to occur, mud sediments from Lake Okeechobee would be transported to nearby waterways, resulting in localized elevated total suspended solids and phosphorus concentrations. It is possible that in the event of a levee breach, additional pollution and land contamination would result from flooding of residential and commercial properties where petroleum, industrial, and household products are commonly present. No significant effects outside the immediate area of the breach would be expected. Without dike rehabilitation, the Lake would be operated at lower stages, which may improve water quality conditions somewhat in the littoral zone of the Lake. However, because of the dike's current lack of structural integrity, high-volume freshwater releases are required during flood events to avoid the possibility of a breach in the dike. These releases affect the lake's two primary outlets: the St. Lucie and Caloosahatchee Rivers. Water released from the Lake contains elevated nutrient concentrations that degrade the water quality of the St. Lucie and Caloosahatchee Rivers and Estuaries.

4.4.1.2 ALTERNATIVE 2A: CUTOFF WALL

The proposed cutoff wall is not expected to result in a change to shallow surficial groundwater quality that seeps into the levee toe ditch. There may be some decrease in seepage water flow into the levee toe ditch; however, this is not expected to alter surface water quality in the toe ditch which is likely to continue to reflect contributions from both the lake and from the adjacent farms.

4.4.1.3 ALTERNATIVE 3: INTERAL DRAINAGE SYSTEM

The installation of the internal drainage collector system would likely result in an increase in toe ditch surface water flow. The quality of this additional surface water is expected to be similar to the existing toe ditch quality.

4.4.2 GROUNDWATER QUALITY

4.4.2.1 NO ACTION ALTERNATIVE

Increased population in the vicinity of HHD is likely to result in greater use of FAS as a source of potable water where its quality supports such use. The FAS groundwater quality conditions are not expected to change in the vicinity of HHD in the foreseeable future. Along the perimeter of Lake Okeechobee from Port Mayaca southwest to Moore Haven, the quality of the shallow surficial aquifer groundwater is expected to become more saline due to overdraining of EAA lands which results in the continued upward flow of relatively deep saline connate groundwater into the upper freshwater portion of the surficial aquifer. Preliminary measurements in CCZ A between Belle Glade and Port Mayaca indicate the possibility that this upward flow of connate groundwater has accelerated in some areas directly adjacent to the cutoff wall already installed.

4.4.2.2 ALTERNATIVE 2A: CUTOFF WALL

Under certain conditions, the installation of a cutoff wall in CCZ A between Belle Glade and Lake Harbor could potentially alter groundwater quality. The proposed cutoff wall depth is to -7 to -

25 feet NAVD88. The PB-1822 groundwater monitoring well shows low chlorides (< 100 mg/L) at a depth of approximately -40 feet NAVD88. Two miles to the northeast, the PB-1920 well shows low chlorides to a depth of -70 feet NAVD88. Under the reasonable assumption that groundwater quality conditions at these two wells are representative for the project area, it is reasonable to assume that a cutoff wall placed to a depth of -7 feet NAVD88 will not affect groundwater quality based on observed groundwater quality impacts in CCZ A (between Belle Glade and Port Mayaca) where a cutoff wall has been installed. If the maximum cutoff wall depth is no greater than -25 feet NAVD88, no significant impacts to groundwater quality are expected within CCZ A. At a depth of -40 feet NAVD88, a cutoff wall is not likely to adversely impact shallow groundwater quality in the vicinity of the PB-1920 well at Hooker Highway; however, in the vicinity of PB-1822 (Lake Harbor) it might impact shallow groundwater quality by reducing seepage from the lake into the upper layers of the surficial aquifer These conclusions are based on observations at the PB-1815, PB-1816, PB-1818, PB1819, and PB1820 wells which show that a cutoff wall placed 15 to 20 feet or more above the chloride transition zone does not significantly alter shallow groundwater quality while those areas where the cutoff wall is deeper or nearer the cutoff wall tip elevation do show changed groundwater quality.

4.4.2.3 ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

The installation of internal drainage features in CCZ A between Belle Glade and Lake Harbor would not alter groundwater quality since the internal drainage feature would be placed to a shallow depth well above the shallowest depth at which connate groundwater is found. The concentrations of nutrients in the collected water should reflect the existing concentrations in the Lake and in the toe ditch.

4.5 WETLANDS

4.5.1 NO ACTION ALTERNATIVE

The No Action Alternative is expected to continue to provide conditions for which the same wetlands as described in Section 3 (Existing Conditions), would occur. Low quality wetlands would continue to occur in the toe ditches around HHD providing foraging opportunities for wildlife. High quality wetland habitat would be expected to continue to exist in the littoral zone currently on the western side of Lake Okeechobee with the same lake stages as are provided for by the LORS 2008. Lake Okeechobee would continue to hydraulically feed wetlands beyond HHD, providing freshwater for the Florida Everglades to the south and for the WCAs in Palm Beach and Broward Counties.

4.5.2 ALTERNATIVE 2A: CUTOFF WALL

Impacts to wetlands would not be expected as a result of this alternative. Proposed structural features would be constructed on or within HHD embankment and construction/staging areas would be located in upland or previously disturbed areas.

4.5.3 ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

Impacts to wetlands would be temporary due to construction within the toe ditches. An ACB is proposed to line the toe ditch, which could prohibit growth of the same wetland vegetation that is currently within the toe ditch, however, the current quality of wetlands within the toe ditches is typically low and is periodically mowed for maintenance. Assessment of the toe ditch wetlands would be performed prior to construction of the internal drainage system, however, mitigation would not be expected due to the low quality of wetlands within the toe ditches.

4.6 THREATENED AND ENDANGERED SPECIES

The Corps is seeking concurrence from the USFWS on the Corps' species effect determinations documented in this EA through the 60 day NEPA public review period. Please see **Table 3-1** for No Effect determinations. Species described further in Section 3 and below are expected and have been known to be within the project area.

4.6.1 NO ACTION ALTERNATIVE

The habitat surrounding HHD is expected to remain similar to that described in Section 3.6 and the same species are expected to remain in the area. The No Action Alternative would not have adverse effects on protected species unless the embankment were to fail; species and habitats directly on the dike and within the path of the water due to a breach would be negatively impacted, and snail kite critical habitat could be negatively impacted due to lower lake levels.

Further, if a breach were to occur along the southern portions of HHD, flooding would occur within the EAA and further south, through the WCAs and eventually to Everglades National Park. There are many state and federally protected species within south Florida that would be negatively impacted due to a loss of habitat from flooding resulting from a breach of HHD.

Audubon's Crested Caracara:
Caracara typically nest in open fields and ranch lands. If the dike were to breach, ranch lands could be flooded and negative impacts to trees available for nesting could occur. Changes in land use are expected to have a greater impact on caracara than a potential breach in HHD. Therefore, the No Action Alternative is not expected to affect caracara.

Eastern Indigo Snake:
The Eastern indigo snake is expected to continue to have the potential to be found on the HHD embankment with the No Action Alternative. If the embankment were to breach, snakes within the breach zone could be swept away due to the loss of water from Lake Okeechobee.

Everglade Snail Kite:
The Everglade snail kite is expected to continue to be present within the littoral zone of Lake Okeechobee with the No Action Alternative. If the dike were to breach, negative effects to the littoral zone could occur due to loss of water within Lake Okeechobee. Nests and young would be negatively impacted as a result of rapid recession rates, along with potential for nest collapse. The littoral zone in Lake Okeechobee is designated as critical habitat for the Everglade snail kite and loss of this habitat would have a negative effect on the snail kite. Further, it is safe to assume the LORS would be updated during the planning horizon. Changes to 2008 LORS have the potential to affect snail kite and these effects would be analyzed in a NEPA document for an updated regulation schedule for Lake Okeechobee.

Okeechobee Gourd:
The Okeechobee gourd is expected to be found along or adjacent to HHD with the No Action Alternative. If the dike were to breach, plants along and within the breach zone would be swept away due to the flow of water from Lake Okeechobee.

West Indian Manatee:
The West Indian manatee is expected to continue to inhabit Lake Okeechobee and the canals adjacent to HHD with the No Action Alternative. If the dike were to breach and a manatee was in the water near the breach zone, it could be caught up in the water flow and potentially be stranded on dry land.

Wood Stork:
The wood stork is expected to continue to nest adjacent to HHD and forage within Lake Okeechobee with the No Action Alternative. If the dike were to beach, temporary impacts to foraging due to loss of water within the littoral zone are expected.

Florida Panther:
The Florida panther is expected to inhabit the lands surrounding HHD with the No Action Alternative. The Florida panther continues to extend its territory northward from the southwest Florida region as its population grows. A breach of HHD could negatively impact the panther if it is caught in the flood waters resulting from a breach.

Florida Bonneted Bat:
The bonneted bat is expected to continue to inhabit lands north and west of Lake Okeechobee with the No Action Alternative. A breach of the dike could negatively impact foraging habitat of the bat within Lake Okeechobee or adjacent wetlands depending on the location of the breach and flow path of the water.

4.6.1.1 STATE LISTED SPECIES EXPECTED TO OCCUR WITHIN THE STUDY AREA

With the No Action Alternative, the gopher tortoise, burrowing owl, and many wading birds are likely to continue to use HHD for foraging and nesting. The wading bird species that could potentially occur in the project area are listed in Table 3-1 and would have similar effects as listed for the wood stork.

Gopher tortoise:
The gopher tortoise is expected to continue to be found on HHD embankment with the No Action Alternative. If the dike were to breach, tortoises within the breach zone could be swept away due to the loss of water from Lake Okeechobee.

Burrowing Owl:
The burrowing owl is expected to continue to be found on the HHD embankment with the No Action Alternative. If the dike were to breach, owls within the breach zone could be swept away due to the loss of water from Lake Okeechobee.

4.6.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

Species would not be directly affected by construction of a cut off wall or internal drainage system; however, there is potential for disturbance to the species during construction activities. The action may produce noise above ambient levels, however, mufflers and sound dampening equipment would be required during construction, along with preconstruction surveys.

Audubon's Crested Caracara:
Audubon's crested caracara has not been documented to nest near the project area (**Figure 3-6**), however, it is possible that nests could be found in other areas adjacent to HHD. Caracara would not be directly affected by construction of a cut off wall or internal drainage system; however, there is potential for disturbance to the species during construction activities. Prior to the initiation of construction and during construction at each site surveys would be conducted to determine if caracaras are present in the project area. If caracaras are encountered within the project area, standard protection measures to include monitoring would be implemented. Monitoring for caracara during the nesting season (January through April) and adaptive management action activities within 985-4920 feet of the nests would be implemented to ensure the action does not increase noise above ambient levels within nest protection areas of active caracara nests. If the project area is within a 4920 foot buffer of the consultation area, this would also be surveyed for nests because of the established buffer zone. The action may produce noise above ambient levels, however, mufflers and sound dampening equipment would be required during construction.

Conclusion: The cutoff wall and internal drainage system alternatives may affect, but are not likely to adversely affect, Audubon's crested caracara.

Eastern Indigo Snake:
Eastern indigo snakes may be found along the embankment of HHD, however, throughout previous HHD project phases (i.e. culverts, cutoff wall), none have been encountered. Eastern indigo snakes would not be directly affected by construction of a cut off wall or internal drainage system; however, there is potential for disturbance to the species during construction activities. If Eastern indigo snakes are encountered within the project area, standard protection measures to include monitoring would be implemented. Preconstruction surveys would be completed in the project area, monitors would be on site during all phases of construction and construction crews would be educated on identifying the indigo snake and the precautions to take to prevent impacts to Eastern indigo snake. In addition, onsite gopher tortoise burrows would be protected to the extent possible to provide snake habitat during construction. The habitat that would be temporarily impacted by construction would be seeded or replaced by sod and is expected to recover within a few months of project completion.

Conclusion: The cutoff wall and internal drainage system alternatives may affect, but are not likely to adversely affect, the Eastern indigo snake.

Everglade Snail Kite:
Impacts to snail kite resulting from implementation of a cutoff wall would be minimal, and restricted to the immediate area of construction. Construction activities would be limited to the levee itself and the landward side of the levee where this species does not forage extensively. Aside from temporal disturbance cause by the operation of heavy equipment, no impact is expected lakeside. Due to the relatively narrow littoral zone in CCZ A between Belle Glade and Lake Harbor, this area provides minimal snail kite foraging habitat, therefore effects to the species are unlikely. Snail kite critical habitat exists northwest of CCZ A (**Figure 3-7**); however, this area would not be impacted by the cutoff wall construction or the internal drainage system. Preconstruction surveys would be completed prior to the initiation of construction activities. Monitoring for snail kites during the nesting season (January through May) and adaptively managing action activities within 500-1,640 feet of active snail kite nests would ensure the

action not increase noise above ambient levels within nest protection areas of active snail kite nests.

Conclusion: The cutoff wall construction or the internal drainage system may affect, but is not likely to adversely affect Everglade snail kite. No effect from either alternative is expected to occur to snail kite critical habitat.

Okeechobee Gourd:
The Okeechobee gourd is known to occur on HHD. Preconstruction surveys would be completed to locate any plants within the construction footprint. If plants are found, the USFWS would be contacted to determine an appropriate course of action for removal and relocation of plants. Flagging would be placed around the gourd for additional protection from pedestrian traffic if plants are sighted outside of, but adjacent to, the construction area.

Conclusion: The cutoff wall and internal drainage system alternatives may affect, but are not likely to adversely affect, Okeechobee Gourd.

West Indian Manatee:
Manatees are known to occur in Lake Okeechobee. West Indian manatee would not be directly affected by construction of a cut off wall or internal drainage system; however, there is potential for disturbance to the species during construction activities. Both alternatives would produce noise above ambient levels. Preconstruction surveys would be completed to ensure that no manatees are harmed or harassed during construction. No manatee critical habitat is adjacent or near the dike.

Conclusion: The cutoff wall and internal drainage system alternatives may affect, but are not likely to adversely affect, West Indian manatee.

Wood stork:
Wood storks are known to forage within the toe ditch and nest near the proposed project area. Wood storks have not been observed nesting near the proposed project areas (**Figure 3-8**). Wood storks would not be directly affected by construction of a cut off wall or internal drainage system; however, there is potential for disturbance to the species during construction activities. The action may produce noise above ambient levels, however, mufflers and sound dampening equipment would be required during construction. Project activities near foraging wood storks could temporarily displace individuals to additional, abundant foraging areas available within the littoral zone of Lake Okeechobee during construction. Construction activity should take place no closer than 500-1500 feet to active colonies. Temporary displacement is not expected to adversely affect wood stork foraging opportunities or efficiency.

Conclusion: The cutoff wall and internal drainage system alternatives may affect, but are not likely to adversely affect, wood stork.

Florida Panther:
Florida panthers are thought to use HHD for traversing from one habitat to the next. Construction of the cutoff wall could temporarily impact panthers to traverse the embankment within CCZ A between Belle Glade and Lake Harbor because the embankment would not be passable during construction. Since this would be temporary in nature, it is not expected to

harm or harass the species. Construction of the internal drainage system would not occur on the crest of the embankment and would therefore not likely impede Florida panther from traversing along the embankment.

Conclusion: The cutoff wall and internal drainage system alternatives may affect, but are not likely to adversely affect, Florida panther.

The Corps has determined that the preferred alternative (Alternative 2A) is not likely to adversely affect any of the federally listed species or its critical habitat known to occur within the project area. Informal consultation with the USFWS began March 10, 2015, with a request for concurrence on our species effect determinations as documented in this EA during the public comment period. The Corps has requested written concurrence on our species effects determinations contained within this EA by letter request dated March 10, 2015 (Appendix B). All monitoring and survey of endangered species onsite would be conducted in accordance with survey protocol from the USFWS South Florida Ecological Services Office and website. (http://www.fws.gov/verobeach/index.cfm?Method=programs&NavProgramCategoryID=3&programID=73&ProgramCategoryID=3)

4.6.3 STATE LISTED SPECIES EXPECTED TO OCCUR WITHIN THE STUDY AREA

While small foraging or nesting areas utilized by the gopher tortoise and burrowing owl may be temporarily affected by this project, each alternative is not likely to adversely affect protected state species and have a less than significant effect on protected state species. Preconstruction surveys for gopher tortoise and burrowing owls would occur, with appropriate relocation permits obtained by the contractor if necessary. Overall, negligible adverse impacts are anticipated to State listed species as a result of this project.

4.7 NOISE

4.7.1 NO ACTION ALTERNATIVE

Noise sources and levels are not expected to change as a result of the No Action Alternative and thus would remain as described within Section 3.6.)

4.7.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

Heavy machinery associated with construction of these alternatives could result in minor nuisance noise. Although sound levels could exceed 70 decibels in proximity to construction activities, attenuation with distance from the construction site would reduce the noise. Contractors would be required to meet local noise ordinances and place noise dampening equipment on trucks and machinery as needed. The effect of noise during construction would be localized and insignificant.

4.8 AIR QUALITY

The EPA published *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule* in the 30 November 1993, Federal Register (40 Code of Federal Regulations [CFR] Parts 6, 51, and 93). This publication provides implementing guidance to document the Clean Air Act Conformity Determination requirements. Subsequent to the 1993 rule, EPA collected information from other Federal agencies on how to maintain the same environmental protections while streamlining the general conformity implementation process.

This information was used to develop and propose regions to the general conformity rule. After soliciting comments on these revisions from the public, EPA issued a final rule revision on April 5, 2010.

4.8.1 NO ACTION ALTERNATIVE

The No Action Alternative would not affect air quality. Relative to the existing condition, it is expected traffic and other practices affecting air quality would increase marginally in most areas of the study area due to moderate population growth.

4.8.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

The Proposed Action Alternatives would occur within Palm Beach county which is currently in attainment with the National Ambient Air Quality Standards (NAAQS) for all six criteria air quality criteria pollutants as designated under Section 110(a)(1) of the CAA; sulfur oxides (SOx), volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon dioxide (CO), particulate matter 10 (PM10), and PM2.5.

Short term impacts from mobile sources and other construction equipment associated with Alternatives would not significantly impact air quality. No air quality permits are expected to be required regardless of the selected alternative. The project is located within an attainment area and therefore the EPA's general conformity rule to implement Section 176(c) of the Clean Air Act does not apply and a conformity statement should not be required. The criteria pollutants, including ozone, are estimated herein for planning purposes only.

Direct emissions from the construction of the all alternatives would be confined to exhaust emissions of construction equipment (excavators, dump trucks etc.). Pollutants considered in this air quality assessment are sulfur oxides (SOx), volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon dioxide (CO), PM10, and PM2.5. Volatile organic compounds, sulfur oxides, and nitrogen oxides are precursors to ozone generation. These criteria pollutants are generated by the activities (e.g., construction and mobile source operations) associated with the all alternatives.

Emission rates for each applicable criteria pollutant CO, NOx, PM2.5, PM10, SOx, and VOCs were estimated based on probable fuel use by year and calculated in tons per year. Fuel use was estimated as a percentage of total construction costs. Estimated fuel use factors ranging from 8 to 10 percent of the total construction costs were derived for excavation and hauling activities (FHWA 1980). Excavators and dump trucks were assumed to be the primary sources of air pollutants with each burning 50 percent of the estimated annual fuel requirement. The construction activities were assumed to be conducted over a period of 5 years with the work load spread evenly over this period. Each sources' (engine) emission rate was derived from the following formula:

$$\textit{Emission Rate (tons/hr)} = \textit{Engine Horsepower} \times \textit{Engine Load Factor} \times \textit{Emission Factor}$$

The construction equipment's engine load factors were estimated from the USEPA technical report *Compilation of Air Emission Factors, AP-42, 5th Edition, USEPA 1995,* incorporating each source's suggested operating mode. Potential criteria air pollutant quantities emitted were calculated based on the following formula:

Emission Amount (tons/year) = Emission Rate (tons/hour) × Working Hours (hours/year)

A high and low estimate for the number of construction hours was used to account for uncertainty in fuel consumption rates and is detailed in the tables below. Since air quality criteria are evaluated on a county by county or air-shed basis, pollutant emissions were estimated for each affected county separately using the following formula:

Pollutant (tons/year) = Emissions (tons/year) × (Embankment Miles per County / (Total Embankment Miles)

A general conformity applicability determination is made by estimating the total of direct and indirect VOC and NOX emissions caused by the construction of the project. Prescribed *de minimis* levels of 100 tons per year per pollutant were compared for planning purposes only. Projects that would result in discharges below the *de minimis* level are exempt from further consultation and development of mitigation plans for reducing emissions.

Table 4-1. Low estimate of emissions resulting from the construction of the proposed action alterative by county

County	Pollutant Emissions (tons/year)					
	CO	VOC	NOx	Sox	PM10	PM2.5
Palm Beach	12.6	2.2	28.0	3.9	2.1	2.0

Table 4-2. High estimate of emissions resulting from the construction of the proposed action alternative by county

County	Pollutant Emissions (tons/year)					
	CO	VOC	NOx	Sox	PM10	PM2.5
Palm Beach	15.8	2.8	35.0	4.9	2.6	2.5

Notes: [1] The Proposed Action Alternative is located within a designated attainment area and a formal conformity determination is not required, emissions for the proposed alternative were compared to the de minimis values of criteria pollutants for reference only.

Carbon Dioxide Emissions: Carbon dioxide (CO_2) is emitted in a number of ways. It is emitted naturally through the carbon cycle and through human activities like the burning of fossil fuels. Natural sources of CO_2 occur within the carbon cycle where billions of tons of atmospheric CO_2 are removed from the atmosphere by oceans and growing plants, also known as 'sinks,' and are emitted back into the atmosphere annually through natural processes also known as 'sources.' When in balance, the total carbon dioxide emissions and removals from the entire carbon cycle are roughly equal. Since the Industrial Revolution in the 1700s, human activities, such as the burning of oil, coal, and gas, and deforestation have increased CO_2 concentrations in the atmosphere. In 2005, global atmospheric concentrations of CO_2 were 35% higher than they were before the Industrial Revolution. As an important greenhouse gas, CO_2 emissions were also calculated for planning purposes. A high and low estimate for the number of construction hours was used to account for uncertainty in project duration and is detailed in **Table 4-3** and **Table 4-4** below.

Table 4-3. Low estimate of CO_2 emissions resulting from the construction of the proposed action alternative

County	Emissions CO_2 (tons/yr)
Palm Beach	2,664

Table 4-4. High estimate of CO_2 emissions resulting from the construction of the proposed action alternative

County	Emissions CO_2 (tons/yr)
Palm Beach	3,330

CO_2 emissions from a gallon of diesel = 2,778 grams x 0.99 x (44/12) = 10,084 grams = 10.1 kg/gallon = 22.2 pounds/gallon

Note: These calculations and the supporting data have associated variation and uncertainty. EPA may use other values in certain circumstances, and in some cases it may be appropriate to use a range of values.

The temporary increases in the project-related emissions are relatively minor compared to the existing point, nonpoint, and mobile source emissions in each of the counties. Effects from project emissions and other construction equipment associated with the Preferred Alternative would not significantly affect air quality within the local air-sheds. Short-term loadings of internal-combustion engine exhaust gasses are expected to be negligible, not posing a threat to workers, local populations, or the area's attainment status. As mobile and temporary sources, no air quality permit would be required for this project. Because the project is located within a designated attainment area, USEPA's general conformity rule Section 176 (c) of the CAA does not apply and a Conformity Determination Analysis would not be required.

4.9 TRANSPORTATION AND UTILITIES

4.9.1 NO ACTION ALTERNATIVE

Impacts to highways and the railroad resulting from a major failure of HHD would be extensive. Structures nearest the breach could be destroyed. Further, travelers or freight on the roads or railroad could be endangered. Even moderate flooding from a low velocity breach would likely cause road closures and traffic delays. A major failure of HHD could destroy utility infrastructure located on lands adjacent to HHD. The destruction of utility infrastructure would cause communication and power outages.

4.9.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

Both Alternatives would require use of the crest of the dike for several months. None of the transportation or utilities described in Section 3 would be negatively affected as a result of implementation of either Alternative 2A or 3.

4.10 SOCIOECONOMICS

4.10.1 NO ACTION ALTERNATIVE

The general economic characteristics of the study area are not expected to change significantly in the foreseeable future. The economic engine of the region is agriculture and to a lesser extent tourism associated with Lake Okeechobee. This is unlikely to change dramatically over time. If a breach were to occur, thousands of acres of productive farmland (almost entirely

sugarcane) would be inundated and likely out of production for several growing seasons. CCZ A has the greatest potential for economic damage. Relative to the other zones, urban damages would be highest for this Consequence Zone. Agricultural damages are also the largest for Consequence Zones A due to the close proximity to the EAA.

Palm Beach County is projected to grow much more quickly (31.3% over 30 years) than the other counties in which HHD is located. The projection is primarily due to expected growth in the coastal areas of the County. The communities near HHD in Palm Beach County (South Bay, Belle Glade, and Pahokee) are not likely to grow as quickly as coastal cities such as West Palm Beach, Jupiter, and Boca Raton. Therefore, the projected growth rate for Palm Beach County is probably overly aggressive for the communities near HHD. In comparison, the growth rate for Hendry County (9.5% over 30 years) is a more realistic projection for communities near HHD. Hendry County is adjacent to Palm Beach County, and its demographic characteristics are much more similar to Belle Glade and Pahokee than those cities are to West Palm Beach.

4.10.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

The structural alternatives (2A and 3) achieve risk reduction by reducing the probability of failure of the embankment rather than reducing the consequences of failure. The reduction in probability of failure results in reduced economic risk. Minor RED impacts of implementing structural measures (including a cutoff wall) could include:

- Temporary business interruption costs
- Temporary road closures and/or traffic re-rerouting
- Temporary and minor disruptions to recreational activities (including tourism)

Though these impacts have not been quantified, they are expected to be minimal in the life of HHD. Temporary recreational closures would most likely result in a maximum duration of one year. During construction, some positive RED benefits are expected to accrue, such as temporary employment increases due to construction jobs.

4.11 PUBLIC SAFETY

4.11.1 NO ACTION ALTERNATIVE

Though major demographic and land-use changes are not expected, the No Action Alternative assumes that reasonable risk management measures would be taken by state and local authorities regardless of Federal action. This is an important assumption, because it ensures that the Federal government would not be making large investments based on poor local planning and preparedness. In other words, risk reduction should be shared responsibility, not an exclusively Federal objective.

In the case of HHD, several specific local planning changes are assumed in the future condition.

- Improved public warning systems (Reverse 911 and warning sirens)
- Improved Public Awareness and education (more effective pre-breach evacuation warnings)
- Improved evacuation planning (more efficient evacuation plans during breach scenarios)

All of the above changes result in more effective public evacuation in the case of a dike breach. The earliest year in which these measures could realistically be implemented by local authorities

is 2020, which was a key assumption of the consequences analysis within the DSMS, which was used to assess the risk for CCZ A between Belle Glade and Lake Harbor.

4.11.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

The cutoff wall or the internal drainage feature would be built in an effort to improve public safety adjacent to HHD and provide the least cost solutions supporting the overall risk reduction strategy for HHD.

4.12 REAL ESTATE

4.12.1 NO ACTION ALTERNATIVE

A breach in HHD would result in widespread flooding of real estate parcels and the structures located on them as waters from Lake Okeechobee pass through the breach and onto adjacent lands. The risk to residents located within the vicinity of HHD is substantial. Inundation mapping and flood stage hydrographs indicate that flooding to nearby real estate would be severe. Agricultural real estate would also suffer damage, possibly for several growing seasons.

4.12.2 ALTERNATIVE 2A: CUTOFF WALL

The project area for the cutoff wall is primarily within the limits of the Federal right-of-way. Those project lands required for staging areas outside of the Federal right-of-way are owned by SFWMD. There is an inactive utility line in CCZ A between Belle Glade and Lake Harbor that would be impacted during construction. Also, there would be temporary impacts to a boat ramp during construction. Access to the project areas would be off of State roads onto public access roads that lead to the HHD.

4.12.3 ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

The project area for the internal drainage system is primarily within the limits of the Federal right-of-way and on lands owned by the State of Florida, SFWMD, Palm Beach County, and private land owners. There would be temporary impacts to a boat ramp during construction. Access to the project are/as would be off of State roads onto public access roads that lead to the HHD.

4.13 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

4.13.1 NO ACTION ALTERNATIVE

If there is a breach in the dike, some lands adjacent to the dike breach may potentially be subject to HTRW contamination as a result of the dispersion of otherwise contained pollutants on private lands. Whether these impacts are short or long-term depends upon what types of commercial and industrial materials become dispersed as a result of a breach. The location of the breach would affect the number of properties affected in this way. A breach in a section of the levee adjacent to agricultural lands would have limited risk for HTRW contamination. A breach in a semi-urban area would have a greater risk of such impacts. Based on past flooding events in other areas of the country, most areas affected by a breach will not have long-term impacts associated with dispersion of HTRW materials. There is the possibility that limited areas directly adjacent to commercial or industrial facilities that experience breach flows could potentially have long-term HTRW impacts.

4.13.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

Construction of a cutoff wall or an internal drainage system are not expected to result in the discovery or generation of HTRW materials. The construction location is not located adjacent to typical sources of HTRW materials such as fuel storage tanks and there have been no land use activities in the immediate vicinity of CCZ A between Belle Glade and Lake Harbor that would have potentially resulted in the deposition of HTRW substances. Construction debris would be disposed of in a licensed/authorized landfill or otherwise processed at a recycling facility. In the unlikely event that HTRW materials are discovered during the construction process, the contractor would be instructed to rectify the situation in accordance with applicable state/Federal laws.

4.14 RECREATIONAL RESOURCES

4.14.1 NO ACTION ALTERNATIVE

It is expected that Lake Okeechobee and HHD would continue to host a variety of recreational activities year-round as described in Section 3.15. The OWW should continue to allow transit between the Gulf of Mexico and the Atlantic Ocean using the Caloosahatchee River (west coast) through Lake Okeechobee and reaching the Atlantic Ocean through the St. Lucie River. Recreational resources in the project area include the LOST, fishing and boating opportunities, campgrounds, hunting, and park areas. Additional opportunities for recreation could be developed by local entities as population numbers increase in the future.

4.14.2 ALTERNATIVES 2: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

Temporary impacts to recreational resources within the project area would result from both alternatives as described below. Camping facilities, parks, and recreational areas adjacent to HHD may be closed temporarily during construction.

4.14.2.1 LAKE OKEECHOBEE SCENIC TRAIL

Portions of LOST would be temporarily closed during construction activities. However, there are multiple access points to enter and exit the LOST and closings would be coordinated with the FDEP and the Office of Greenways and Trails.

4.14.2.2 FISHING AND BOATING

There are numerous boat ramps along HHD. Boat ramps would be temporarily closed during construction activities at those locations. However, construction would be implemented in phases, so not all boat ramps would be closed at the same time. Public coordination through FDEP and appropriate agencies would occur for notification of when boat ramps would be closed. Boat ramps not in the immediate area of construction would be open for use. Boat access to Lake Okeechobee via structures would be temporarily closed during construction activities at those locations.

4.15 AESTHETIC RESOURCES

4.15.1 NO ACTION ALTERNATIVE

With the No Action Alternative, the HHD crest would continue to provide panoramic views of the flat agricultural (mostly sugarcane) fields and rim canal to the south, southwest, and southeast CCZ A between Belle Glade and Lake Harbor. Along CCZ A between Belle Glade and

Lake Harbor, submerged vegetation is abundant along the lakeshore. There are several parks adjacent to HHD. These parks include resources such as ponds, picnic areas, restrooms, grassy fields, boat ramps, and other amenities.

4.15.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE

Short term temporary impacts to aesthetic resources within the project area would result from construction activities and the movement of construction equipment through lands designated for staging and construction. The LOST, used for viewing Lake Okeechobee from the top of HHD, would be temporarily closed during construction. Grassy side slopes of HHD would be affected during construction, but would be reseeded or sod would be used to replace grassy vegetation upon completion of construction activities.

4.16 CULTURAL RESOURCES

4.16.1 NO ACTION ALTERNATIVE

A review of the FMSF lists over 25 recorded historic structures in the vicinity of CCZ A in South Bay and Lake Harbor and NRHP Resource Groups such as the HHD, FEC Railroad Corridor, North New River Canal, the Miami Canal and the Lake Harbor Historic District. In the event of a failure in HHD, there would be a potential for adverse effects to both recorded and yet unrecorded historic properties outside of the CCZ A between Belle Glade and Lake Harbor APE, including HHD itself which is eligible for listing on the NRHP. Depending on the location and severity of the breach, impacts from flooding, erosion, and standing water could cause varying adverse effects to historic properties within the vicinity of CCZ A.

4.16.2 ALTERNATIVE 2A: CUTOFF WALL

In 2005, the Corps determined the cutoff wall for Reach 1, constructed within the Federal right of way, would not affect the National Register of Historic Places (NRHP) eligibility of the dike and the Florida State Historic Preservation Officer (SHPO) concurred (DHR No. 2007-2429B, April, 2005, and DHR No. 2007-9225, July, 2007). The Corps has determined no historic properties affected by the construction of the cutoff wall in CCZ A within the Federal right of way and is expected to attain SHPO concurrence.

4.16.3 ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

The Corps has determined that impacts associated with expanding or constructing a drainage system within the Federal right of way in CCZ A of HHD would not affect the eligibility for listing HHD on the NRHP. No historic properties have been located outside the Federal right of way within the APE of CCZ A. The Corps has determined no historic properties affected by the construction of the drainage system in CCZ A. Coordination with the Florida SHPO and appropriate federally recognized tribes is ongoing.

4.17 TRIBAL RESOURCES

4.17.1 NO ACTION ALTERNATIVE

No portion of the proposed project in CCZ A between Belle Glade and Lake Harbor exists within or adjacent to any Native American properties.

4.17.2 ALTERNATIVE 2A: CUTOFF WALL & ALTERNATIVE 3: INTERNAL DRAINAGE SYSTEM

No portion of the proposed project in CCZ A between Belle Glade and Lake Harbor exists within or adjacent to any Native American properties.

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Preferred Alternative (Alternative 2a: Cutoff Wall) would require irreversible and irretrievable commitments of resources including the expenditure of funding, energy, labor, and materials. The project would not cause the permanent removal or consumption of any renewable resources. However, implementation would commit lands and resources for reconstruction of the cutoff wall, fill material, and other project features.

4.19 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Both the Preferred Alternative (Alternative 2a) and the No Action Alternative have unavoidable adverse direct and indirect environmental effects that are discussed in this document. The No Action Alternative could have significant adverse effects on public health and safety. Due to signs of HHD instability during high water stages in Lake Okeechobee after the 2004 and 2005 hurricanes in South Florida, SFWMD contracted for an expert review panel of the stability and safety of HHD. Particular emphasis was placed on the structural stability of HHD with regard to seepage and water pressures within the embankment and erosion and potential overtopping concerns during large storm events. The technical review concluded that the current condition of HHD poses an imminent danger to the people and the environment of south Florida.

As discussed under each resource subsection above, adverse effects associated with implementing the Preferred Alternative are expected to insignificant. Many effects, such as recreation and noise levels would be temporary during construction activities.

4.20 COMPATIBILITY WITH FEDERAL, STATE, AND LOCAL OBJECTIVES

The objective of this project is rehabilitation of HHD. State and local agencies concur with the Federal objective and current operations would be maintained throughout the duration of construction as justified on a temporary basis to prevent significant hardships.

4.21 CONFLICTS AND CONTROVERSY

There are no known conflicts or controversy regarding rehabilitation of HHD. However, indirectly related to the rehabilitation efforts is the potential for revisions to LORS 2008 for operations of Lake Okeechobee. The LORS Final EIS (USACE 2007) stated the following with respect to rehabilitation of HHD:

> *A new regulation schedule is required to respond to high lake levels that have resulted in integrity issues and concerns with the Herbert Hoover Dike (HHD), high volume releases to the estuaries, and impacts to Lake Okeechobee littoral zones. Hence, a new Lake Okeechobee Regulation Schedule was developed. LORS is intended to be an interim schedule. Because this schedule was formulated to address specific conditions existing in 2007, as circumstances change, the Corps will adapt its Lake Okeechobee operations accordingly. The Corps expects to operate under LORS until the earlier of (1) implementation of a new Lake Okeechobee schedule as a component of the system-wide operating plan to*

> *accommodate the Comprehensive Everglades Restoration Plan (CERP Band 1 projects) and the State of Florida's fast track Acceler8 projects, or (2) completion of HHD seepage berm construction or equivalent dike repairs for Reaches 1, 2 and 3. The occurrence of the above referenced events are expected to allow for greater operational flexibility, potentially including higher lake levels for increased water storage. In balancing the multiple project purposes, the Corps, will timely shift from the interim LORS to a new schedule with the intent to complete any necessary schedule modifications or deviations concurrent with completion of (1) or (2).*

This EA does not propose to change 2008 LORS as part of the rehabilitation efforts.

4.22 CUMULATIVE EFFECTS

Cumulative effects are defined in 40 CFR 1508.7 as those effects that result from:

> *...the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

Cumulative environmental effects for the proposed project were assessed in accordance with guidance provided by the President's Council on Environmental Quality (CEQ).

Table 4-5 summarizes the impact of such cumulative actions by identifying the past, present, and reasonably foreseeable future condition of the various resources which are directly or indirectly impacted by the proposed action and its alternatives. Also illustrated is the future condition with any reasonable alternatives (or range of alternatives).

Table 4-5. Summary of cumulative effects

Resources/Issues	Past Actions & Their Effects	Preferred Alternative Effects	Other Present and Reasonably Foreseeable Future Actions & Their Effects	Cumulative Effects of All Actions
Water Quality	The C&SF Project has greatly altered the natural hydrology of the project area. Construction methods implemented in the 1930s and 1940s created a dike unable to withstand lake stages higher than 18 feet (NGVD). As a result, rapid, high-volume releases of lake water are required during storm events that stress downstream estuaries.	There are minor anticipated changes to water quality.	To avoid stressing the structural integrity of HHD, the current operating schedule for Lake Okeechobee (LORS) provides for lower lake levels as compared with the prior water control plan (WSE), which helps to avoid adverse impacts to water quality in downstream estuaries. Changes to LORS 2008 would be considered once triggers described in the LORS EIS have been met. CERP projects and other initiatives would improve the water quality in Lake Okeechobee, reduce undesirable freshwater releases from the lake, and reduce watershed runoff to the estuaries.	Rehabilitation of HHD, along with other current and reasonably foreseeable actions, would improve water quality in Lake Okeechobee and provide improvements in water deliveries to the coastal estuaries.

Resources/Issues	Past Actions & Their Effects	Preferred Alternative Effects	Other Present and Reasonably Foreseeable Future Actions & Their Effects	Cumulative Effects of All Actions
Protected Species	Fish and wildlife habitat has been greatly altered as a result of the C&SF Project. Most land has been converted to agricultural, commercial, or residential use.	Minor temporary impacts to foraging and loafing habitat are expected from the maintenance operations for construction of the Preferred Alternative.	An abundance of alternative foraging and loafing habitats are available around the Lake and on Kreamer and Torry islands.	HHD rehabilitation as a whole is not expected to significantly affect protected species. Coordination with USFWS is ongoing.
Wetlands	The C&SF Project has greatly altered the natural hydrology of the project area. Most land has been converted to agricultural, commercial, or residential use. Compensatory mitigation for implementing rehabilitation features in L-D9 has already been completed. The Corps removed 57 acres of the invasive species melaleuca adjacent to L-D1.	The Preferred Alternative would not have impacts to wetlands during construction.	Rehabilitation measures for the entire HHD are currently being studied under the DSMS. Temporary impacts during construction could occur if work occurs within the toe ditch. New drainage swales in other reaches may be constructed, creating wetland habitat	Overall, there would probably be a net increase in wetland functionality in the area as a result of new drainage swale wetland habitat and functional gains in surrounding wetlands as a result of mitigation efforts of future rehabilitation efforts.

Resources/Issues	Past Actions & Their Effects	Preferred Alternative Effects	Other Present and Reasonably Foreseeable Future Actions & Their Effects	Cumulative Effects of All Actions
Public Safety	Construction methods implemented in the 1930s and 1940s created a dike unable to withstand lake stages higher than 18 feet (NGVD). As a result, communities near HHD are at risk during storm events.	The Preferred Alternative would aid in improving public safety for the communities that exist near the dike. The plan is designed to prevent seepage and piping within CCZ A between Belle Glade and Lake Harbor.	To avoid stressing the structural integrity of HHD, the current operating schedule for the lake (LORS) operates a lower lake regulation schedule than the previous operating schedule (WSE). CERP projects designed to store excess water would help managers to operate the lake at lower stages during flood events. .	Rehabilitation of HHD, along with other current and reasonably foreseeable actions, would significantly improve the safety of the communities adjacent to the dike.

5.0 ENVIRONMENTAL COMPLIANCE

The Preferred Alternative was considered in relation to compliance with Federal environmental review and consultation requirements. The following paragraphs document compliance with applicable Federal statutes, Executive Orders, and policies.

CLEAN AIR ACT OF 1972, AS AMENDED
This project would be coordinated with FDEP, Air Quality Division, and EPA. No air quality permits are required, and no permanent sources of air emissions are part of the Preferred Alternative. The Corps would be in compliance with Sections 176 and 309 of the Clean Air Act.

CLEAN WATER ACT OF 1972, AS AMENDED
Full compliance would be achieved with issuance of Water Quality Certification under Clean Water Act Section 401 from the State of Florida. A Section 404(b) (1) Evaluation was not prepared because no wetlands would be affected by implementation of the Preferred Alternative. Section 402(b) (2) requires that a NPDES construction activities permit be acquired for construction activities that disturb more than five acres of land. The FDEP issues these permits within 48 hours of application. This permit will be acquired prior to initiation of construction.

COASTAL BARRIER RESOURCES ACT
This Act is not applicable. The study area is not in a designated Coastal Barrier Resources Act unit.

COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED
A Federal Consistency Determination has been prepared in accordance with the provisions of 15 CFR 930 and is located in Appendix A. The state has not yet concurred with this determination. Upon review and concurrence of this EA and Federal Consistency Determination, the project would be in compliance.

ENDANGERED SPECIES ACT OF 1973, AS AMENDED
The Corps is engaging in informal consultation with USFWS through review of this EA and request for concurrence on species determination herein. If warranted by U.S. Fish and Wildlife Service, the Corps would initiate formal consultation as appropriate. The proposed action would be in compliance with the Endangered Species Act through formal or informal consultation.

ESTUARY PROTECTION ACT OF 1968
No estuaries under the Act are in the project area. However, failure of the dike, a possibility under the No Action Alternative, could severely adversely impact the Caloosahatchee River and St. Lucie Estuaries downstream of Lake Okeechobee as large deliveries of freshwater dramatically change the estuarine water chemistry and associated environmental resources. The project is in compliance.

FARMLAND PROTECTION POLICY ACT OF 1981
Prime or unique farmland exists within the project footprint. Coordination with NRCS was completed April 23, 2014 for the DSMS which included the footprint for this project and is included in Appendix B. The NRCS noted there are delineations of Important Farmland soils

(Farmland of Unique Importance) within the scope of this project. Farmland would not be adversely affected, and the project is in compliance.

FEDERAL WATER PROJECT RECREATION ACT OF 1965, AS AMENDED

The effects of the Preferred Alternative on outdoor recreation have been considered and are presented in EA. Impacts to LOST located on top of the dike would require close coordination with FDOT and FDEP. The LOST would be closed during construction. Closing of LOST would be coordinated with the FDEP and the Office of Greenways and Trails. Boat ramps and access to lake side recreational resources would also be closed temporarily during construction.

FISH AND WILDLIFE COORDINATION ACT OF 1958, AS AMENDED

This project has been coordinated with USFWS. A Fish and Wildlife Coordination Act Report (FWCAR) for Reach 1 was submitted by the FWS in 2001 for the 2000 HHD MRR. Supplemental FWCARs for HHD rehabilitation in Reach 1 were provided by USFWS in 2003 (Reach 1), 2004 (Reach 1A) and 2006 (Reach 1A). The USFWS provided a Draft FWCAR for HHD DSMS July 14, 2014, which included similar proposed rehabilitation measures as for this CCZ A between Belle Glade and Lake Harbor. In response to the requirements of this Act, the Corps has and would continue to maintain coordination with the USFWS and the FWC during all stages of planning and implementation of this project. Coordination is ongoing and this project is compliance with this Act.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The National Oceanic and Atmospheric Administration, National Marine Fisheries Service works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. Essential fish habitat has been described for approximately 1,000 managed species to date. There is no essential fish habitat, as designated by National Marine Fisheries Service, within the project area. This Act is not applicable.

MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED

This Act is not applicable. Ocean disposal of dredged material is not proposed as a part of HHD DSMS.

MIGRATORY BIRD TREATY ACT AND MIGRATORY BIRD CONSERVATION ACT

Under the Migratory Bird Treaty Act, project construction shall not destroy migratory birds, their active nests, their eggs, or their hatchlings. Monitoring for such would be required by the construction contractor. A buffer zone around active nests or nestling activity would be required during the nesting season. No migratory birds (other than those described under threatened and endangered species) would be affected by project activities; however, the bald eagle has been identified in the project area. The toe ditch wetlands provide low quality habitat foraging habitat for migratory birds. Alternative and higher quality habitats are available along the Lake Okeechobee shoreline and in adjacent canals. This project is in compliance with these Acts.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969, AS AMENDED

A Notice of Availability of the EA was prepared and sent March 10, 2015 to begin the public review period. The EA is in compliance with this Act.

NATIONAL HISTORIC PRESERVATION ACT OF 1966 (INTER ALIA)

Consultation with the Florida State Historic Preservation Officer (SHPO) was initiated September 1, 2010, and is ongoing in accordance with the National Historic Preservation Act of 1966, as amended, and as part of the requirements and consultation processes contained within the NHPA implementing regulations of 36 CFR 800. This project is also in compliance, through ongoing consultation with the SHPO and appropriate Federally recognized tribes, with the Archeological Resources Protection Act (96-95), the Abandoned Shipwreck Act of 1987 (PL 100-298; 43 U.S.C. 2101-2106) American Indian Religious Freedom Act (PL 95-341), Executive Orders (E.O) 11593, 13007, and 13175 and the Presidential Memo of 1994 on Government to Government Relations.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA), AS AMENDED BY THE HAZARDOUS AND SOLID WASTE AMENDMENTS (HSWA) OF 1984, COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA) AS AMENDED BY THE 5.26.21 SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) OF 1996, TOXIC SUBSTANCES CONTROL ACT OF 1976

A preliminary Phase I HTRW assessment conducted in November of 2009 which did not reveal any contamination issues within CCZ A between Belle Glade and Lake Harbor, nor in the adjacent areas. The project is in compliance with these Acts.

RIVER AND HARBOR APPROPRIATION ACT OF 1899

The project is in compliance. The proposed work would not obstruct navigable waters of the United States.

SAFE DRINKING WATER ACT (SDWA) OF 1974, AS AMENDED

Lake Okeechobee, as well as local ground and surface waters, supply drinking water for several communities around Lake Okeechobee. Implementation of the project would not impact water quality of Lake Okeechobee, ground waters, or surface water used to supply drinking water. This project complies with the Act.

UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970 (PUBLIC LAW 91-646)

All real estate interests acquired for construction of the Preferred Alternative would be in accordance with the provisions of this law. The Uniform Act sets forth procedures for the acquisition of private property for public use and specifically requires that the acquiring agency appraise the real property interests it wishes to acquire and provide the owner a written summary of the basis for the amount established as just compensation.

WILD AND SCENIC RIVER ACT OF 1968, AS AMENDED

No rivers designated under the Act are in the project area. This Act is not applicable.

WATER RESOURCES DEVELOPMENT ACT (WRDA) OF 1986, SECTION 904

Section 904 of the 1986 Water Resources Development Act requires that the plan formulation and evaluation process consider both quantifiable and unquantifiable benefits and costs of the quality of the total environment, and preservation of cultural and historical values. This EA is in compliance.

EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS
The Preferred Alternative would not result in impacts to wetlands. The EA is in compliance with the goals of this Executive Order (EO).

EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT The Preferred Alternative would directly support a reduction in hazards and risks associated with floods and would minimize the impact of floods on human safety, health and welfare. The study is in compliance.

EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE
EO 12898 requires agencies of the Federal Government to review the effects of their programs and actions on minorities and low-income communities. The Preferred Alternative would help to ensure the safety of those communities within the study area as well as residents living within the area anticipated to be impacted in the event of a project failure. In addition to ensuring the safety and well-being of residents and their property, implementation of the Preferred Alternative may have a significant beneficial effect on local communities through job creation, increased sale of construction material and other goods necessary to sustain a large construction force for the duration of the project. The study area is known to contain a significant percentage of low income and minority individuals. This project is not expected to have disproportionately high and adverse human health or environmental impacts on minority or low-income populations.

EXECUTIVE ORDER 13112, INVASIVE SPECIES
Exotic and invasive plant species are within drainage swales, connecting canals, wetlands, and some uplands within the project area. However, the project would not contribute to nutrient loading that could favor invasive species. Further, some removal of invasive species would be necessary within the project footprint. Ballast water organisms or terrestrial exotic wildlife species would not be affected. This project is in compliance.

EXECUTIVE ORDER 13045, PROTECTION OF CHILDREN
EO 13045, requires each Federal agency to "identify and assess environmental risks and safety risks [that] may disproportionately affect children" and ensure that its "policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." This project has no environmental or safety risks that may disproportionately affect children. The project is in compliance.

EXECUTIVE ORDER 13653, CLIMATE CHANGE CONSIDERATIONS
EO 13653 requires Federal agencies to review the effect of climate change on their programs. For this project, climate change is likely to affect water management operations of Lake Okeechobee which is contained within Herbert Hoover Dike. Under present hydrologic and climatologic conditions, Lake Okeechobee water levels are managed such that the lake level remains within an envelope between approximately 9 ft NAVD88 and 15 ft NAVD88. In the future, the ability of water managers to keep the lake level within the target envelop is likely to be adversely impacted because climate change could increase or decrease the frequency and magnitude of large storm events, alter the frequency and characteristics of "wet" and "dry" year rainfall patterns, and likely increase evapotranspiration from the lake and upstream basins which will decrease the quantity of water available for storage in the lake. The effectiveness of the dike renovation alternatives proposed in this EA will not be compromised by climate change impacts associated with increased evapotranspiration since lake stages are likely to be lower as

a result. However, the effectiveness of the dike renovation efforts may be adversely impacted by potential climate change impacts associated with increased frequency and magnitude of large storm events which could result in more extreme high lake stage events which would put more stress on the dike. At present, there is no published or widely accepted projection of climate change related variance in storm event magnitude and frequency in South Florida so per USACE Engineering and Construction Bulletin No. 2014-10, the design of dike renovation alternatives has been based on historic extreme event climatic conditions. Herbert Hoover Dike has man controlled lake levels, therefore each alternative for rehabilitation of the embankment would not be directly affected by sea level rise. However, if storms become stronger, rehabilitation of the embankment would provide more stability for life safety and resource protection with implementation of the project. The project is in compliance.

6.0 LIST OF PREPARERS

The people responsible for contributing to this EA are listed below.

Name	Discipline/Expertise	Role in Document Preparation
Stacie Auvenshine	Biologist, NEPA	Principal Author
Gina Ralph	Biologist, NEPA	NEPA review
Aaron Lassiter	Physical Scientist	Water quality, HTRW, Air quality
Mark Shafer	Environmental Engineer	Water quality, HTRW, Air quality
Wendy Weaver	Archeologist	Cultural, historic, tribal resources
Colin Rawls	Economist	Socioeconomics
Kevin Wittmann	Plan Formulation	Plan Formulation
Michael Christofidis	Civil Engineer	Engineering Design
John Kendall	Geotechnical Engineer	Geotechnical Lead
Amanda Lavigne	Civil Engineer	Hydrology & Hydraulics
Rob Tucker	Civil Engineer	Hydrology & Hydraulics Review
Emmanuel Freeman	Reality Specialist	Real Estate
Tim Willadsen	Civil Engineer	Project Management

7.0 PUBLIC COORDINATION

7.1 PUBLIC INVOLVEMENT

In compliance with the NEPA and the Corps policies, input on projects is solicited from the public and other governmental agencies. The public was invited to comment during the public review period of this EA. A press release on February 4, 2015 announced that this EA would be available on March 10, 2015 to start public review. Numerous public meetings and information sessions have been held concerning the rehabilitation of HHD. The Corps, Jacksonville District, maintains a public outreach program meant to keep the public informed of rehabilitation activities. Copies of presentations previously given to the communities surrounding HHD and information fact sheets can be found on the Jacksonville District website: http://www.saj.usace.army.mil/Missions/CivilWorks/LakeOkeechobee/HerbertHooverDike.aspx

7.2 PUBLIC MEETINGS –
THE CORPS HELD THE FOLLOWING MEETINGS DURING FORMULATION FOR HHD DSMS.

Table 7-1. Public Meetings

Date	Meeting Name	Agency/Attendees
February 26, 2013	Scoping Meeting	Public Meeting Clewiston, FL
February 28, 2013	Scoping Meeting	Public Meeting Okeechobee, FL
March 26, 2013	HHD DSMS Coordination Meeting	Florida Department of Transportation (FDOT), District 1
March 27, 2013	HHD DSMS Coordination Meeting	FDOT, District 4
August 12, 2013	HHD DSMS Coordination Meeting	Florida Department of Environmental Protection & South Florida Water Management District
May 5, 2014		Florida Department of Transportation, District 1
January 14, 2014	Fish and Wildlife Coordination Act Meeting	USFWS – Vero Beach, FFWCC
August 18, 2014	HHD DSMS Coordination Meeting, Government to Government Consultation	Seminole Tribe of Florida staff level brief
TBD	Risk Update, Plan Formulation Update	FEMA
September 4, 2014	HHD DSMS Coordination Meeting, Government to Government Consultation	Seminole Tribe of Florida, government to government consultation
	Risk Update, Plan Formulation Update	Okeechobee County Coalition Meeting Okeechobee, FL
	Risk Update, Plan Formulation Update	Public Meeting Okeechobee, FL

	Risk Update, Plan Formulation Update	Public Meeting Clewiston, FL
	Risk Update, Plan Formulation Update	Public Meeting Jupiter, FL
TBD	Risk Update, Plan Formulation Update	Public Meeting Ft. Myers, FL

7.3 LIST OF RECIPIENTS

The NOA was mailed to the Federal and state agencies, tribal representatives, and interested stakeholders. A complete mailing list, including the general public, is available upon request. The EA and Proposed FONSI will be posted on the internet at the following address Palm Beach County:

http://www.saj.usace.army.mil/About/DivisionsOffices/Planning/EnvironmentalBranch/EnvironmentalDocuments.aspx

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